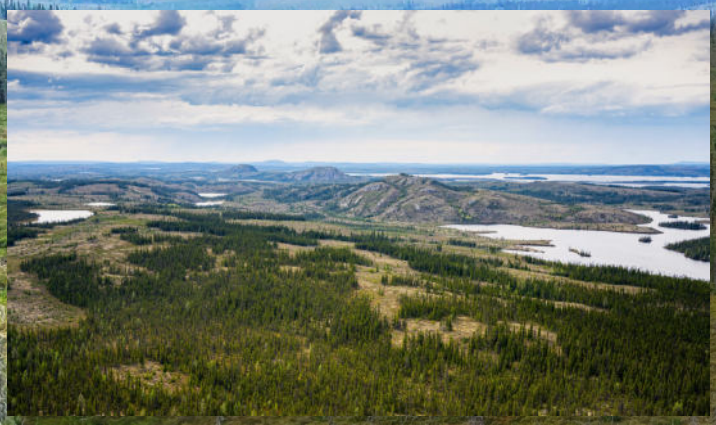
PN5 Summary

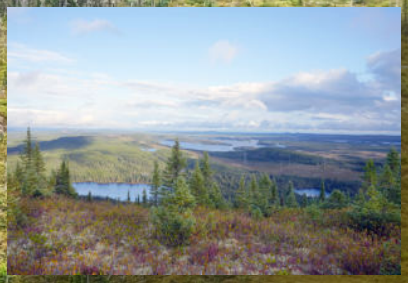
RESSOURCES PMET RESOURCES

Shaakichiuwaanaan Mining Project

SHAAKICHIUWAANAAN

Summary of the Environmental Impact Assessment







March 2026

CA0001724.3318

wsp

PMET RESOURCES INC.

SHAAKICHIUWAANAAN MINING PROJECT

SUMMARY OF THE ENVIRONMENTAL IMPACT STUDY

EEYOU ISTCHEE JAMES BAY

FINAL VERSION

WSP REFERENCE: CA0001724.3318

MARCH 2026

WSP CANADA INC.
1135 LEBOURGNEUF BOULEVARD
QUEBEC CITY, QUEBEC G2K 0M5
CANADA

PHONE: +1-418-623-2254
FAX: +1-418-624-1857

WSP.COM

SIGNATURES

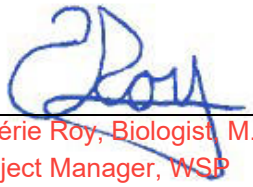
PREPARED BY



March 31, 2026

Marie-Hélène Brisson, Biologist
Project Director, WSP

Date

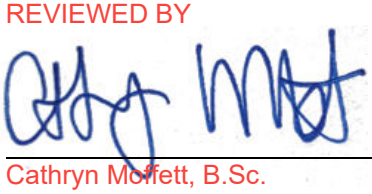


March 31, 2026

Valérie Roy, Biologist, M.Sc., PMP®
Project Manager, WSP

Date

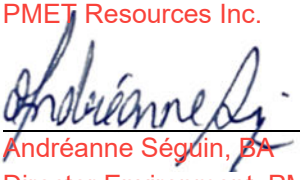
REVIEWED BY



March 31, 2026

Cathryn Moffett, B.Sc.
Vice-President Environment and Approvals,
PMET Resources Inc.

Date



March 31, 2026

Andréanne Séguin, BA
Director Environment, PMET Resources Inc.

Date

LIMITATIONS

WSP Canada Inc. (“WSP”) prepared this report solely for the use of the intended recipient, PMET Resources Inc., in accordance with the professional services agreement between the parties. In the event a contract has not been executed, the parties agree that the WSP General Terms for Consultant shall govern their business relationship which was provided to you prior to the preparation of this report.

The report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions presented in this report are based on work performed by trained, professional and technical staff, in accordance with their reasonable interpretation of current and accepted engineering and scientific practices at the time the work was performed.

The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this project.

WSP disclaims any obligation to update this report if, after the date of this report, any conditions appear to differ significantly from those presented in this report; however, WSP reserves the right to amend or supplement this report based on additional information, documentation or evidence.

WSP makes no other representations whatsoever concerning the legal significance of its findings.

The intended recipient is solely responsible for the disclosure of any information contained in this report. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report.

WSP has provided services to the intended recipient in accordance with the professional services agreement between the parties and in a manner consistent with that degree of care, skill and diligence normally provided by members of the same profession performing the same or comparable services in respect of projects of a similar nature in similar circumstances. It is understood and agreed by WSP and the recipient of this report that WSP provides no warranty, express or implied, of any kind. Without limiting the generality of the foregoing, it is agreed and understood by WSP and the recipient of this report that WSP makes no representation or warranty whatsoever as to the sufficiency of its scope of work for the purpose sought by the recipient of this report.

In preparing this report, WSP has relied in good faith on information provided by others, as noted in the report. WSP has reasonably assumed that the information provided is correct and WSP is not responsible for the accuracy or completeness of such information.

Benchmark and elevations used in this report are primarily to establish relative elevation differences between the specific testing and/or sampling locations and should not be used for other purposes, such as grading, excavating, construction, planning, development, etc.

Overall conditions can only be extrapolated to an undefined limited area around these testing and sampling locations. The conditions that WSP interprets to exist between testing and sampling points may differ from those that actually exist. The accuracy of any extrapolation and interpretation beyond the sampling locations will depend on natural conditions, the history of Site development and changes through construction and other activities. In addition, analysis has been carried out for the identified chemical and physical parameters only, and it should not be inferred that other chemical species or physical conditions are not present. WSP cannot warrant against undiscovered environmental liabilities or adverse impacts off-Site.

The original of this digital file will be kept by WSP for a period of not less than 10 years. As the digital file transmitted to the intended recipient is no longer under the control of WSP, its integrity cannot be assured. As such, WSP does not guarantee any modifications made to this digital file subsequent to its transmission to the intended recipient.

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

The French version of this document constitutes the official version. In case of conflict of interpretation between the English and French versions, the French version prevails.

CLIENT

PMET RESOURCES INC.

Vice President – Environment and Approvals	Cathryn Moffett, B.Sc.
Vice President – Community and ESG	Éva Roy-Vigneault, B.A.
Executive Vice President, Corporate Affairs	Grace Barrasso, MA
Vice President – Financial Planning and Risk Management	Vicky Munger, CPA
Director – Environment	Andréanne Séguin, BA
Vice-President – Exploration	Darren L. Smith, M. Sc., P. Geo
Director of Operations	Frédéric Mercier-Langevin, Ing. M.Sc.
Director of Studies – Operations	Jonathan Houle, P. Ing.

PRODUCTION TEAM

WSP CANADA INC. (WSP)

Project Director	Marie-Hélène Brisson, Biol.
Project Manager	Valérie Roy, Biol. M. Sc., PMP®
Senior Editor	Ghyslain Pothier, Biol., M. Env.
Collaborators	Nathalie Martet, Chemist, M. Sc. A. (risk management)
	Mégane Lemieux, ing. (risk management)
	Nicolas Sbarrato, Eng. M.Sc. (resilience to climate change)
	Sylvain Marcoux, ing. MBA (GHG)
	Philip Latulippe Beaulieu, Economist, M. Sc. (economic benefits)
	Mark-Anthony Sagaria, P.Eng., M.Eng., MFin, LL.M. (economic benefits)

	Julien Poirier, ing. M. Sc. (Air quality)
	Elsa Sormain, ing. M.Sc. (hydrology)
	Andréanne Hamel, ing. M.Sc. (hydrogeology and groundwater quality)
	Isabelle Cartier, biologiste, M.Sc. (water and sediments)
	Sébastien Faucher, biologiste, M.Sc. Env. (vegetation and wetlands)
	Mathieu St-Laurent-Addison, Geographer Env. (ichthyofauna and benthos)
	Émilie D'Astous, Biologist, M.Sc. (herpetofauna, birds and mammals – other species)
	Catherine Villeneuve, Biologist, M. Sc. (birds)
	Rémi Duhamel, Biologist, M. Sc. (bats)
	Jade Legros, Biologist, M. Sc. (bats)
	Lisyanne Metthé, Biologist, M.Sc. (large fauna)
	Maxime Lachance, M. Env. (human environment)
	Laurence Lépine, Expert in Relation with communities (health)
	Karine Neuman, Anthropologist (human environment)
	Christine Madisson, Landscape Architect (landscape)
	François Gagnon, Professional in Environment (habitat compensation)
Mapping and geomatics	Jonathan Roy, Analyst GIS
	Martine Leclair, Analyst GIS
	Maxime Dupraz, Analyst GIS
Word processing and editing	Cathia Gamache

TABLE OF CONTENTS

1 Introduction 1

1.1 About the Proponent 1

1.1.1 Proponent's Experience 1

1.1.2 Policies, corporate initiatives, and environmental and sustainable development agreements 2

1.2 Consultant mandated by the project initiator 2

2 Project context and rationale 3

2.1 Context 3

2.1.1 Location 3

2.1.2 Project Overview 3

2.1.3 History of Mining and Exploration Activites 3

2.1.4 Mining rights and land ownership 5

2.2 Regulatory Context 5

2.3 Project Rationale 5

2.4 Alternatives to the Project 6

2.5 Similar Projects 6

3 Community relations 7

3.1.1 Engagement Approach 7

3.1.2 Objectives 7

3.1.3 Engagement tools 8

3.2 Regional Context 8

3.3 Cree communities of Eeyou Istchee and Indigenous organizations 8

3.3.1 Cree communities and Indigenous organizations 8

3.3.2 Engagement Activities During the Exploration Phase 9

3.3.3 Engagement Activities During the ESIA phase 9

3.3.4 Results of Engagement Activities 10

3.3.5 Cree Input and Participation 11

3.3.6 Upcoming Information and Consultation Activities 11

3.4 Non-Indigenous stakeholders and government entities 11

3.4.1 Engagement Activities 12

3.4.2 Results of engagement activities 12

3.4.3 Upcoming Engagement Activities 13

4 Alternatives assessment 15
4.1 Technology Alternatives 15
4.1.1 Ore Processing 15
4.1.2 Tailings and waste rock management approach 15
4.1.3 Water treatment 16
4.1.4 Shipment of spodumene concentrate 17
4.1.5 Energy Supply Sources 17
4.2 Location alternatives 18
4.2.1 Location options for key infrastructure 18
4.2.2 Other infrastructure 19
4.3 Cost-benefit analysis 20

5 Project description 21
5.1 Project Summary 21
5.2 Description of the Mine and Operations 21
5.2.1 Mineral Deposits, Resources, and Reserves 21
5.2.2 Ore Extraction 21
5.2.3 Ore Processing 25
5.2.4 Expedition of Spodumene Concentrate 26
5.2.5 Geochemistry of Tailings and Waste Rock 29
5.2.6 Storage Area Management 30
5.3 Planned Infrastructure and Related Facilities 30
5.3.1 Road Access and Internal Road Network 31
5.3.2 Electric Power Supply 31
5.3.3 Buildings and surface infrastructure 31
5.3.4 Communication and Security Systems 36
5.3.5 Fuel Storage and Distribution 36
5.3.6 Compressed natural gas (CNG) 36
5.3.7 Quarries for construction 36
5.4 Water Management 37
5.4.1 Water Balance 37
5.4.2 Contact Water Management Infrastructure 37
5.4.3 Dikes and stream diversion 38
5.4.4 Drainage of Lake L01 – Sediment and Water Management 38
5.4.5 Mining and Industrial Water Treatment Plant 39
5.4.6 Mine Effluent 39
5.4.7 Drinking Water 39
5.4.8 Sanitary Wastewater 40

5.4.9 Other water treatment systems....40
5.5 Planned activities during the construction, operation, and closure phases....40
5.5.1 Construction activities....40
5.5.2 Operational Activities....41
5.5.3 Mine Site Restoration....41
5.6 Waste management and the 3RV approach....42
5.6.1 Household Solid Waste....42
5.6.2 Dry waste....42
5.6.3 Hazardous materials....42
5.7 Energy Consumption....43
5.7.1 Total requirements....43
5.7.2 Energy Optimization....43
5.7.3 Autonomy and Backup....43
5.8 Greenhouse gas emissions....44
5.8.1 Emissions sources....44
5.8.2 Reduction and Offset Measures....44
5.8.3 Climate performance target....45
5.9 Project Timeline....45
5.9.1 Key milestones....45
5.10 Labor, Economic Benefits, and Overall Costs....46
5.10.1 Labor and economic benefits....46
5.10.2 Overall Project Costs....47

6 Description of the Existing Environment....49
6.1 Delimitation of study areas....49
6.2 Physical Environment....49
6.2.1 Climate....49
6.2.2 Ambient Air....55
6.2.3 Greenhouse gases (GHG)....55
6.2.4 Acoustic Environment....55
6.2.5 Light Environment....55
6.2.6 Geology and Geomorphology....55
6.2.7 Hydrology....56
6.2.8 Surface water....56
6.2.9 Sediments....56
6.2.10 Hydrogeology....56
6.2.11 Groundwater Quality....57

6.3 Biological Environment 57
6.3.1 Vegetation and wetlands 57
6.3.2 Aquatic wildlife (fish) and habitat 58
6.3.3 Herpetofauna 58
6.3.4 Avian fauna 59
6.3.5 Mammals – Large Fauna 60
6.3.6 Mammals – Chiroptera 60
6.3.7 Mammals – Other Species 60
6.3.8 Flora and fauna species with special status 61
6.4 Human Environment 61
6.4.1 Territorial Governance and Land Use Planning 61
6.4.2 Cree communities of Eeyou Istchee 67
6.4.3 Jamesian Municipalities and Localities 67
6.4.4 Regional Economy 68
6.4.5 Transportation 68
6.4.6 Archeology 69
6.4.7 Landscape 69

7 Identification of Issues 71

8 Impact Assessment 77
8.1 Method for Identifying and Assessing Impacts 77
8.1.1 Identification of Potential Impacts 77
8.1.2 Assessment of Residual Impacts 77
8.2 Assessment and Mitigation of Project Impacts 78
8.2.1 Issue No· 1 – Preservation of Aquatic Habitat Quality 78
8.2.2 Issue No. 2 – Preservation of soil and groundwater quality 82
8.2.3 Issue No. 3 – Preservation of wetlands and habitats of interest to terrestrial flora and fauna 86
8.2.4 Issue No. 4 – Preserving the quality of life of the local population 95
8.2.5 Issue No. 5 Health, social, and economic conditions of Indigenous peoples 96
8.2.6 Issue No. 6 – Preservation of traditional activities and uses by Indigenous peoples and activities and uses by non-Indigenous peoples (Current use of lands and resources for traditional purposes) 101
8.2.7 Issue No. 7 – Addressing Climate Change 106

9 Cumulative Impacts Assessment 109
9.1 Methodology 109
9.2 Analysis Parameters 109
9.2.1 Overview of Project Issues 109
9.2.2 Identification and justification of selected VECs 110
9.2.3 Spatial and temporal boundaries 110
9.2.4 Projects, Actions and Events considered in the Analysis 110
9.3 Cumulative Impact Analysis 111
9.3.1 Surface Water Quality 111
9.3.2 Wildlife (fish) and aquatic habitat 111
9.3.3 Wetlands and Waterbodies 111
9.3.4 Wildlife Species with Special Status 112
9.3.5 Terrestrial wildlife and wildlife habitats 112
9.3.6 Physical, Psychological, and Social Health of the Regional Population (Health, Social, and Economic Conditions of Indigenous Peoples) 113
9.3.7 Road safety 113
9.3.8 Hunting and Trapping 113
9.3.9 Well-being on the Territory 114
9.3.10 Climate Change Mitigation (GHG Emissions) 114
9.4 Summary of Cumulative Impacts 114

10 Summary of residual impacts 115

11 Climate change resilience 127
11.1 Methodology 127
11.2 Future Climate Hazards 128
11.2.1 Existing Climate 128
11.2.2 Future Climate Profile 128
11.3 Mitigation measures 129

12 Risk management 131
12.1 Introduction 131
12.2 Major Technological Accident Risk Assessment 131
12.2.1 Objectives and Scope 131
12.2.2 Methodology for Risk Assessment 131
12.2.3 Identification of Sensitive Elements in the Environment 132
12.2.4 Accident history 133

12.3 Hazard Identification 133
12.3.1 External hazards of natural origin 133
12.3.2 External anthropogenic hazards 134
12.3.3 Identification of hazards related to on-site activities 135
12.4 Potential Accidents 135
12.4.1 Open-pit mining 135
12.4.2 Underground mine 136
12.4.3 Ore processing 136
12.4.4 Storage and Use of Chemicals 137
12.4.5 Storage and Handling of Explosives 137
12.4.6 Storage and use of petroleum products 138
12.4.7 Storage and use of flammable gas 139
12.4.8 Mine water treatment 139
12.4.9 Accumulation areas and retention structures 139
12.4.10 Road transport 140
12.4.11 Risks associated with external hazards 140
12.4.12 Risk summaries 141
12.5 Quantitative Consequence Assessment 141
12.5.1 Incident Involving Hazardous Materials 141
12.5.2 Retention dam failure 143
12.6 Risk management program 143
12.7 Preliminary Emergency Response Plan (ERP) 143

13 Monitoring and follow up program 145
13.1 Environmental Monitoring 145
13.2 Environmental Follow-up 145

14 Preliminary habitat compensation program 147

References 159

TABLE OF CONTENTS

Tables

Table 5-1 Classification of lithologies relevant to the project 29
Table 5-2 Timeline of the project's main phases 45
Table 5-3 Labor requirements by project phase 46
Table 7-1 List of issues raised by the project and associated valued environmental components, selected or not selected for the impact assessment 73
Table 10-1 Summary of Impacts by Issue 117
Table 13-1 Proposed Environmental Monitoring 146
Table 14-1 Summary of estimated direct losses of fish habitat, wetlands, and aquatic environments 147
Table 14-2 Summary of Potential Fish Habitat Loss Compensation Projects 150
Table 14-3 Summary of potential projects to offset the loss of wetlands and water bodies 155

Figure

Figure 5-1 Flow diagram of the crushing and dense media separation (DMS) process 27

Maps

Map 1 Location of the Shaakichiuwaanaan Mining Project 4
Map 2 Mining Project Components 23
Map 3 Existing Project Components 33
Map 4 Map Regional Study Areas 51
Map 5 Local and Project Study Areas 53
Map 6 Inventory of the Human Environment in the Regional Study Area 63
Map 7 Inventory of the Human Environment in the Local Study Area 65

1 Introduction

The Shaakichiuwaanaan mining project (the "project"), located in northern Quebec in Eeyou Istchee James Bay, is the subject of an environmental impact assessment (EIA) aimed at identifying, describing, and assessing the project's potential effects on the biophysical and socioeconomic components of the existing environment. This EIA is being conducted in accordance with the requirements of the provincial and federal environmental assessment regimes applicable to the territory covered by the James Bay and Northern Quebec Agreement (JBNQA), as well as under the *Impact Assessment Act*.

The EIA incorporates the main concerns expressed by Indigenous land users and project stakeholders consulted as part of the project. These concerns are addressed in a cross-cutting manner throughout the analysis, particularly through the identification of issues, the assessment of impacts, and the definition of mitigation, monitoring, and compensation measures. The report is structured to present, in sequence, the project context, the community engagement approach, the analyzed alternatives, a description of the planned project activities, the existing environment and social conditions, an impact analysis, an assessment of cumulative effects and technological risks, an assessment of the project's resilience to climate change, and the planned monitoring, follow-up, and compensation programs.

1.1 About the Proponent

The project is initiated by PMET Resources Inc. (PMET), a mineral exploration company engaged in the development of base metals and critical mineral projects. In 2023, the proponent established a wholly-owned Quebec subsidiary, Innova Lithium Inc., which owns the mining claims associated with the project, located in the Eeyou Istchee James Bay region.

The project aims to develop a mining complex including an open-pit mine and underground infrastructure for the extraction of lithium-bearing spodumene pegmatites. The projected extraction rate, exceeding 5 kt/day, means the project is subject to environmental and social assessment mechanisms applicable at both the provincial and federal levels. The work presented in the EIA was carried out in accordance with the project-specific guidelines issued by the relevant provincial and federal authorities.

1.1.1 Proponent's Experience

PMET Resources Inc. was incorporated in 2007 and listed on several stock exchanges. The project proponent has experience in mineral exploration and project development, as well as an organizational presence in Quebec, including corporate offices in Montreal and facilities associated with exploration activities at the project site.

This experience is a key factor in the planning, execution, and management of a mining project in a northern context, taking into account the environmental, regulatory, and social constraints specific to the project area.

1.1.2 Policies, corporate initiatives, and environmental and sustainable development agreements

As part of its operations, the project proponent has established policies and commitments governing its practices regarding the environment, community relations, health and safety, responsible procurement, and internal and supplier conduct. These policies apply to all employees, partners, and suppliers involved in the project proponent's projects, at all stages of their lifecycle.

Corporate commitments focus in particular on compliance with legal and regulatory requirements, the prevention and reduction of environmental impacts, the protection of biodiversity, the responsible use of natural resources, and the proper management of waste. The policies also incorporate considerations regarding relations with host communities, including dialogue, addressing expressed concerns, respecting rights and customs, and promoting local socioeconomic benefits.

Planning for the closure and restoration of sites is incorporated from the earliest stages of projects, with a view to responsible and sustainable land management, in consultation with the relevant stakeholders.

1.2 Consultant mandated by the project initiator

The coordination and preparation of the EIA have been entrusted to WSP Canada Inc. (WSP), which is acting as the lead consultant. The mandate includes the overall coordination of the environmental and social assessment process, the preparation of required documents, and the integration of specialized studies necessary for the project analysis.

Several other specialized consulting firms have contributed to the work, particularly in the fields of fauna, hydrology, hydrogeology, geochemistry, geotechnical assessments, archaeology, and restoration planning. This multidisciplinary approach aims to ensure the scientific and technical rigor of the analyses conducted and to support the integrated assessment of the project's potential impacts on the surrounding environment.

2 Project context and rationale

This chapter outlines the context of the Shaakichiuwaanaan mining project (the "project"), its regulatory framework, and the rationale for its implementation. It also presents an analysis of alternatives, the identified constraints and challenges, as well as the project's alignment with government policies and applicable agreements within the Eeyou Istchee James Bay territory.

2.1 Context

2.1.1 Location

The project is located in Quebec in the Nord-du-Québec administrative region, more specifically on lands administered by the Eeyou Istchee James Bay Regional Government (GREIBJ) situated between the^{49th}and^{55th}parallels, on Category III lands as defined by the James Bay and Northern Quebec Agreement (Map 1). The project is located 220 km east of the town of Radisson and borders the traditional territory of three Cree communities: Chisasibi, Wemindji, and Mistissini.

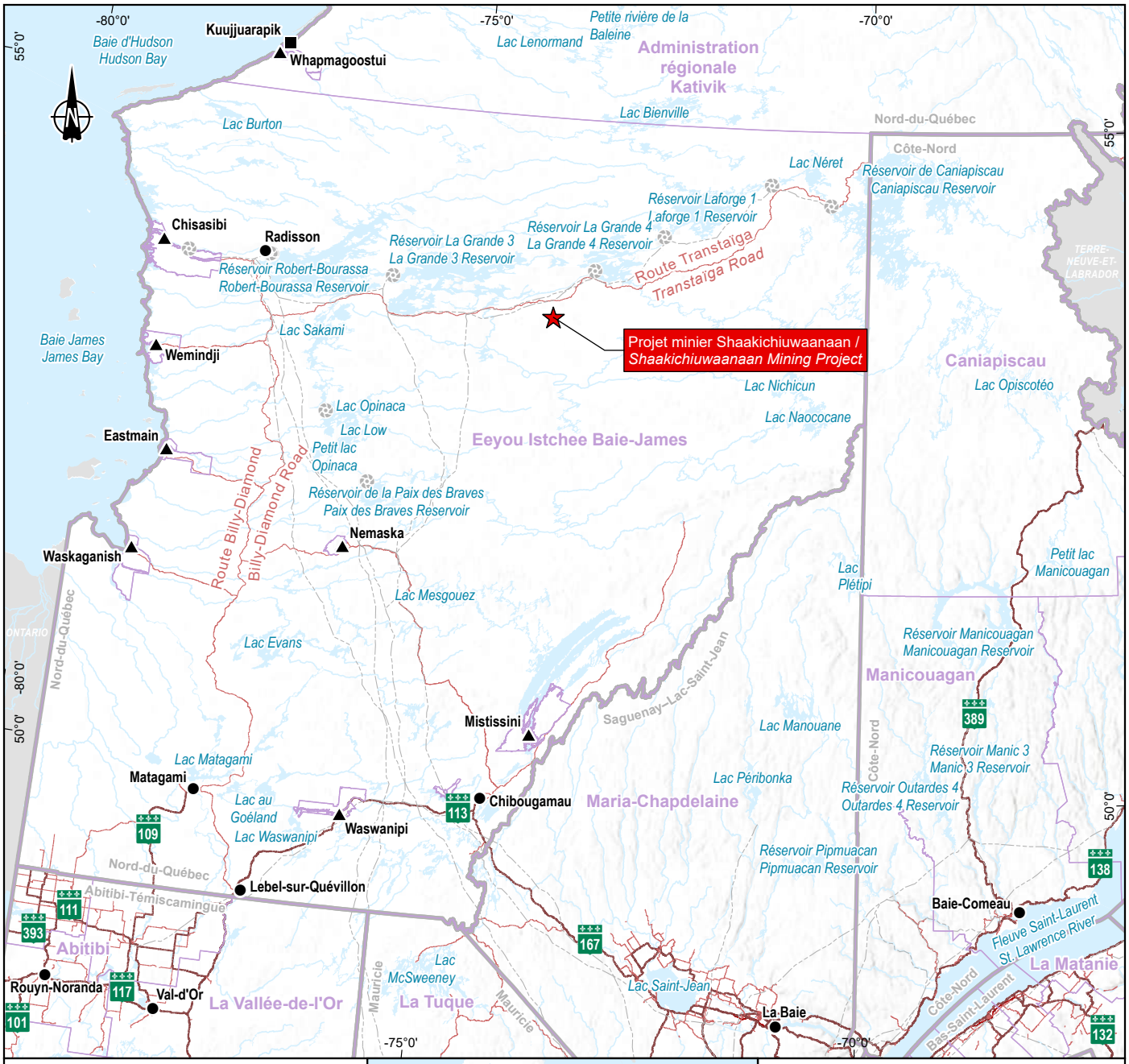
2.1.2 Project Overview

The project aims to develop a spodumene pegmatite deposit using a hybrid approach combining open-pit and underground mining. The projected mine life is 21 years, including the construction, operation, and closure phases. At full production, the underground mine is expected to reach an extraction rate of 5,500 tonnes of ore per day. A total of 84.3 million tonnes (Mt) of ore is expected to be extracted over the mine's life, which will be sent to a processing plant with a nominal processing capacity of 5.1 million tonnes per year. The project will also generate 155.2 Mt of waste rock, 71.1 Mt of mine tailings, 14.0 Mt of overburden, and 3.2 Mt of organic material, which will be stored in waste rock stockpiles, overburden and organics stockpiles and in the pit.

Mining infrastructure includes the pit, underground tunnels, waste rock and tailings stockpiles, overburden and organic stockpiles, the processing plant, energy infrastructure, water and waste management infrastructure, a substation and power line (connected to the LG-4 power plant), and other support facilities.

2.1.3 History of Mining and Exploration Activites

Exploration work conducted on the property since the 1950s initially targeted base and precious metals. Beginning in 2016, intensive exploration work carried out by PMET confirmed the presence of lithium pegmatites and delineated major deposits, notably CV5 and CV13, justifying the initiation of the mining project.



Repères géographiques / *Geographical Landmarks*

- Communauté crie (zone d'étude régionale) / *Cree community (regional study area)*
- Village inuit / *Inuit village*
- Municipalité / *Municipality*

Infrastructures / *Infrastructure*

- Centrale hydroélectrique / *Hydroelectric generating station*
- Ligne de transport d'énergie / *Electric power transmission line*

Réseau routier / *Road Network*

- Autoroute / *Highway*
- Route nationale ou régionale / *National or regional road*
- Autre / *Other*

Limites / *Boundaries*

- Région administrative / *Administrative Region*
- Municipalité régionale de comté (MRC) et Territoires autochtones / *Regional County Municipality (RCM) and First Nations Territories*



Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Résumé de l'étude d'impact sur l'environnement / *Summary of the Environmental Impact Assessment*

Carte 1 / *Map 1*
Localisation du projet minier Shaakichiuwaanaan / *Location of the Shaakichiuwaanaan Mining Project*

Sources :

SDA, 1/20 000, MRNF, 2024-02
Canvec, 1/250 000, 1/5 000 000 et 1/15 000 000, RNCan, 2019
BDGA, 1/1 000 000, MRN Québec, 2014
BDGA, 1/5 000 000, MRNF Québec, 2010
AQréseau+, réseau routier, MERN, 2024-03-01
RNCan, Frontières géopolitiques, 2002

0 50 100 km

NAD 1983 Quebec Lambert

2026-03-25

Préparation / Preparation : M.-H. Brisson
Dessin / Drawing : J. Roy
Approbation / Approval : M.-H. Brisson
CA0001724_3318_eie_resume_c01_05_260325.aprx
CA0001724_3318_eie_resum_c1_164_loc_projet_260325

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / Boundary accuracy and measurements shown on this document are not intended for engineering or land delineation purposes. No land analysis has been performed by a land surveyor.

2.1.4 Mining rights and land ownership

The Shaakichiuwaanaan property comprises 463 exclusive exploration rights (EERs) held by PMET, covering an area of approximately 23,710 ha and extending over approximately 51 km. The CV5 and CV13 pegmatite deposits are located in the center of the property, approximately 13 km south of KM 270 on the Trans-Taiga Road. PMET also holds a lease south of KM 270 on the Trans-Taiga Road, where its exploration camp and core collection facility are located.

2.2 Regulatory Context

The project is subject to a provincial and federal environmental assessment. At the provincial level, it falls under the *Environment Quality Act* and the specific regime established in Chapter 22 of the JBNQA, under the responsibility of COMEV and COMEX. At the federal level, the project is subject to the *Environmental Impact Assessment Act* due to its production capacity.

The project will also need to obtain various ministerial authorizations and permits under applicable laws and regulations, including Directive 019 on the Mining Industry, the *Mining Act*, the *Occupational Health and Safety Act*, as well as applicable municipal and federal authorizations.

2.3 Project Rationale

The project's objective is to develop a world-class lithium deposit to produce spodumene concentrate for the battery industry. Lithium is a critical mineral essential to the energy transition, particularly for the manufacture of lithium-ion batteries. The project offers probable reserves estimated at 84.3 Mt of ore with an average grade of 1.26% Li_2O, yielding 2.62 Mt of lithium carbonate equivalent, to be produced over approximately 19 years.

The project aligns with the government policies of Quebec and Canada regarding critical and strategic minerals, the energy transition, and the economic development of Northern Quebec. It also adheres to the principles of sustainable development by integrating environmental, social, and economic considerations from the project's inception.

According to the project's feasibility study managed by G Mining Services (2025) and undertaken by a team of qualified professionals, the project will help strengthen Quebec's mining ecosystem with a total development capital investment of approximately $1,978 million, operating costs of approximately $9,664 million, and reclamation and closure costs estimated at approximately $248 million. It will generate positive benefits for local communities through business opportunities, direct and indirect jobs.

Given the size of the deposit, its high grade, and the strong projected demand for lithium, the project is well-positioned to contribute to market supply and to serve as a strategic player in the development of Quebec's battery industry.

2.4 Alternatives to the Project

The “do nothing” approach or the potential of postponing the project would have significant economic and strategic repercussions, particularly by limiting Quebec’s contribution to the critical mineral sector. The selected solutions, including the adoption of a hybrid mining method (open pit and underground mining), result from consultations with local land users and project stakeholders and aim to reduce the environmental footprint and impacts on the area. The decision to move forward with the project is based on its strategic relevance, the favorable characteristics of the deposit, a favorable economic context, the potential to generate significant economic benefits, and social acceptability supported by strong engagement from PMET.

2.5 Similar Projects

Several lithium mining projects are currently under development or evaluation in the Eeyou Istchee James Bay region and in Quebec, four of which are considered major. The presence of these projects raises issues of cumulative effects, which are taken into account in the impact study, particularly regarding pressure on natural environments, infrastructure, and local communities.

3 Community Relations

PMET recognizes the importance of developing positive and mutually beneficial relationships with local land users, project stakeholders and Indigenous communities affected by its activities on the Shaakichiuwaanaan property. As early as 2017, during the initial exploration work, the company implemented a structured and culturally sensitive approach to identify, inform, and consult with potentially affected stakeholders.

This chapter presents the engagement activities carried out during the EIA phase, following the filing of the project notice with the provincial government in November 2023. Community relations are an ongoing process that will continue after the submission of the EIA and throughout the life of the project.

3.1.1 Engagement Approach

PMET's engagement approach is based on both government requirements and the internal *Stakeholder Engagement Protocol*, which is grounded in the ECOLOGO® UL 2723 certification for mining exploration companies.

The engagement approach is structured around several key stages, including identifying project parameters and PMET's disclosure responsibilities, identifying project stakeholders and local land users, outreach planning, maintaining accountability, and ongoing information sharing. This approach aims for rapid stakeholder and community engagement, is adapted to the local culture, encourages feedback, systematically documents activities, and ensures continuous communication throughout the project.

3.1.2 Objectives

The objectives of the engagement process are to:

- promote dialogue with local land users, Indigenous communities and project stakeholders;
- widely disseminate information about PMET and project activities;
- gather information on land use, culture, and traditions of Indigenous and local communities;
- gather concerns and identify potential challenges related to the project and the company's other activities;
- address concerns, correct misperceptions as needed, and make appropriate commitments;
- build a lasting relationship of trust with affected parties.

Thus, PMET aims to offer stakeholders and local communities the opportunity to proactively participate in the planning and design of the project.

3.1.3 Engagement tools

PMET has developed various tools, specifically tailored to Indigenous communities, reflecting the importance placed on the relationship between the company and the affected Cree communities. The tools implemented include:

- A communications log that allows for the identification of stakeholders and local actors, the documentation of engagement activities, the recording of concerns raised, and the tracking of commitments made by the company.
- A community liaison office in Chisasibi, where the liaison coordinator hired by PMET is based. Their role is to maintain relationships with various community stakeholders, inform the public about ongoing activities, act as an interpreter, contribute to the engagement strategy, support the dissemination of knowledge about the project, and coordinate information sessions, site visits, and public events.
- A regional working group on spodumene concentrate transportation that incorporates the perspectives of local stakeholders into the development of the concentrate transportation plan from the mine site.
- A suite of communication tools, some of which were developed with the Chisasibi community, including meetings and interviews, public presentations, phone calls and emails, bulletins and fact sheets, newsletters, letters, a website and social media, informational videos, radio broadcasts, and digital billboards.

3.2 Regional Context

The project is located on the territory of the Eeyou Istchee James Bay Regional Government (GREIBJ), corresponding to Category III lands under the JBNQA between the 49th and 55th parallels. On this territory, the Cree have exclusive trapping rights for fur-bearing animals and fishing rights for certain species. The JBNQA's environmental protection regime guarantees them a privileged role in environmental assessment processes through consultation and representation mechanisms in which they play a major role. In this context, the Crown has an obligation to consult with Indigenous peoples and accommodate them where appropriate, and certain procedural aspects of this obligation are delegated to PMET for this project.

3.3 Cree communities of Eeyou Istchee and Indigenous organizations

The Crown has delegated certain procedural aspects of the obligation to consult Indigenous peoples for the project to PMET, through the requirements contained in the project-specific impact assessment guidelines.

3.3.1 Cree communities and Indigenous organizations

In 2025, the AEIC and the Cree Nation Government signed the Agreement regarding the federal external assessment process for Shaakichiuwaanaan under the JBNQA and the *Impact Assessment Act*. The Agreement delegates to a joint assessment committee, composed of representatives from the Cree Nation Government and the AEIC, the responsibility for carrying out the activities required by the Act, including the implementation of an Indigenous Engagement and Partnership Plan (IEPP).

The PMPA identifies the Indigenous groups likely to be affected and who, as a result, must be consulted and informed as part of the impact assessment: the Cree Nation of Chisasibi, the Wemindji Cree Nation, the Mistissini Cree Nation, the Makivik Corporation, and the Cree Nation Government. PMET has identified Chisasibi as a priority stakeholder, as the project is located on trapping territory CH39. The company has therefore worked with elected officials to identify the tallyman and agree on communication protocols. Mistissini (M02A) and Wemindji (VC26) are also being informed due to the proximity of their trapping grounds to the project area, even though no drilling or development activities are planned there. PMET attempted to contact the Makivik Corporation without success.

3.3.2 Engagement Activities During the Exploration Phase

Prior to the EIA, information and consultation activities were conducted with Chisasibi beginning in 2017. In 2018, the Cree Mineral Exploration Board was informed of PMET's intention to conduct work on the Shaakichiuwaanaan property. In 2022, formal meetings were held to introduce the company and its exploration activities, supplemented by written and telephone communications.

Tallyman CH39 and his family were met for the first time in 2022 at the Mirage site, which allowed them to familiarize themselves with exploration activities. Mistissini was informed of PMET's intentions as early as 2019 and received information in 2022 regarding exploration and construction activities. In December 2022, the Chief of Wemindji and Tallyman VC29 were notified of exploration activities on the property.

3.3.3 Engagement Activities During the ESIA phase

Since November 2023, PMET has intensified its activities with Cree communities, increasing the number of working meetings, information sessions, site visits, and cultural events. These activities include:

- Meetings with band councils and the Cree Nation Government (28 between November 2023 and July 2025 regarding project progress, the communication protocol, planning of engagement activities, Shaakichiuwaanaan Day, field visits, information sessions, the exploration program, the EIA process, the mineral resource update, training, employment, relations with Hydro-Québec, and fish habitat compensation projects. Virtual meetings were also held with Mistissini and Wemindji.
- Interviews with tallymen and their families (20 between November 2023 and July 2025) that helped document land use, present the project, explain the new authorization process for impact exploration work (ATI), discuss benefits and advantages, plan Shaakichiuwaanaan Day, present the field studies conducted, the exploration program, the baseline status of the natural and human environment, mineral resources, and initial considerations regarding mine closure and concentrate transport. In 2025, similar meetings were held with the M02A VC26 tallymen.
- Community information sessions (7 between October 2023 and September 2025) provided an opportunity to present the project, detail the evaluation process, present the project timeline, discuss employment, training, and business opportunities, impacts on fish habitat and compensation projects, land use, mitigation and compensation measures, and site closure. Some sessions were broadcast on community radio, reaching a wider audience, and two exhibitions featuring 22 informational posters were also organized.

- Focused meetings with other Cree entities (7 between April 2024 and April 2025) that covered the project presentation, the fish habitat compensation program, the exploration program, the EIA process, workforce training, health, well-being, and business opportunities.
- Other engagement activities, such as Shaakichiuwaanaan Day (held in 2024 and 2025), aimed to celebrate Cree culture and allow community members to familiarize themselves with the project facilities, as well as National Truth and Reconciliation Day and Orange Shirt Day. A tour of the facilities was also organized in 2025 for Tallyman CH39 and his family.

3.3.4 Results of Engagement Activities

The results of the engagement activities conducted with the identified Cree communities and Cree organizations reveal the following concerns:

- preservation of the Cree way of life;
- the practice of traditional activities;
- the physical, psychological, and social health of workers;
- living conditions at the mining camp;
- vulnerable populations;
- spiritual well-being;
- pressure on health services;
- jobs; economic benefits; training;
- road safety;
- terrestrial and aquatic wildlife;
- water, soil, and air quality,
- noise levels, landscape,
- social acceptability, the consultation process, and the assessment process.

PMET plans to progressively implement a suite of measures from the construction phase through to site closure. These measures include the negotiation of an Impact and Benefit Agreement (IBA), the establishment of a worker camp incorporating health and wellness facilities, corporate prevention policies, and mental health support. They also include commitments related to the training and recruitment of Cree workers.

In addition, the project provides for the implementation of environmental monitoring programs, measures aimed at limiting the project's footprint, as well as specific actions related to residual materials management, atmospheric emissions, and noise management. Transparency mechanisms will also be put in place, notably through the establishment of a monitoring committee and the application of a communication protocol. Finally, site restoration and post-closure monitoring measures are planned.

3.3.5 Cree Input and Participation

The Cree's contributions and participation in the project to date include:

- The expression of concerns and comments on the project during 208 engagement activities between November 2023 and March 2025, which helped influence the project's design, reduce the area of lakes affected, and adjust the rehabilitation and closure plan.
- The contribution of members of the Chisasibi community, including users of the CH39 trapping ground, to environmental data collection, particularly regarding flora and fish.
- The participation of Indigenous and local businesses in the provision of goods and services (valued at over $23.2 million between April 2024 and March 2025) as well as the increased presence of Indigenous workers at the project site.

In addition to these aspects, PMET has contributed over $143,400 in donations and sponsorships, including $115,300 in Eeyou Istchee James Bay, notably to the 2023 Forest Fire Reconstruction Fund, the Cree Restor-Action Fund, and various community initiatives in Chisasibi. A fishing program for Cree youth is also being developed with Trapping Master CH39.

3.3.6 Upcoming Information and Consultation Activities

The company intends to maintain ongoing and transparent communication with stakeholders and communities potentially affected by the project, particularly during key stages of project development.

PMET will continue to visit the Chisasibi community regularly. The liaison office will be maintained and operated by the liaison officer. PMET will continue to publish newsletters on a quarterly basis to keep the community informed of recent project developments. The company also intends to reach out to the new Chief of Chisasibi and his council. An Impact and Benefit Agreement (IBA) must be negotiated between Chisasibi, the Cree Nation Government, and PMET before construction begins. Once signed, PMET's engagement approach will be adjusted in accordance with its terms. The creation of an environmental monitoring committee is also provided for in the communication protocol, but the timing of its establishment remains to be determined.

3.4 Non-Indigenous stakeholders and government entities

PMET has compiled a list of non-Indigenous stakeholders in the territory likely to be interested in or affected by the project based on publicly available data. This list was updated following receipt of the provincial guidelines for the environmental impact assessment and expanded throughout the mining project development process, particularly as exploration activities were conducted and the project design became more defined.

3.4.1 Engagement Activities

Engagement activities involved two main groups of stakeholders:

- Various federal and provincial government departments and Crown corporations to inform them about the project and its activities, discuss land access, infrastructure needs, mining planning, taxation, support programs, transportation, timelines related to the EIS approval process, baseline data collection, cumulative effects, and compensation projects.
- Various local and regional government entities and other stakeholders to keep them informed about exploration work, present the project to them, and engage in dialogue to better understand the organizations, document land use, planning, and development, socio-economic issues, community health, the carrying capacity of affected communities, tourism, cumulative effects, and suggested mitigation measures

3.4.2 Results of engagement activities

Key comments and concerns from non-Indigenous stakeholders and government entities include, in particular:

- water management and the location of mine effluent;
- impacts on wetlands, biodiversity, and fish habitat;
- ambient air quality;
- the effects of airport commuting on the vitality of communities in the James River Valley, community health, and health services;
- issues related to substance use and violence against women;
- housing, capacity, and social investment needs;
- economic impacts, employment, training, and the capacity of local businesses;
- road safety and increased heavy traffic on the Billy-Diamond and Trans-Taiga roads;
- poaching, overfishing, noise levels, the landscape, and the use of the multi-use path;
- energy needs and the climate footprint.

PMET is forwarding a series of measures to address the concerns raised, particularly regarding water management, the environment, socioeconomic impacts, and land use. These measures include the construction of a water treatment plant, the development of effluent dilution modeling, and the implementation of surface water and sediment quality monitoring. Plans also include maintaining riparian buffer strips and ensuring that site water does not flow into the Lake de la Corvette watershed. A compensation plan for wetlands and fish habitat is being developed, as are air quality monitoring programs. The project also provides for measures aimed at regulating activities and promoting positive benefits for communities. These include the use of fly-in/fly-out transportation via the LG-4 Airport, actions to promote local employment and procurement, as well as community and educational initiatives.

Occupational health and safety measures are also planned, including coordination with regional emergency services, the prevention of harassment and sexual violence, actions to encourage the participation of women in the mining industry, and support for workers during site closure.

With respect to economic benefits and infrastructure, PMET intends to adapt its procurement practices to the capacity of local businesses and to implement a recruitment and training strategy for the local and regional workforce. Road safety issues will be taken into account through the Transportation Working Group and through the completion of a transportation pre-feasibility study.

Finally, with regard to land use, the project provides for measures which include holding consultations on land use, the establishment of a complaints management mechanism, noise and vibration reduction measures, the progressive restoration of sites and the use of the multi-user path under certain conditions.

3.4.3 Upcoming Engagement Activities

Following the submission of the EIA, PMET intends to continue its information and consultation activities with government entities, localities and municipalities in the James River region, and regional organizations through:

- meetings at key project milestones;
- continuing the work of the Transportation Working Group
- issuing press releases;
- regularly updating the website.

Additional engagement initiatives may be added based on the needs expressed by stakeholders in the non-Indigenous community.

4 Alternatives Assessment

The following section provides an overview of the various technical and location alternatives that were examined during the project's planning phase. These alternatives were evaluated based on economic, social, and technical criteria. The evaluation of these alternatives resulted in a project proposal that minimizes environmental impacts and maximizes benefits while achieving its objective.

4.1 Technology Alternatives

4.1.1 Ore Processing

Three alternatives were studied: a DMS (dense media separation) process and two hybrid alternatives combining DMS and flotation. The DMS process uses three-stage crushing, followed by density separation in a suspension adjusted to between 2.6 and 2.8 g/cm³. The hybrid alternatives add a flotation process to capture fine and ultrafine particles, but involve significant reagent consumption and more complex slurry management. The analysis concludes that the DMS process is selected because it offers good recovery, reduced environmental impacts, better social acceptability, and an economic advantage over the hybrid alternatives.

4.1.2 Tailings and waste rock management approach

4.1.2.1 Mine tailings

Mine tailings can be pumped as slurry, thickened, or dewatered prior to transport. The slurry alternative requires an increase in the volume of water to be treated, but allows them to be pumped directly to the tailings pile site. The thickened tailings option is similar to the slurry version and is challenging due to the water content, which, although lower than in the slurry option, remains significant. The selected alternative involves dewatering the tailings, which allows them to be managed as solid material and combined with potentially leachable waste rock, but it entails a large number of truck trips for transport to the tailings piles, which will, however, be located a short distance from the production sites. Finally, it should be noted that a portion of the tailings will be used to produce a slurry for backfilling sections of the underground mine once mining operations in those areas are completed.

4.1.2.2 Waste rock

Waste rock is divided into two categories: those with the potential to leach and those without. The alternatives considered for their storage essentially involve either combining them into a single stockpile or separating them into distinct stockpiles. A single stockpile would unnecessarily increase the volume of contaminated water requiring treatment. The chosen option is to separate the stockpiles, grouping the tailings with leaching potential together with the waste rock.

4.1.3 Water treatment

The water to be treated comes from various project-related sources, including sanitary facilities, industrial water from production areas, dewatering from the open pit and underground mine, and stormwater from the site in general, as well as from tailings piles and storage areas. These various water sources are managed using technical alternatives specific to the anticipated contaminants that were subject to a comparative assessment, namely:

- For sanitary wastewater, two modular biological system alternatives were considered. In both cases, the system includes a screen, an equalization tank, and a dissolved air flotation unit with a dephosphatization stage to limit eutrophication. The variants considered either the use of a packed-bed biological reactor (RGBS) or a membrane bioreactor (MBR). Ultimately, the RGBS was selected since the effluent will be directed to the polishing tank, limiting the need for advanced treatment of suspended solids that the MBR would have required.
- For contaminated contact water, the alternatives considered were sequential precipitation, the use of sulfur-based chelating agents, and ultrafiltration. Sequential precipitation was selected for its simplicity and effectiveness, whereas the other alternatives generated either unstable sludge or a significant volume of brine, as well as high costs.
- For uncontaminated contact water, the alternatives considered included physicochemical treatment or settling via sedimentation basins and a polishing basin. The latter option was selected to avoid the use and management of chemicals.
- For drainage water, the alternatives included direct discharge into the natural environment and passage through a sedimentation basin with transfer to the polishing basin. The anticipated concentrations of suspended solids, metals, and ammonia favored the choice of basins. Note that an additional treatment based on coagulation and flocculation has been designed, and space has been reserved for its implementation should water quality require it.
- For stormwater from the mining site, no alternatives were considered, as directing it to the polishing basin was deemed sufficient to intercept the anticipated contaminants (SS).
- For stormwater from the overburden piles and the organic soil deposit, the alternatives considered included directing it to the polishing basin, to the pit for management with drainage water, and the installation of catchment plots. This last option was selected because it allows for the settling of TSS without requiring pumping, and its installation and management costs are lower.
- Rainwater from waste rock pile 01, which does not require specific treatment, is directed to two unlined ponds (01 and 01a) where sedimentation occurs. The water is then directed to the polishing basin.
- For rainwater from the tailings and mining residue pile 02, its high leaching potential requires treatment at the industrial water treatment plant after passing through two sedimentation ponds (02 and 03).

4.1.4 Shipment of spodumene concentrate

Three concentrate transport scenarios were analyzed, all based on truck transport to Matagami, where the ore is transferred to rail transport. The alternatives involve choosing the final destination: one of three port facilities in Bécancourt, Québec City (Beauport sector), or Grande-Anse (near the city of Saguenay). The Bécancour scenario is the least expensive but depends on the future availability of industrial facilities. The Québec–Beauport scenario involves additional port operations. The Grande-Anse scenario has intermediate costs and offers a robust maritime solution.

4.1.5 Energy Supply Sources

4.1.5.1 Electricity Supply to the Mining Site

The mining site is projected to require, excluding heating, an average load of 34.55 MW per year during regular years of operation, from 2032 to 2048. To meet these electricity needs, a total of seven distinct scenarios were evaluated based on technical and economic criteria. These include connection to the Hydro-Québec grid, a diesel power plant, a hybrid diesel/renewable energy power plant with battery energy storage (BESS), an LNG power plant, a hybrid LNG/renewable energy power plant with BESS, a CNG power plant, and a hybrid CNG/renewable energy power plant with BESS.

The scenarios were analyzed using a weighted approach that compared economic, environmental, social, and technical criteria. This analysis shows a clear advantage for the option of connecting to the Hydro-Québec grid, with a marked advantage in terms of economic and social criteria, and a median score for environmental criteria (primarily due to its footprint on the land and on water bodies and wetlands). It is therefore this option that has been selected and will be implemented.

4.1.5.2 Heating of the facilities

For heating, the analysis focused on three main scenarios: liquefied natural gas (LNG), liquefied propane gas (LPG), and compressed natural gas (CNG).

Following the analysis, CNG was selected for the initial phase of the project due to its low initial investment, rapid implementation, and emissions profile comparable to that of LNG, despite higher operating costs.

4.2 Location alternatives

4.2.1 Location options for key infrastructure

4.2.1.1 Open-pit versus underground tunnels

The evaluated mining scenarios include an exclusively open-pit operation, an exclusively underground operation, and a hybrid option. Open-pit mining maximizes accessibility but requires a large footprint and generates significant amounts of waste rock and tailings. Underground mining reduces surface impact but is more costly and involves additional technical challenges as well as resource loss. The hybrid option, combining open-pit and underground mining, is selected because it optimizes ore recovery and reduces the land footprint.

4.2.1.2 Dikes

The scenarios considered included the construction of a single large dike that would isolate the western end of Lake L01 from the main body of water from the outset, by replacing the lake's natural outlet with a channel constructed east of the original location, as well as various alternatives for the sequential installation of dikes aligned with the pit's expansion, allowing for more flexible water management and a reduction in environmental impacts.

During the analysis, hydrological and seismic safety criteria, as well as regulatory requirements, guided the decisions throughout the process. The selected solution involves the construction of two dikes in Lake L01, each corresponding to a phase of the open-pit expansion. The first dam is constructed before excavation begins, isolating the western portion of the lake and maintaining its water level east of the dam. The second dam, built during the pit's expansion, completes the isolation and adapts water management to the new operating conditions.

4.2.1.3 Water Diversion

Water diversion is an essential measure to enable the development of the open-pit mine while preserving the water balance of the bodies of water located near the project. Before excavation begins, a diversion channel is planned to be constructed to redirect water from Lake L01 to Lake L05, bypassing the pit and maintaining Lake L01 at its natural elevation.

Five route and design scenarios for the diversion channel were analyzed (A, B, C1, C2, D1, and D2). The variants studied differ in length (from 726 to 793 m), slope gradient (from 2.5:1 to 1:1), and compliance with safety distances from water bodies and the pit (buffer zones ranging from 10 to 60 m). The alternatives were compared based on their hydraulic capacity, ease of construction, impact on aquatic environments, and ability to limit intrusions into lakes L02, L03, L04, and L05.

The selected solution is a variation of Scenarios D1 and D2. It maintains safety distances from the pit walls (45 m) and surrounding lakes while minimizing impacts on aquatic environments. The channel is designed to recreate hydraulic conditions favorable to fish migration, notably through the installation of weirs and boulders.

4.2.1.4 Waste rock and tailings storage and management areas

As with any mining project, storage facilities for waste rock and mine tailings will be required as part of the project's development. An initial inventory of 31 potential sites, located within a 10-km radius of the open-pit mine, was conducted. A shortlist was then developed based on various criteria to limit the footprint on sensitive environments, reduce transport distances, and optimize the integration of infrastructure into the main logistics corridor. This resulted in five siting scenarios, which were analyzed as part of an in-depth comparative study. This evaluation was conducted using a multi-criteria matrix (POETS), incorporating environmental, technical, social, economic, and operational criteria. Scenario 3 was recommended following the multi-criteria analysis, as it offers the best balance between economic, operational, environmental, technical, and social criteria. This scenario involves a storage area located near the treatment plant, enabling optimized internal logistics, reduced GHG emissions, and easier environmental monitoring.

4.2.1.5 Industrial Zone

An industrial zone of approximately 40 ha will be required to accommodate the various infrastructure facilities of the mining complex. The main criteria for the location of the industrial zone are related to the position and dimensions of the open-pit mine. Three scenarios for the pit's dimensions were considered, each associated with a distinct layout of the industrial zone. Positioning Scenario 1 was selected. It is relatively confined around Lake L01, allowing the industrial zone to be positioned between water bodies L02 through L08 to the south and Lake L12 to the north. The industrial zone would occupy most of the land between these water bodies.

4.2.1.6 Main Access Road to the Trans-Taiga Highway

A main access road connecting the project study area to the Trans-Taiga Road was constructed in the summer of 2024 and will be retained with some modifications to facilitate the transport of lithium concentrate by truck.

4.2.1.7 Secondary access roads

Two alternatives were considered for the design of the secondary access network connecting the open-pit mine to the industrial area and storage facilities: a single network for all vehicles and a separate network for light and heavy vehicles. The second alternative was selected for safety and efficiency reasons.

4.2.2 Other infrastructure

4.2.2.1 Power line

The project's power supply requires the construction of a new 120-kV transmission line connecting the mining site to the Hydro-Québec grid. Two route scenarios were compared. The first largely follows the Trans-Taiga road and existing access roads, limiting the construction of new roads, although it crosses certain natural environments and is located near a few sensitive sites. The second scenario, which is more direct but crosses more wetlands and old-growth forests, requires more access roads and presents more technical constraints.

4.2.2.2 Landing strip

An airstrip may be required to support crew rotation and supply operations. Its location depends on prevailing winds, terrain, proximity to the access road, and potential topographical obstacles.

As discussions are underway with the SDBJ and Hydro-Québec regarding the opening of LG-4 Airport to the public, the need to build a new runway may be called into question. Consideration of location alternatives for such a runway is temporarily suspended pending the results of these discussions.

Furthermore, the Mirage runway, southeast of LG-4, remains insufficient to accommodate the required aircraft. No additional heliport is planned; the heavy vehicle parking area may serve as a landing area if necessary.

4.2.2.3 Quarries

The construction of infrastructure requires large volumes of granular materials. Three alternatives were considered: using only materials from the excavation of the pit, relying solely on potential quarries and borrow pits located on either side of the access road, or using these quarries and borrow pits first until the pit provides sufficient materials.

The option of using only the pit is not feasible at the start of construction. Relying exclusively on quarries and borrow pits would increase transportation costs. The chosen approach is to utilize quarries and borrow pits at the start of the project, then switch to using materials from the pit once they become available, with quarries and borrow pits remaining as an alternative source.

4.2.2.4 Overburden stockpile areas

Overburden will be removed in two phases corresponding to the gradual opening of the pit. Two alternatives were studied: a single stockpile or two separate stockpiles. A single stockpile would require a sufficiently large site and result in a greater footprint on sensitive environments. It was therefore decided to develop two smaller stockpiles, which can be better integrated near the site and generate fewer environmental impacts.

4.2.2.5 Organic Material Storage Areas

The alternatives for organic materials are similar to those for overburden: a single area or two separate areas. The chosen solution calls for two accumulation areas so that they can be located near the areas to be stripped and to minimize encroachment on sensitive natural environments.

4.3 Cost-benefit analysis

The analysis highlights the project's significant socioeconomic impacts, particularly in a northern context. The selected alternatives balance optimal resource recovery, a reduced environmental footprint, and consideration of concerns raised during consultations, particularly regarding hybrid mining. Maintaining the status quo would avoid impacts but prevent the development of a strategic deposit for the province.

5 Project Description

This section describes the entire project, including the deposits, extraction methods, processing methods, infrastructure, water management, activities by phase, waste management, energy consumption, GHGs, the timeline, and economic benefits.

5.1 Project Summary

The project aims to develop the CV5 spodumene deposit, located in the James Bay region. PMET Resources, through Lithium Innova Inc., holds 463 claims covering 23,710 ha. The project involves mining and processing ore to produce a spodumene concentrate grading 5.5% Li_2O, intended for the lithium value chain. The chosen approach combines open-pit and underground mining to limit the land footprint and reduce visual impacts, in response to concerns raised during consultations. The project aligns with Quebec's Policy on Critical and Strategic Minerals and the 2030 Green Economy Plan, addressing the growing global demand for lithium.

5.2 Description of the Mine and Operations

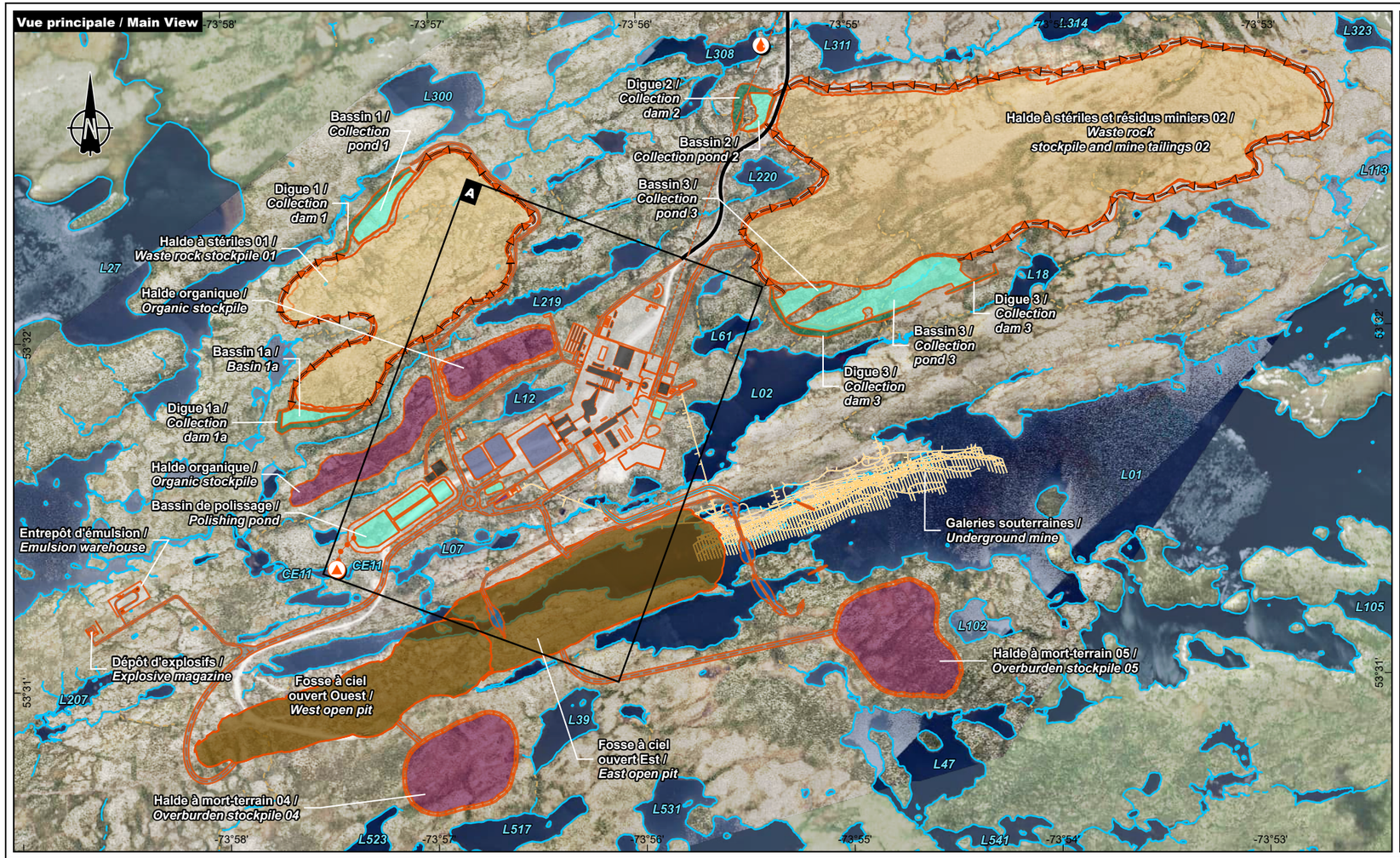
The mining complex will consist of various infrastructure components summarized in the following subsections. Several of the project's components are illustrated in Map 2.

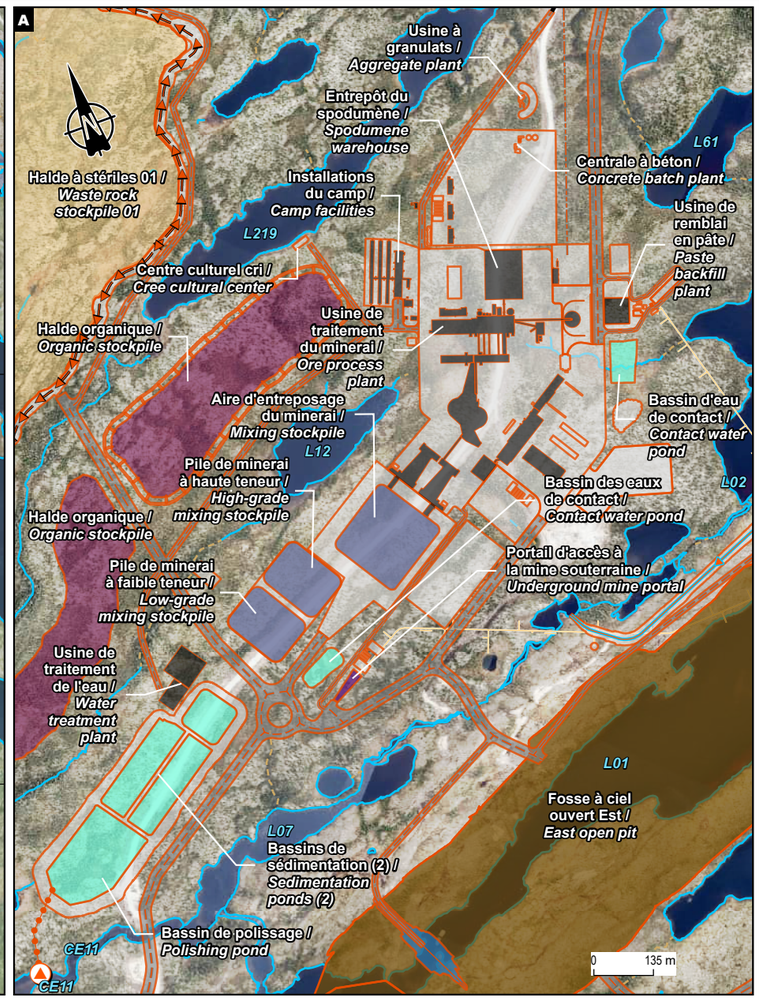
5.2.1 Mineral Deposits, Resources, and Reserves

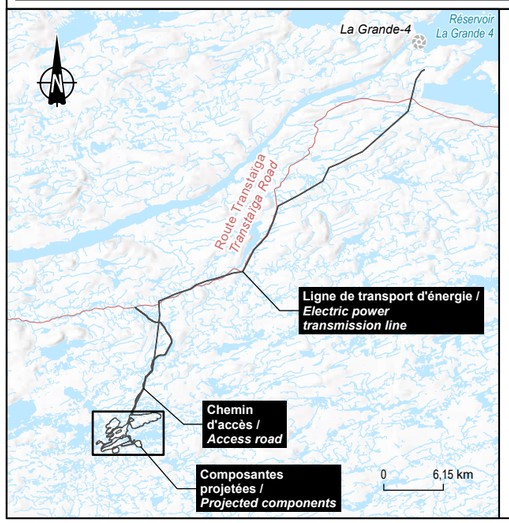
The main deposit is the CV5 pegmatite, a subvertical tabular body of the LCT (lithium-cesium-tantalum) type, located within the La Grande greenstone belt. It extends for approximately 5.0 km and remains open laterally and at depth. Drilling programs, totaling 235,000 m across approximately 800 holes, have enabled the definition of resources in accordance with NI 43-101. Indicated resources amount to 101.8 Mt (1.38% Li_2O) and inferred resources to 13.9 Mt (1.21% Li_2O). The cut-off grades used are 0.40% Li_2O for open-pit mining and 0.70% Li_2O for underground mining. The project is located in a geological setting favorable to lithium, comprising several mineral trends (Golden Trend, Maven Trend, and CV Trend), the latter hosting nine distinct groups of LCT pegmatites. The central zone of the pegmatite vein includes the approximately 5.0 km long CV5 spodumene pegmatite and the approximately 3.2 km long CV13 spodumene pegmatite.

5.2.2 Ore Extraction

The project will be developed using a hybrid mining method involving both open-pit and underground operations. A total of 84.3 million tonnes (Mt) of ore is expected to be mined over the life of the mine, requiring the excavation of 155.2 Mt of waste rock, 14 Mt of overburden, and 3.2 Mt of organic material.







Zone d'étude / *Study Area*

Projet / *Project*

Composantes du projet / *Project Components*

Existante / *Existing*

Chemin d'accès / *Access road*

Projetées / *Projected*

Effluent minier / *Mining effluent*

Prise d'eau / *Water intake*

Barrage / *Dam*

Canal / *Channel*

Canal de dérivation / *Diversion Channel*

Chemin secondaire / *Secondary road*

Fossé / *Ditch*

Galerie souterraine / *Underground mine*

Ligne de transport d'énergie / *Power transmission line*

Aire d'entreposage du minerai mixte / *Mixed ore stockpile*

Autre / *Other*

Bâtiment ou équipement / *Building or equipment*

Digue / *Dam*

Bassin / *Basin*

Digue des bassins / *Basins dam*

Fosse / *Pit*

Halde à mort-terrain et organique / *Overburden stockpile*

Halde à stériles et/ou résidus / *Waste rock and/or tailings stockpile*

Portail d'accès à la mine souterraine / *Underground mine portal*

Voie de circulation / *Roadway*

Hydrographie / *Hydrography*

Plan d'eau / *Waterbody*

Cours d'eau / *Watercourses*

Intermittent / *Intermitent*

Permanent / *Permanent*

Souterrain / *Underground*

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Résumé de l'étude d'impact sur l'environnement / *Summary of the Environmental Impact Assessment*

Carte 2 / *Map 2*
Composantes du projet minier / *Mining Project Components*

Sources / Sources
SDA, 1/20 000, MERN, 2024-02
CanVec+, 1/50 000, RNCan, 2014
CanVec, 1/250 000, RNCan, 2017
BDGA, 1/1 000 000, MRN Québec, 2014
BDGA, 1/1 000 000, MRN Québec, 2002
AQréseau+, réseau routier, MERN, 2024-03-01
G Services Miniers, Composantes projetées, CASN-A-001-GE-SKE-0005-A, 2025

0 260 520 m
UTM, fuseau 18, NAD83 (CSRS)

2026-03-31

Préparation / Prepared by : M-H. Brisson
Dessin / Drawn by : J. Roy
Approbation / Approved by : M-H. Brisson
CA0001724_3318_eie_resume_c01_05_260325.aprx
CA0001724_3318_eie_resum_c2_165_infras_proj_260331

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / Boundary accuracy and measurements shown on this document are not intended for engineering or land delineation purposes. No land analysis has been performed by a land surveyor.

5.2.2.1 Open Pit Mine

Surface mining will follow a conventional method (drilling, pre-cutting, blasting, loading, hauling). The pit is divided into two phases: West Pit (priority) and East Pit (secondary). These phases allow for the optimization of resource recovery while respecting the site's hydrological and geotechnical constraints. The maximum extraction rate is 23 Mt/year. Total production is projected at 49.2 Mt of ore grading 1.12% Li_2O and 216.7 Mt of overburden. Planned equipment includes drills, hydraulic excavators, loaders, 140-ton mining trucks, bulldozers, and graders.

5.2.2.2 Underground Mine

The underground mine will exploit the portion of the deposit located beneath Lake L01 (CV5). The selected method is the long-hole approach (LHOS), primarily in a cross-cut configuration. Production requires the excavation of 40.3 Mt of material, including 35.1 Mt of ore with an average grade of 1.45% Li_2O. Underground operations will be carried out using battery-electric mining equipment (BEV), thereby reducing air emissions. The planned equipment includes jumbos, electric loaders, and 50-ton underground trucks.

5.2.3 Ore Processing

The ore processing plant will be located north of the CV5 pit and will continuously receive ore from both the open-pit and underground mines. The process is designed to produce a dry concentrate with 5.5% Li_2O, with an average recovery rate of 69% and an annual production of approximately 800,000 tons. The concentrate produced will be stored under cover prior to shipment.

5.2.3.1 Infrastructure

The plant comprises several functional areas: raw ore (ROM) storage areas, primary, secondary, and tertiary crushing circuits, crushed ore storage, DMS (dense media separation) circuits for different particle sizes, a magnetic separation circuit, dewatering areas, and a final product storage area. Intermediate products and tailings are managed in dedicated circuits involving screening, hydrocyclones, thickeners, and conveyors. Intermediate tailings still containing recoverable concentrations of lithium and tantalum may eventually be reprocessed if a flotation or gravity recovery circuit is added in the future.

5.2.3.2 Concentration Process

The concentration process at the processing plant aims to produce a spodumene concentrate that meets quality specifications from the raw ore extracted from the mine. This process will rely on a gravity circuit using a three-stage DMS and a crushing circuit, applicable to both coarse and fine fractions. The main processing steps, also shown in Figure 5-1, will be as follows:

- crushing circuit (primary, secondary, and tertiary crushing);
- silo storage for feeding crushed material;
- dense media separation (of coarse, fine, and re-crushed materials);
- separation and handling of the final product;
- discharge of fines, dewatering of intermediate products, and handling;
- handling of final waste (tailings).

5.2.3.3 Reagents used in the process

Two main types of reagents are used:

- ferrosilicon (FeSi) for preparing the dense media, delivered in bulk bags and mixed on-site before being fed into the DMS circuits;
- anionic flocculant (Magnafloc 10) for thickening and dewatering, delivered in 25-kg bags and diluted in raw or process water.

The mixing and handling of reagents take place in protected areas equipped with spill recovery systems.

5.2.4 Expedition of Spodumene Concentrate

Estimated annual production is approximately 800,000 t of spodumene concentrate. Transport is carried out by 75-t truck convoys over more than 800 km to Matagami. A transshipment yard will be built there, including a covered building to protect the concentrate. From Matagami, the concentrate is transported by rail to the port of Grande-Anse/La Baie for shipment to processing facilities. It should be noted that if a local spodumene conversion facility were eventually available, this option would take priority, without affecting the shipping arrangement described.

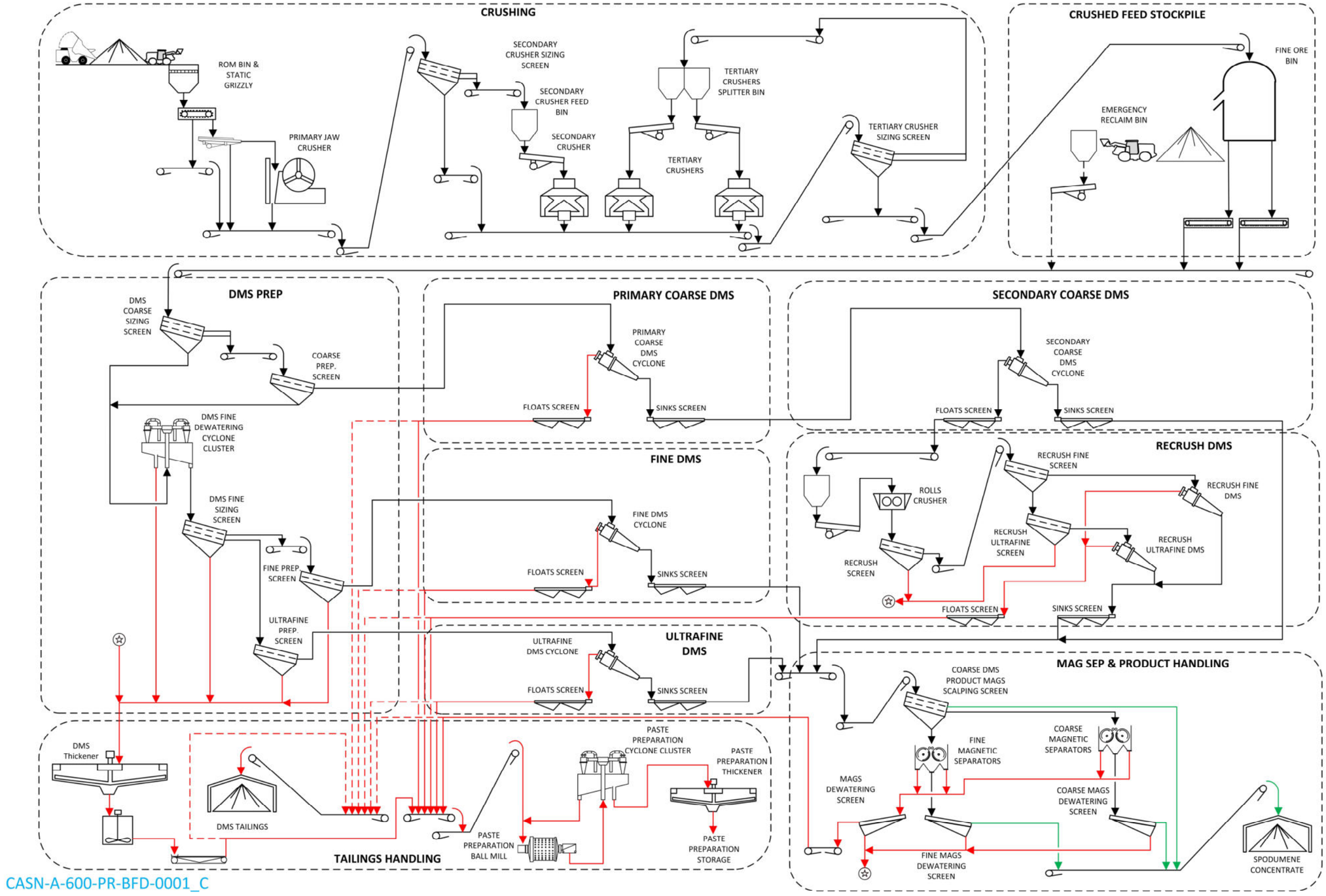


Figure 5-1 Mineral Processing Facility Simplified Process Flow Diagram

5.2.5 Geochemistry of Tailings and Waste Rock

The geochemical studies conducted for the project include static tests (ABA), kinetic tests (HCT and columns), and predictive modeling using Vision Geochemistry (Appendix 5-4-1 of the EIA).

A review of available geochemical data was conducted by Atkins-Realis (Appendix 5-4-2 of the EIA) to update the classification of mining materials that will be produced during the project's operation according to the criteria of the Quebec Guide to the Characterization of Mine Tailings and Ore. The data examined include results from static tests conducted on 350 samples of waste rock, ore, and mine tailings, as well as results from kinetic tests in wet cells and columns. The exercise aimed to validate and update the interpretation presented in the Vision Geochemistry report based on the additional data collected.

Table 5-1 presents a summary of the classification of the various lithologies evaluated as part of this review. This overview forms the basis for interpreting the risks associated with the geochemical behavior of the project's materials and will be used to develop the on-site mining materials management program. The classification is based on the information available as of the date of this review, assuming that the properties of the samples analyzed for a given lithology are representative of the properties of that lithology as a whole.

Table 5-1 Classification of lithologies relevant to the project

Lithology	Acidogenic	Leachability	High risk	Radioactivity (preliminary assessment)
Amphibolite	No	Leachable (**As, Cd, Sb**)	No	No
Metasediments	No	Leachable (As)	No	No
Ultramafic	No	Leachable (**As, Cd**)	No	No
Barren pegmatite	No	Leachable (As, Cd, Cu)	No	No
Spodumene pegmatite	No	Potentially leachable (As, Li), to be confirmed by further testing	No	No
Mine tailings	No	Leachable (**As**, Li, U)	No	No

Note: Elements **in bold** are more likely to leach over the long term based on column test results. Certain materials within each lithology may be considered non-leachable when segregated based on their arsenic and sulfide content.
As = arsenic, Cd = cadmium, Cu = copper, Li = lithium, Sb = antimony, U = uranium

leachable materials, specifically the complete separation of ultramafic lithology and the removal of all materials with an arsenic concentration exceeding 30 ppm. This method should prevent arsenic leaching at stockpile 01, thereby keeping arsenic concentrations below the CVAA and REMMMD/D019 criteria.

Conversely, leaching conditions have been identified in waste rock stockpile 02, with arsenic concentrations that could exceed the REMMMD/D019 criteria by up to two orders of magnitude, primarily due to the presence of tailings. Similarly, antimony and, to a lesser extent, lithium could leach from waste rock stockpile 02.

Among the measures planned to limit environmental impacts, the project includes the installation of a geomembrane-lined foundation beneath stockpile 02, as well as a drainage system and collection ponds to intercept leachate. This leachate will be directed to a treatment plant to remove contaminants before discharge into the natural environment.

5.2.6 Storage Area Management

Storage areas contain five categories of materials: mine tailings, waste rock, overburden, organic matter, and ore. The project includes two waste rock stockpiles, two overburden areas, and two organic material areas. These stockpiles are constructed progressively throughout the mine's lifespan and will be partially reused upon closure.

5.2.6.1 Waste Rock and Tailings Management

The project will produce 155.2 Mt of waste rock:

- 74.2 Mt of low-risk, non-leachable waste rock, stored in stockpile 01 and the pit,
- 81 Mt of leachable waste rock, stored in stockpile 02.

Mine tailings total 71.1 Mt, of which 54 Mt, with low lithium and tantalum content, will be stored with the metal-leachable waste rock in waste rock stockpile 02.

Stockpile 01 will have a footprint of 80 ha and a height of approximately 95 m. Stockpile 02 will cover 218 ha with a maximum height of 120 m, of which 92 ha are reserved for tailings and 126 ha for leachable waste rock. All tailings piles will maintain a minimum setback of 60 m from water bodies. Waste rock stockpile 02 will be constructed on a textured geomembrane. Waste rock and tailings will be compacted using bulldozers and vibrating compactors. Final slopes will range from 26° to 30°, in accordance with the studies.

5.2.6.2 Management of Overburden and Organic Soils

Approximately 14 Mt of topsoil will be removed and stored in two stockpiles (04 and 05), with respective areas of 225,000 m² and 271,000 m².

Organic soils total 3.2 Mt and will be stored in two separate areas totaling 98,400 m² and 134,200 m². All of these materials are intended for reuse in restoration.

5.2.6.3 Ore Management

The extracted ore will be stored in stockpiles located near the plant. The raw ore (ROM) storage platform has a storage capacity of 1 Mt for the entire life of the mine. The foundations will be adapted based on the final results of geochemical tests to prevent leaching.

5.3 Planned Infrastructure and Related Facilities

The project will include a comprehensive set of infrastructure designed to support the project's mining, processing, and environmental management operations. This infrastructure will be designed in accordance with Quebec standards for safety, environmental performance, and integration into the surrounding landscape. The site infrastructure plan is presented in Map 2.

Some infrastructure has been developed, and additional infrastructure is planned to be developed prior to the commencement of the works and activities described in this document. This infrastructure and its construction have been or will be subject to prior authorizations and are necessary for the project's development, but are not within the scope of its environmental impact assessment. This infrastructure, shown on Map 3, includes:

- the completed construction of an exploration camp at kilometer 270 of the Trans-Taiga Road;
- the completed construction of an all-season road from the Trans-Taiga Road to the project study area.

5.3.1 Road Access and Internal Road Network

The main access is via an existing 20-km road connecting kilometer 270 of the Trans-Taiga Road to the project's industrial zone. This road, with an average right-of-way of 30 m, accommodates both light and heavy vehicle traffic and serves as the link for transporting the concentrate to Matagami via the Billy-Diamond Road.

Within the site, a network of approximately 17 km of gravel roads will connect the main facilities: processing plant, workshops, fuel depots, material storage areas, waste rock stockpiles, and explosives facilities. Certain lanes will be reserved for mining trucks to separate heavy and light traffic flows. The roads are designed for 140-ton rigid trucks and include ditches, culverts, and structures to ensure proper water drainage.

5.3.2 Electric Power Supply

Electricity is supplied via a connection to the Tilly substation (315 kV) near the La Grande-4 complex. A 315/120 kV transformer station will be built near the Tilly substation to convert the power to meet the site's needs. On the mining site, a 120/13.8 kV step-down substation will distribute electricity to the infrastructure. The project's total power demand is estimated at 35 MW.

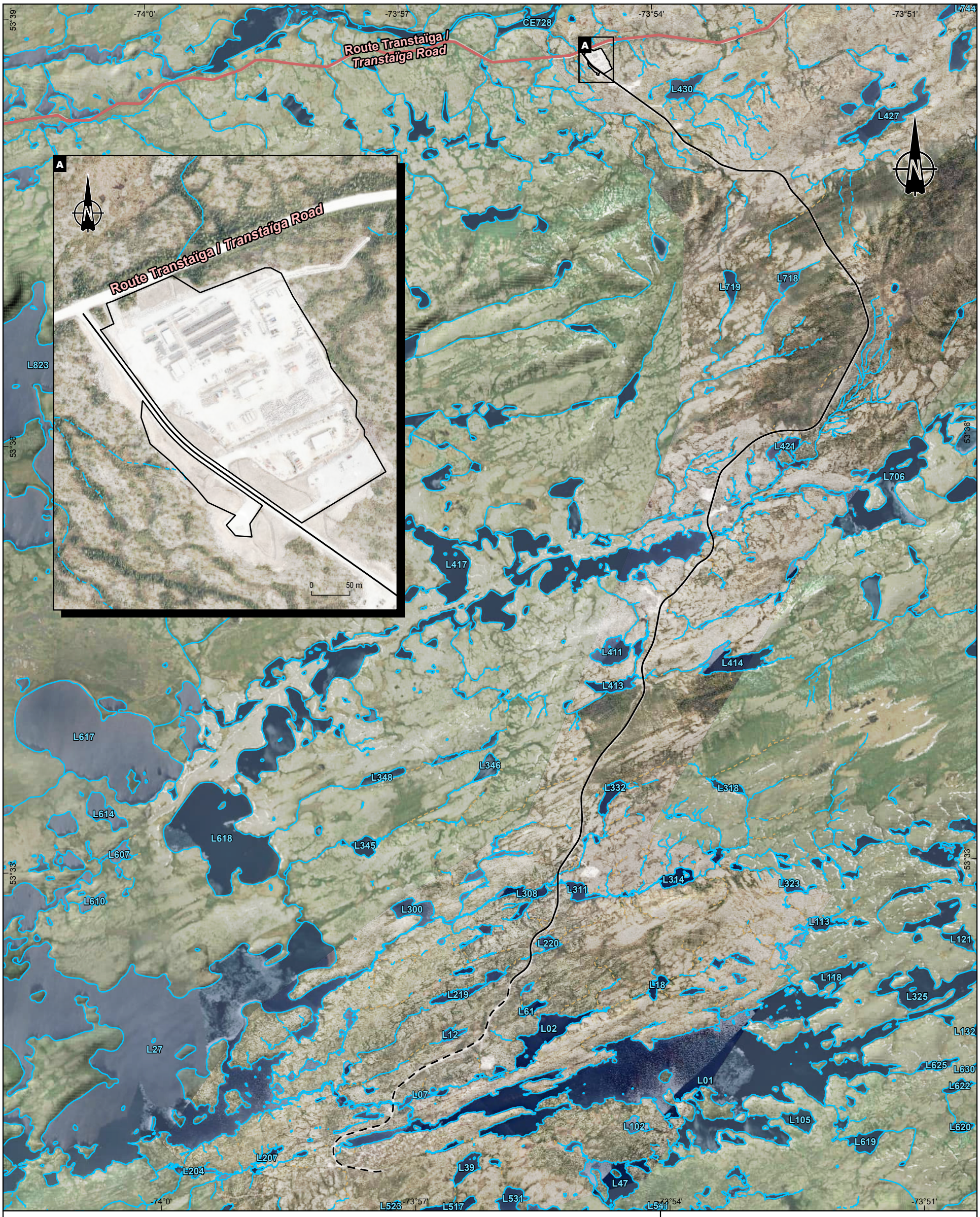
A backup system includes three diesel generators, each with a capacity of 2 MW. They will supply power to critical loads in the event of a Hydro-Québec grid outage, according to an established load shedding plan. Two generators will operate in redundancy, and a third will provide an additional safety margin.

5.3.3 Buildings and surface infrastructure

The industrial site will include various buildings and surface infrastructure, which are described in the following sections. All buildings will be thermally insulated and connected to a compressed natural gas (CNG) central heating system. Domestic wastewater will be treated on-site using a modular system.

5.3.3.1 Administration and Laboratory Building

The administrative and laboratory building will be designed to bring together office, meeting, and technical analysis functions under one roof. The administrative section will include ten private offices, an open workspace with 30 workstations, two meeting rooms, a dining room, and support areas (printing, storage). The laboratory section will be equipped for various analytical and preparation activities. Support spaces such as a mechanical room, a chemist's office, and a training room will be integrated. Soundproofing will be installed in certain areas to improve safety and comfort.



Composantes du projet / *Project Components*

Existante / *Existing*

- Campement d'exploration / *Exploration camp*
- Chemin d'accès / *Access road*
- Chemin d'accès à démanteler / *Access road to be dismantled*

Hydrographie / *Hydrography*

- Plan d'eau / *Waterbody*

Cours d'eau / *Watercourses*

- Intermittent / *Intermitent*
- Permanent / *Permanent*
- Permanent partiellement souterrain / *Partially underground permanent*
- Souterrain / *Underground*

Infrastructures / *Infrastructure*

Réseau routier / *Road Network*

- Route collectrice municipale / *Municipal collector road*

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Résumé de l'étude d'impact sur l'environnement / *Summary of the Environmental Impact Assessment*

Carte 3 / *Map 3*
Composantes existantes du projet / *Existing Project Components*

Sources / Sources
AQréseau+, réseau routier, MERN, 2024-03-01
G Services Miniers, Composantes actuelles, CASN-A-001-GE-GA-0002-CAD_RevB5, 2025
MERN, Ombrage MNT 50k, 2023
ESRI, World Imagery

0 0,5 1 km
UTM, fuseau 18, NAD83 (CSRS)

2026-03-25

Préparation / Prepared by : M-H. Brisson
Dessin / Drawn by : J. Roy
Approbation / Approved by : M-H. Brisson
CA0001724_3318_eie_resume_c01_05_260325.aprx
CA0001724_3318_eie_resum_c3_166_infras_exist_260325

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / Boundary accuracy and measurements shown on this document are not intended for engineering or land delineation purposes. No land analysis has been performed by a land surveyor.

5.3.3.2 Process buildings and infrastructure

The secondary and tertiary crushing, screening, and DMS sizing buildings, as well as the DMS buildings, will be fully insulated and heated to prevent freezing. Thickeners and water tanks will be located outdoors but adapted for winter conditions. The crushed ore silo, located under an insulated concrete dome, will be equipped with an access gallery for emergency use. All conveyors downstream of the DMS building will be enclosed and heated. In Phase 2, the entire crushing and concentration facilities will be doubled.

5.3.3.3 Personnel Administration Building

The building will be multifunctional and will occupy an area of approximately 750 m². It will combine staff preparation areas and administrative spaces to optimize the safety and efficiency of operations. It will include, in particular, changing rooms with a washing area and restrooms, boot washing areas, administrative spaces, and various other amenities (cafeteria, electrical room, laundry room). The layout will facilitate traffic flow during shift changes and will be located near the truck shop, ensuring separate traffic flows for safety.

5.3.3.4 Permanent Camp and Related Buildings

The camp will accommodate up to 480 workers in Phase 1 and 672 in Phase 2. Type B dormitories, on two levels, will each house 96 beds, with shared sanitary facilities, and will be added to the existing 150-bed camp. The kitchen and dining hall facilities will accommodate approximately 150 people at a time. The office will be a single-story building of approximately 750 m², located near the laundry room and recreation room.

5.3.3.5 First Nations Cultural Centre

The First Nations Cultural Centre will be located on the shore of Lake L219 and will include spaces for meetings and traditional activities. It will feature restroom facilities, a cold kitchen with a wood stove, and a library. Nearby, a traditional house will be constructed, covered with a waterproof tarp and built using a combination of traditional and modern materials.

5.3.3.6 Temporary Truck Garage

A temporary garage will be used during construction. It will include several service bays (light vehicles, tires, welding, oils, and batteries), as well as three bays for heavy vehicles and two for tracked equipment. The facility will be equipped with an insulated dome and safety equipment.

5.3.3.7 Warehouse

The warehouse will be a thermally insulated steel structure, clad with thermoacoustic panels and featuring a fiber-insulated dome, covering an area of approximately 1,390 m². It will be designed for storage, receiving, and distribution operations, with an internal layout that promotes smooth workflow and safety.

5.3.3.8 Explosives storage facility

The facility will include two mobile manufacturing units (MMUs), ANE ISO containers, a garage for one MMU, areas for gas-generating products, an evaporator, and storage areas for detonators and explosives. A 5.5-day supply buffer without deliveries is planned to cover the weekly requirement of 63,000 kg of 100% emulsion. The area will be fully fenced and secured.

5.3.4 Communication and Security Systems

The site will be equipped with a fiber-optic and satellite telecommunications network enabling real-time monitoring of operations and security systems.

Security measures will include the following:

- 24-hour surveillance system at strategic checkpoints;
- computerized access control;
- an emergency and corrective action plan integrated into the project's Health and Safety Management System (HSMS).

Joint emergency drills will be conducted periodically with local services and relevant Cree authorities.

5.3.5 Fuel Storage and Distribution

The fuel depot will feature two separate areas for light and heavy vehicles. It will include three 50,000-liter horizontal tanks and one 20,000-liter tank, with three additional 50,000-liter tanks added in the third year of operation. The total capacity will provide five days of autonomy at maximum consumption. The facilities include secure walkways, grounding, fencing, spill containment systems, emergency shut-off, overflow alarms, and RFID access. An oil/water separator will treat the water before discharge.

5.3.6 Compressed natural gas (CNG)

CNG will provide 100% of the site's heating and will be delivered by high-pressure trailers (4,300 psi), which will serve as both a means of transport and a mobile storage unit. The expected operational range is four days during peak periods. The supplier will rotate the trailers to maintain the supply.

5.3.7 Quarries for construction

The project requires the development of five quarries, two of which are located within the footprint of the planned waste rock stockpiles 01 and 02, as well as a borrow pit for loose materials. A report detailing the locations of the quarries and borrow pits, along with their capacities, is provided in Appendix 5-9 of the EIA.

5.4 Water Management

The project's water management aims to prevent any contamination of the aquatic environment, optimize the reuse of process water, and ensure regulatory compliance for discharges. The system is designed using an integrated water balance approach, combining collection, storage, treatment, and recirculation.

5.4.1 Water Balance

A water balance model was developed for the entire mining complex to quantify inflows (precipitation, runoff, infiltration) and outflows (evaporation, pumping, treatment, discharges) under various climate scenarios. The flows considered include runoff from waste rock stockpiles, the pit, and platforms; dewatering from the underground mine; process water; and natural inflows.

Freshwater supply ranges from 4,424 m³/month to 4,898 m³/month. When the mine is fully operational, the volumes of excess water discharged into the environment range from 4.95 Mm³/year (dry conditions) to 8.41 Mm³/year (wet conditions). Internal recirculation exceeds 75%, reducing the demand for fresh water. The runoff basins are sized to manage spring floods, and the hydraulic retention time of the passive infrastructure remains sufficient for effective sedimentation. Normal basin operation occurs between the lowest water level (LOWL) and the highest water level (MOWL), utilizing only 40% of pumping capacity.

5.4.2 Contact Water Management Infrastructure

The water management plan was designed to effectively separate contact water from uncontaminated water, in accordance with the requirements of Directive 019 on the mining industry. The infrastructure will be sized to withstand at least a 100-year return period rainfall event and equipped with automated control systems.

5.4.2.1 Contact Water Collection Ditches and Pipelines

Ditches will be constructed to collect runoff from stockpiles 01 and 02 and convey it to the contact water collection basins. All ditches will be designed to allow for the construction of an adjacent inspection road, and those around stockpile 02 will be lined with a geomembrane. Pipes for potable, sanitary, and industrial water will also be installed on the site.

5.4.2.2 Contact water collection basins

Six basins are used for the temporary storage and regulation of runoff water prior to pumping to the treatment plant. The sizing accounts for various extreme events:

- Basins 01 and 01A (waste rock stockpile pond 01): a 24-hour freeze combined with 13 days of 100-year snowmelt.
- Basins 02 and 03 (waste rock stockpile 02): 2,000-year rainfall in 24 hours + 100-year snowmelt over 13 days.
- Basins CP1 and CP2 (industrial zone): 100-year rainfall in 24 hours and 100-year snowmelt over 13 days.

Basins 01, 01A, 02 and 03 require waste rock fill covered with 1.5-mm textured geomembranes. The basins associated with waste rock stockpile 02 are equipped with 1.5 mm LLDPE geomembranes. Emergency spillways are provided on all embankments to convey extreme floodwaters without damaging the structures.

5.4.2.3 Pumping Stations

These pumping stations are strategically located throughout the site and are used to transfer contact water between the collection system and the treatment facilities. The pumping system was also designed to provide operational support for water supply to various mining activities.

5.4.3 Dikes and stream diversion

The development of the pit requires the gradual dewatering of part of Lake L01. The system includes:

- a diversion channel connecting L01 to L05,
- several diversion and cutoff dikes,
- structures designed to preserve the water regime and allow fish passage.

Lake L01 has a surface area of 4.48 km² and a watershed of 106 km². Approximately 1.9 km² of the watershed (1.7%) is affected by the diversion. The canal is approximately 870 m long, with a base width of 5 m and an average gradient of 0.3%. Most of the alignment is excavated in rock, with 1:1 vertical-to-horizontal slopes. Waterfalls, pools, and boulders are incorporated to replicate natural hydraulic conditions and facilitate fish migration. No control infrastructure (gates, spillways) is required.

The dikes—one in the West phase and four in the East phase—are classified as “Extreme” according to the CBA. Their construction requires: dredging of foundation sediments, silt curtains during construction, inert rock fill, and berms constructed by backfilling. The crests will be 6 m wide and maintained at a height of 1 m above the water level. They meet the seismic (return period of 1/10,000) and hydraulic requirements of the ACB and MELCCFP guidelines.

5.4.4 Drainage of Lake L01 – Sediment and Water Management

The dewatering of Lake L01 is carried out in stages, based on the West and then East phases of the pit, and taking into account the bathymetry and natural drainage.

Western Phase of the Pit

Drained after the dike was constructed, this portion of the pit comprises two sectors:

- Eastern Sector: Sediments removed to prevent their mobilization; runoff directed toward the pit, then treated as contact water.
- Western Sector: Sediments left in place but separated from the pit by a permeable berm (Berm 1), and a pumping system manages flows up to a 10-year flood; runoff is pumped to a sedimentation basin before discharge.

Eastern Phase of the Pit

Three sectors are defined:

- North and Center: complete removal of sediments; runoff flows into the pit and is then pumped to the industrial area.
- Southern Sector: Sediments left in place; isolated by Berm 2, designed to contain a 10-year flood; a pumping system directs runoff water to a sedimentation basin.

5.4.5 Mining and Industrial Water Treatment Plant

The treatment plant (TP) uses a physicochemical process involving:

- pH adjustment and metal precipitation;
- coagulation and flocculation assisted by ballast (microsand);
- high-flow clarification in a lamellar clarifier;
- reuse of microsand via a hydrocyclone.

The treated water is transferred to the polishing basin, which ensures homogenization and final treatment. The filtered water can supply the ore processing plant, the backfill plant, or the underground mine. Sludge from the processing plant is dewatered in geosynthetic bags installed in several bays, one of which remains available at all times. The consolidated sludge will be transferred to waste rock stockpile 02.

The facility is modular and pre-assembled in containers. It is designed to comply *with* Directive 019, the *Metal and Diamond Mine Effluent Regulations* (MDMER), and the *Water Quality Regulations, with the option to include Environmental Discharge Objectives* (EDOs).

5.4.6 Mine Effluent

The final treated effluent will be discharged into watercourse CE11, downstream of the polishing basin and upstream of Lake L27. Discharge occurs by gravity through three 90-meter submerged pipes, each equipped with 14 15-centimeter diffusers with check valves. This configuration ensures a flow velocity sufficient for effective mixing. Complete mixing is achieved within 200 m downstream of the discharge point. Continuous monitoring of flow rate (set at 0.93 m^3/s), pH, conductivity, dissolved metals, and turbidity is planned.

5.4.7 Drinking Water

Drinking water is drawn from Lake L308 using submersible pumps installed on a barge. Ultrafiltration and nanofiltration treatment removes suspended solids and total organic carbon. Disinfection is provided by UV and chlorination. Buffer tanks ensure availability during periods of high demand.

5.4.8 Sanitary Wastewater

Sanitary wastewater is directed to an equalization tank and then treated by a moving bed biofilm reactor (MBBR). Coagulation removes phosphorus, and disinfection is performed by UV. The sludge produced is stored in a dedicated tank and then transported to an authorized facility. The potential for stabilization through liming will be studied. The treated effluent is discharged into the polishing basin.

5.4.9 Other water treatment systems

Secondary systems will provide targeted treatment for specific effluents:

- equipment washwater: recycling and cartridge filtration;
- oily water: API separators and coalescing filters;
- firewater: temporary containment basins prior to treatment.

5.5 Planned activities during the construction, operation, and closure phases

The project will proceed in three main phases: **construction**, **operation,** and **closure/restoration**. Each phase includes planned activities aimed at ensuring the technical performance, safety, and environmental compliance of the mining site.

5.5.1 Construction activities

The construction phase will be carried out in several stages divided into two main parts: the first will involve the installation of most of the infrastructure and the opening of the western section of the pit, and the second will involve the opening of the eastern section of the pit and the associated infrastructure. This work will take place over approximately four years, from February 2028 to March 2032, and will include the following activities:

- **Site preparation:** This activity includes selective tree clearing, removal of organic soil and its storage in designated areas, as well as the installation of fences and temporary roads.
- **Earthwork and drainage:** This activity includes leveling the areas where infrastructure will be installed, removing overburden for the pit and storing it at stockpiles 04 and 05, and preparing the waste rock stockpiles, ponds, and the sites for the various buildings and the plant.
- **Construction of major infrastructure:** This activity includes:
  - upgrading the 20-km access road (bridges and culverts);
  - construction of the 120 kV power line and the substation planned for the mining site;
  - construction of industrial, maintenance, and administrative buildings;
  - the installation of water management ponds and treatment plants (drinking water and wastewater);
  - of the permanent camp and telecommunications systems.

- **Installation of ore processing equipment:** This activity involves the installation of components related to the concentration plant, including crushers, DMS circuits, magnetic separators, and filter presses.
- **Installation of safety and environmental systems:** This activity involves the installation of emergency ponds, monitoring stations, and weather stations.

5.5.2 Operational Activities

The operations phase will run from 2030 to 2049, corresponding to the mine's estimated lifespan. The main activities include:

- The extraction of ore from the open-pit and underground mines using drilling and blasting, as well as its loading and transport to the processing plant.
- Management of waste rock through its selective transport to designated waste rock stockpiles and the gradual rehabilitation of stabilized areas.
- Processing of the ore at the concentration plant, which will operate continuously (5.1 Mt/year).
- Continuous maintenance of infrastructure, including regular inspection of dikes, ponds, and roads.
- Environmental monitoring of the site, including monitoring of water quality, air quality, noise, and wildlife in accordance with the environmental monitoring plan.
- Transportation of the concentrate by truck to the rail transshipment site in Matagami.

The operation will maintain a permanent workforce of approximately 1,100 employees, including operations, maintenance, laboratory, and administrative staff.

5.5.3 Mine Site Restoration

Closure and restoration activities will begin gradually starting in 2045, in parallel with the decline of mining operations, and will continue through 2052. They will aim to return the site to a safe, stable, and ecologically functional state.

All mining infrastructure will be subject to the redevelopment and restoration measures to be implemented. The main measures planned are:

- Dismantling of non-reusable infrastructure and removal of equipment;
- Contouring of waste rock piles and covering with inert materials to limit erosion and seepage;
- Partial backfilling of pits and the creation of permanent water bodies;
- Soil rehabilitation and revegetation using native species;
- Post-closure monitoring (water, stability, vegetation) for a minimum period of ten years;
- Monitoring of community commitments, including consultation on the site's final restoration.

5.6 Waste management and the 3RV approach

Waste management, including hazardous waste, will promote the implementation of practices based on the 3RV approach, i.e., prioritizing the reduction, reuse, recycling, and recovery of waste in accordance with applicable laws and regulations.

5.6.1 Household Solid Waste

Approximately 120 tons per year of household waste will be generated by the camp and offices. The waste includes organic materials, paper, plastic, and non-recyclable waste. A selective collection system and an on-site composting facility will be implemented. Final waste will be shipped to Radisson. Monthly monitoring will assess volumes and recovery rates, with a recovery target of over 60%.

5.6.2 Dry waste

This material will come from construction and maintenance activities (wood, metals, concrete, cables, packaging materials). It will be sorted at the source. Inert materials will be reused whenever possible (backfilling, road maintenance). Metals will be sent to certified recyclers. Non-recyclable materials will be transferred to authorized external facilities. The goal is a minimum recycling rate of 70%.

5.6.3 Hazardous materials

Hazardous materials (used oil, filters, solvents, paints, chemicals, batteries, contaminated sludge) will be stored in a dedicated, ventilated, and sealed room equipped with a waterproof floor and spill containment trays. They will then be transported by licensed contractors to certified facilities. The environmental management system to be implemented at the mining site will include the creation and maintenance of a hazardous materials disposal tracking log and the conduct of annual staff training on emergency response procedures related to hazardous materials used and generated as waste.

The developer commits to ensuring the recycling of used oils with a target of over 90%. Similarly, batteries will be returned to manufacturers or approved collection points.

5.7 Energy Consumption

The project will be powered primarily by hydroelectricity supplied by Hydro-Québec, thereby ensuring a low-carbon energy profile. Energy requirements are determined based on the operating plan and the sizing of the industrial facilities.

5.7.1 Total requirements

Total energy consumption is estimated at 89,369 GJ/year, including:

- Hydro-Québec electricity (472 GJ/year);
- compressed natural gas (CNG) for heating (87,691 GJ/year);
- diesel for mining vehicles, emergency generators, and concentrate transport (1,206 GJ/year).

5.7.2 Energy Optimization

The project's energy optimization effort involves a phased approach. At this stage of the project, the main measures under consideration are:

- Exclusive use of renewable electricity for industrial processes and lighting to reduce GHG emissions.
- Integration of high-efficiency motors (IE3/IE4) and variable-speed drives to improve equipment energy efficiency.
- Heat recovery from compressed air and ventilation systems, contributing to reduced heating requirements.
- Implementation of an energy management program compliant with ISO 50001 during the operational phase to ensure monitoring and continuous improvement.
- Gradual replacement of light-duty diesel vehicles with electric models, depending on their availability on the market.

5.7.3 Autonomy and Backup

A backup power plant consisting of three 2-MW diesel generators will ensure the continuity of critical operations in the event of a power outage. This equipment will operate for less than 100 hours per year and will be equipped with vapor recovery and spill containment systems.

5.8 Greenhouse gas emissions

The project design places a central emphasis on reducing greenhouse gas (GHG) emissions from the earliest engineering phases. The project's energy profile, largely powered by hydroelectricity, minimizes direct and indirect CO_2 emissions.

5.8.1 Emissions sources

GHG emissions primarily come from the following sources:

Source	Description	Annual estimate (t CO_2 eq.)
Diesel (mining vehicles)	Trucks, drills, loaders, mobile equipment	54,127
Mining equipment	Generators and other stationary equipment	3,226
CNG heating	Heating for buildings and camp	8,035
Explosives	Explosives used at mining sites	1,050
Concentrate transport (truck)	Transport by truck to the rail transfer point	27,457
Concentrate transport (train)	Transport by train to the port facility by a third party	24,555
Electricity (Hydro-Québec)	Processing plant and pumps	492

The estimated total emissions at the site (excluding Hydro-Québec electricity) is approximately 64 kt CO_2 eq. per year during the operational phase, representing an average carbon intensity of 0.08 t CO_2 eq. per ton of concentrate produced, which is below the global average for lithium mines (~0.10 t CO_2 eq./t conc.).

Annual direct emissions related to operations at the site are estimated at a minimum of 24 kt CO_2 eq. during the first year of operation and a maximum of approximately 87 kt CO_2 eq. in 2036. The annual average over the entire operational period is 64 kt CO_2 eq.

5.8.2 Reduction and Offset Measures

Mitigation measures will be implemented at every stage of the project to minimize GHG emissions, including:

- **Optimization of mining transportation**: short routes, preventive vehicle maintenance, and low-rolling-resistance tires.
- **The gradual replacement** of light-duty diesel vehicles with electric models.
- **Heat recovery** in the processing plant for building heating.
- **Training staff** in eco-driving and fuel consumption reduction.
- **Annual monitoring of the GHG inventory** according to the ISO 14064-1 methodology and reporting to the MELCCFP.
- **Voluntary participation** in carbon offset programs (reforestation, verified credits).

5.8.3 Climate performance target

The developer's objective is to **reduce direct emissions** by 2035, in line with the government's 2050 carbon neutrality targets, compared to the baseline scenario, notably through increased fleet electrification and process energy efficiency.

The project's greenhouse gas emissions were estimated based on available preliminary engineering data. Total emissions associated with construction are estimated at 95 kt CO_2eq, primarily due to site deforestation. Annual emissions associated with operations are estimated at an average of 64 kt CO_2eq. Machinery accounts for 59% of these emissions, with logistics transportation and explosives representing 38% and 3% of emissions, respectively. It should be noted that these emissions are annual and vary from year to year during the operational phase.

5.9 Project Timeline

The overall project timeline will span a period of approximately 19 years, including planning, construction, operation, and the phased closure of the site (Table 5-2).

Table 5-2 Timeline of the project's main phases

Period	Key Activities	Details and objectives
2025–2027	Environmental studies, permitting, and detailed engineering	Finalization of baseline studies, submission of the EIES, COMEX hearings, obtaining provincial and federal permits, and construction engineering.
Q1 2028 – Q2 2030	Construction and commissioning	Development of road, electrical, and industrial infrastructure; construction of the camp and processing plant; dry and load testing.
Q3 2030 – 2048	Mining operations (Phases 1 and 2)	Nominal production of 5.1 Mt/year of ore from both underground and open-pit mining.
2048–2052	Phased closure and rehabilitation	Dismantling, reprofiling of waste stockpiles, revegetation, and post-closure environmental monitoring (≥ 5 years).

5.9.1 Key milestones

The project's key milestones include:

1. Approval of the EIA and obtention of permits – Q4 2027
2. Start of construction work – Q1 2028
3. Completion of the substation and access road – Q4 2029
4. Commissioning of the ore processing plant (concentration) – Phase 1 – Q2 2029
5. Reaching design capacity (5.1 Mt/year) – Q1 2032
6. Start of underground mining operations – Phase 2 – Q1 2032
7. Completion of post-closure monitoring and release of bonds – 2052

This list of milestones incorporates constraints associated with the northern climate: earthwork and concrete pouring are primarily scheduled during the summer season, and seasonal logistical windows are required for oversized equipment.

5.10 Labor, Economic Benefits, and Overall Costs

5.10.1 Labor and economic benefits

5.10.1.1 Direct and Indirect Jobs

The project's labor requirements and economic impacts were assessed based on expenditure flows associated with the construction, operation, capital maintenance, and closure phases, as defined in the feasibility study (NI 43-101, 2025). The economic impacts were estimated using the Quebec Inter-sectoral Model (MISQ) developed by the Institut de la statistique du Québec.

The results presented below correspond to the direct, indirect, and induced effects generated by project expenditures in the Quebec economy. Jobs are expressed in person-years, which is the equivalent of one full-time job sustained for one year. Table 5-3 presents a summary of the labor requirements associated with the various phases of the project, expressed in person-years. It aims to provide an order of magnitude for the jobs supported by the project. For clarity, the table also presents annual averages over the duration of each phase.

Table 5-3 Labor requirements by project phase

Project phase	Duration (months)	Jobs (total)	Jobs (annual average over the duration)
Construction:			
Phase 1	41	7,545	2,208
Phase 2	43	3,629	1,013
Operations	19 years	66,282	3,489
Closure and follow-up	30	1,537	615

Note: Total jobs are for the duration of each phase.

5.10.1.2 Regional and National economic impacts

Combining all project phases, the total economic impact is estimated at approximately 79,000 person-years of employment and $10.5 billion in value added across Quebec. At the regional level, the cumulative impacts are estimated at approximately 10,400 person-years of employment and $1.3 billion in value added, representing 13% and 12% of the provincial results, respectively. These results should be interpreted as indicative orders of magnitude, as the regional impacts are not derived from a standalone regional cross-sectoral model, but rather from an allocation of provincial results based on conservative and documented assumptions.

The project will also contribute to **Quebec's 2030–2050 energy and mining strategy** by positioning the province as a key supplier of critical materials for the global energy transition.

5.10.2 Overall Project Costs

The financial estimates are derived from the feasibility study (NI 43-101, 2025) and are expressed in 2025 Canadian dollars. The total cost of the Project is estimated at **$2,914**.7 million. It is important to note that this amount **excludes** pre-production revenue of **$101.7 million** during the construction of Phase 1, as well as **restoration and closure** costs, estimated at **$248.4 million**.

The **unit production cost** is estimated at **CAD 729.1/t of concentrate**, for an **all-in sustaining cost (AISC)** of **CAD 799.8/t of concentrate**.

The economic assumptions are based on:

- an exchange rate of **CAD/USD = 1.34**;
- an average price of **SC 5.5** concentrate = **$1,221/t FOB**;
- a combined life of the open-pit and underground mines of **19 years in nominal production**.

These estimates illustrate the magnitude of the potential economic benefits associated with the project expenditures.

6 Description of the Existing Environment

6.1 Delimitation of study areas

The project is located north of the 53rd parallel in the Nord-du-Québec administrative region, on Category III lands within the Eeyou Istchee James Bay territory. It is located approximately 220 km east of the town of Radisson and lies within the traditional territory of three Cree communities: Cree Nation of Chisasibi (a village located 330 km to the west), Wemindji (330 km to the southwest), and Mistissini (350 km to the south).

To identify and locate sensitive environments that could be affected by the project, five study areas were delineated, shown in Map 4 and Map 5:

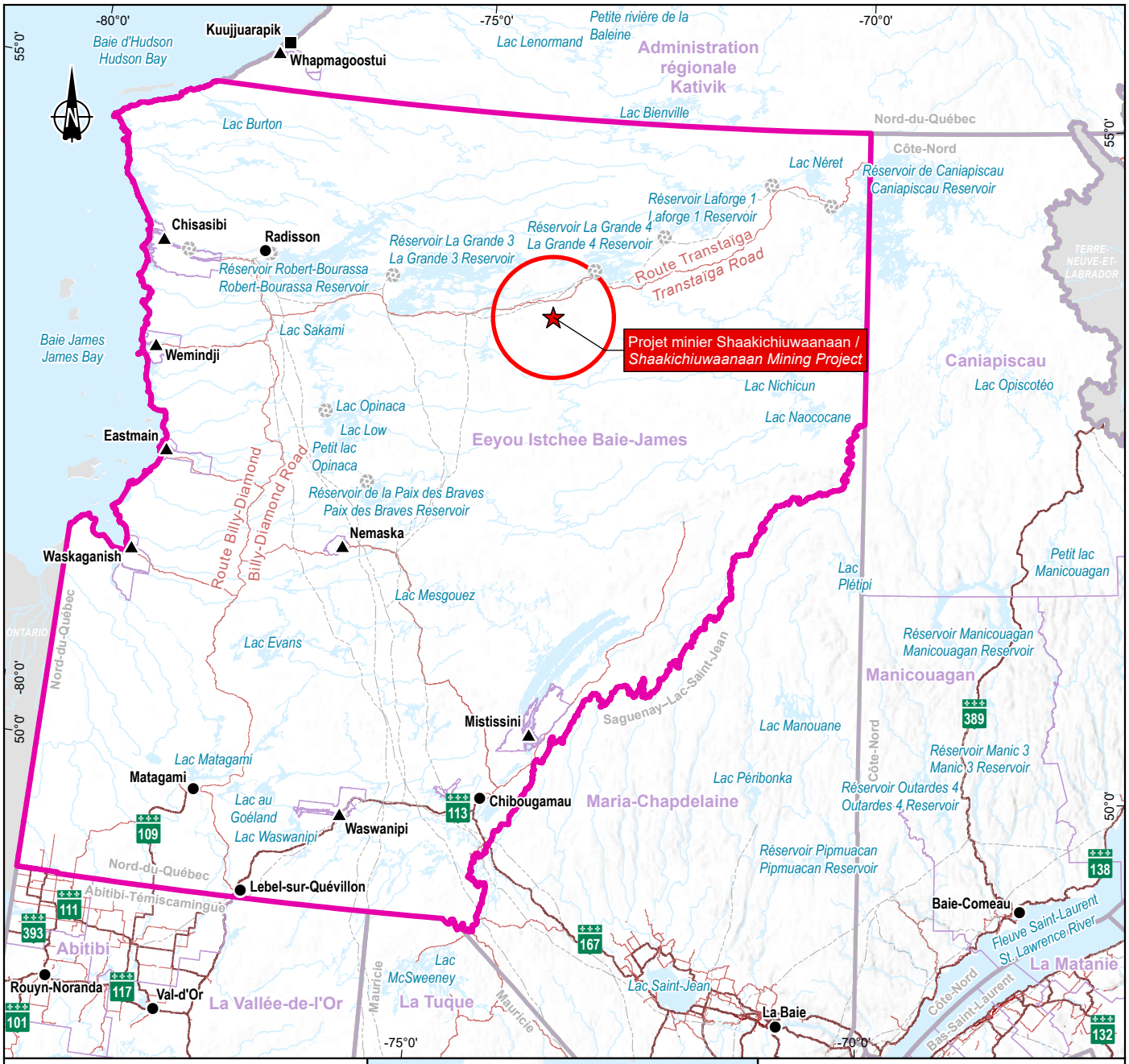
- A local study area (LSA) and a regional study area (RSA) (boundaries of the Eeyou Istchee James Bay territory) for the socioeconomic components;
- A local study area (LSA) (a 3-km zone around the mining area and a 1-km zone around the access road and power line) and a regional study area (RSA) (a 50-km radius around the mine site) for the biophysical components;
- A project study area encompassing all existing and planned facilities, as well as a 25-m buffer zone around them (Map 5).

The consideration of these different study areas is justified by the fact that certain components are affected only in the vicinity of the mining site, while others may be influenced on a broader scale.

6.2 Physical Environment

6.2.1 Climate

The climate of the study area is subpolar continental, characterized by long, cold winters and short, cool summers. Climate data are primarily from the La Grande IV station (1991–2020), supplemented by data from Nitchequon for precipitation. The average monthly temperature ranges from −22.4 °C in January to 14.7 °C in July, with notable extremes of −50.4 °C and 35.5 °C. Average annual precipitation is 827 mm, with a significant snowfall component (328 cm) from August to May. Prevailing winds come mainly from the southwest, with speeds that can exceed 30 km/h during more intense episodes.



Zones d'étude / *Study Areas*

- Régionale - Biophysique / *Regional - Biophysical*
- Régionale - Humain / *Regional - Human*

Repères géographiques / *Geographical Landmarks*

- Communauté crie (zone d'étude régionale) / *Cree community (regional study area)*
- Village inuit / *Inuit village*
- Municipalité / *Municipality*

Infrastructures / *Infrastructure*

- Centrale hydroélectrique / *Hydroelectric generating station*
- Ligne de transport d'énergie / *Electric power transmission line*

Réseau routier / *Road Network*

- Autoroute / *Highway*
- Route nationale ou régionale / *National or regional road*
- Autre / *Other*

Limites / *Boundaries*

- Région administrative / *Administrative Region*
- Municipalité régionale de comté (MRC) et Territoires autochtones / *Regional County Municipality (RCM) and First Nations Territories*



Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Résumé de l'étude d'impact sur l'environnement / *Summary of the Environmental Impact Assessment*

Carte 4 / *Map 4*
Zones d'étude régionales / *Regional Study Areas*

Sources :

SDA, 1/20 000, MRNF, 2024-02
Canvec, 1/250 000, 1/5 000 000 et 1/15 000 000, RNCan, 2019
BDGA, 1/1 000 000, MRN Québec, 2014
BDGA, 1/5 000 000, MRNF Québec, 2010
AQréseau+, réseau routier, MERN, 2024-03-01
RNCan, Frontières géopolitiques, 2002

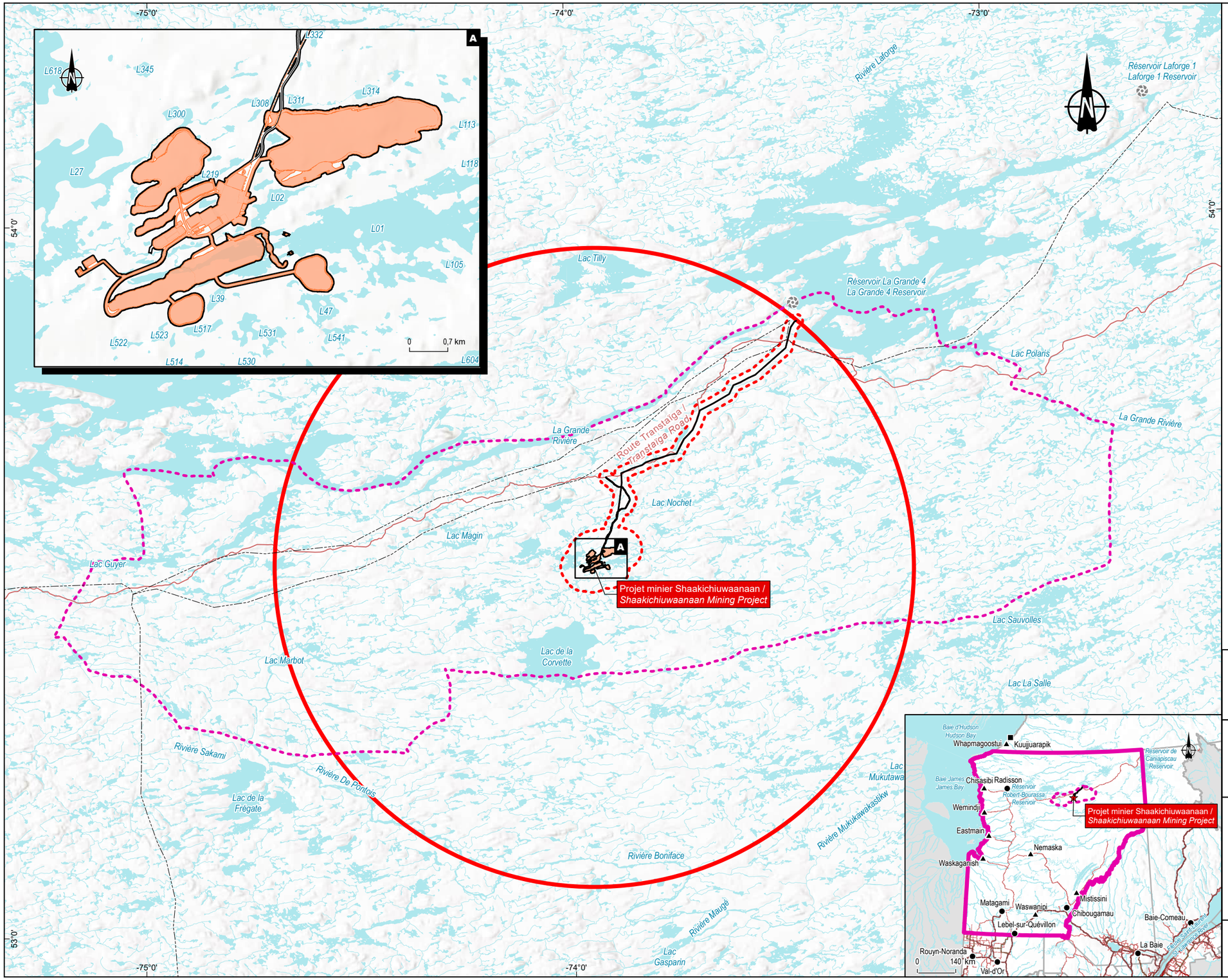
0 50 100 km

NAD 1983 Quebec Lambert

2026-03-25

Préparation / Preparation : M.-H. Brisson
Dessin / Drawing : J. Roy
Approbation / Approval : M.-H. Brisson
CA0001724_3318_eie_resume_c01_05_260325.aprx
CA0001724_3318_eie_resum_c4_167_ze_reg_260325

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / Boundary accuracy and measurements shown on this document are not intended for engineering or land delineation purposes. No land analysis has been performed by a land surveyor.



Projet / *Project*

- Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Zones d'étude / *Study Areas*

- Projet / *Project*
- Régionale - Biophysique / *Regional - Biophysical*
- Locale - Biophysique / *Local - Biophysical*
- Régionale - Humain / *Regional - Human*
- Locale - Humain / *Local - Human*

Repères géographiques / *Geographical Landmarks*

- Communauté crie / *Cree community*
- Village inuit / *Inuit village*
- Municipalité / *Municipality*

Composantes du projet / *Project Components*

Existante / *Existing*

- Chemin d'accès / *Access road*

Projeté / *Projected*

- Ligne de transport d'énergie / *Power transmission line*
- Limites des composantes de projet / *Limit of project components*

Infrastructures / *Infrastructure*

- Centrale hydroélectrique / *Hydroelectric generating station*
- Ligne de transport d'énergie / *Electric power transmission line*

Réseau routier / *Road Network*

- Route collectrice municipale / *Municipal collector road*

Hydrographie / *Hydrography*

- Plan d'eau / *Waterbody*
- Cours d'eau / *Watercourse*

Projet minier Shaakichiuwaanaan /
Shaakichiuwaanaan Mining Project

Résumé de l'étude d'impact sur l'environnement /
Summary of the Environmental Impact Assessment

Carte 5 / *Map 5*
Zones d'étude locales et de projet / *Local and Project Study Areas*

Sources / Sources
SDA, 1/20 000, MERN, 2024-02
CanVec+, 1/50 000, RNCan, 2014
CanVec, 1/250 000, RNCan, 2017
BDGA, 1/1 000 000, MRN Québec, 2014
AQréseau+, réseau routier, MERN, 2024-03-01
MRNF, Ombrage MNT 50k, 2019
ESRI, World Imagery / ESRI, World Topographic

0 6 12 km
UTM, fuseau 18, NAD83 (CSRS)

2026-03-25

Préparation / Prepared by : M.-H. Brisson
Dessin / Drawn by : J. Roy
Approbation / Approved by : M.-H. Brisson
CA0001724_3318_eie_resume_c01_05_260325.aprx
CA0001724_3318_eie_resum_c5_f68_ze_locales_260325

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. /
Boundary accuracy and measurements shown on this document are not intended for engineering or land delineation purposes. No land analysis has been performed by a land surveyor.

6.2.2 Ambient Air

The baseline air quality was established using three sources: measurements from the Radisson station of the National Air Pollution Monitoring Network (RNSPA), the baseline concentrations prescribed for northern projects in the *Instruction Guide – Preparation and Implementation of Atmospheric Emission Dispersion Modeling – Mining Projects,* as well as generic initial concentrations drawn from the document *Quebec Air Quality Standards and Criteria [NCQQA v10]* for substances not available for northern projects. These values serve as input data for modeling the project's atmospheric effects.

6.2.3 Greenhouse Gases (GHG)

Greenhouse gas (GHG) emissions refer to the quantities, in metric tons, of GHG emissions, primarily carbon dioxide (CO_2), methane (CH_4), and nitrous oxides (N_2O). In 2023, Quebec's emissions totaled 78 Mt CO_2 eq, with the transportation sector as the primary emitter, followed by the industrial sector. Nationwide, emissions totaled 694 Mt CO_2 eq in Canada. The mining sector, excluding oil and gas extraction, accounts for a significant proportion of the country's industrial emissions.

6.2.4 Acoustic Environment

The ambient noise level was determined through field measurements using sound level meters installed at three temporary Cree camps located within 15 km of the project study area, as well as at four additional measurement points around the project area. The measurements indicate a generally very quiet environment, with levels typical of a remote natural setting (19 to 26 dBA). A few localized increases were recorded near the Trans-Taiga Road due to traffic. Overall, the baseline background noise in the study area is below the thresholds established by Directive 019 on the mining industry, which set levels of 45 dBA at night and 50 dBA during the day for this sector.

6.2.5 Light Environment

Light measurement campaigns conducted in October 2024 indicate that the night sky in the study area remains very dark, with a surface magnitude greater than 21.97 mag/arcsec², indicating a near absence of light pollution. Intrusive light is low (<1 lux) at most stations, except near the LG-4 complex and the airfield, where values as high as 5 lux were observed. The light environment reflects a natural nightscape, minimally influenced by distant artificial sources.

6.2.6 Geology and Geomorphology

6.2.6.1 Geology

The study area is part of the Superior geological province, composed mainly of Archean rocks. The LSA is located in the La Grande subprovince, while the RSA also extends into the Opinaca subprovince. The project study area rests on Mesoarchean formations composed of metavolcanic and metasedimentary rocks associated with felsic intrusions, including spodumene pegmatites, which constitute the ore of interest. Several major faults structure the area, including the Ponthois-Sud Fault, which exhibits reverse and southward-dipping shear.

6.2.6.2 Geomorphology and surface deposits

The topography is relatively uniform, ranging between 320 and 400 m in elevation. The project study area, located at an elevation of approximately 335–340 m, has a gentle northward slope. Surface deposits are dominated by undifferentiated till covering about 72% of the LSA. Geotechnical investigations reveal a soil sequence typical of the Canadian Shield: a superficial organic layer followed by sandy and silty horizons. Characterized natural metals generally fall below reference criteria, with the local exception of silver and arsenic, which exhibit concentrations corresponding to the A–B range of natural background metal concentrations (NBMC).

6.2.7 Hydrology

The hydrology of the area was documented between 2023 and 2025 using flow measurements, stream cross-sections, water level readings, and rain gauges. Eleven calculation points were established to model the hydrological behavior of the watersheds. Discharge rates were estimated using frequency analyses and hydrological transposition methods adapted to the northern context. The results obtained for average and low-flow conditions show good agreement between measured and estimated discharge rates. The seasonal ice cycle shows freezing between mid-November and early December depending on the size of the water bodies, followed by thawing observed between mid-May and early June.

6.2.8 Surface water

Surface water was sampled at 29 stations between 2022 and 2025. The water bodies are primarily oligotrophic, characterized by low productivity, good surface oxygenation, and good transparency. The slightly acidic pH (6 to 6.5) reflects the natural conditions of the Canadian Shield. Several parameters show occasional or recurring exceedances: pH, dissolved oxygen, aluminum, mercury, and sometimes iron, fluorides, and zinc. These exceedances are generally attributable to the natural geochemistry of the surrounding geological formations rather than to anthropogenic influence.

6.2.9 Sediments

Sediments were collected at 19 stations between 2024 and 2025. The grain size distribution is dominated by fine-grained deposits (clay-silt), with occasional sandy fractions. Several metals exceed CER, CSE, or CEP criteria depending on the station, notably arsenic, cadmium, chromium, copper, mercury, lead, and zinc. Two lakes located in the area exposed to mine effluents show exceedances for a polycyclic aromatic hydrocarbon (dibenzo(a,h)anthracene). These results reflect a naturally enriched geochemical context rather than recent anthropogenic inputs.

6.2.10 Hydrogeology

Surface deposits at the project study area are structured into four units: ablation till or undifferentiated till, shallow bedrock, intermediate bedrock, and deep bedrock. Hydraulic conductivity ranges from 3.9×10^{-6} to 3×10^{-8} m/s in the till, around 2×10^{-7} m/s in the first 50 meters of rock, and between 6.7×10^{-8} and $8.6 \times^{10^{-8}}$m/s in the deeper units.

6.2.11 Groundwater Quality

Groundwater quality was assessed based on 23 wells sampled in 2023–2024. Several exceedances of applicable criteria were observed, particularly for arsenic (24 results exceeding thresholds). Other elements exceed the criteria less frequently, notably dissolved manganese, ammonia nitrogen, dissolved antimony, fluoride, molybdenum, and sulfide in the form of S_2^-. No hydrocarbons were detected. The groundwater is predominantly of the calcium-magnesium bicarbonate or sodium-potassium bicarbonate type, which is consistent with the mineralogy of the bedrock.

6.3 Biological Environment

6.3.1 Vegetation and wetlands

The biophysical LSA, covering approximately 20,661 ha, is located within the lichen-covered spruce forest bioclimatic zone of the open boreal forest, dominated by black spruce. Photo interpretation and field inventories have identified fourteen plant communities, distributed mainly across terrestrial habitats (approximately 75%), wetlands (nearly 12%), and water bodies (just over 12%). Terrestrial habitats are dominated by forest regeneration resulting from past wildfires and by coniferous stands (moss-covered spruce forests, lichen-covered spruce forests, and gray pine forests). Mixed and deciduous stands are very scarce. Lichen-covered shrublands and heaths occupy smaller areas, characterized by a shrub layer of heath family plants and generally thin or sandy soil resting on bedrock.

Wetlands cover approximately 12% of the LSA and consist mainly of wooded and open ombrotrophic peatlands. These bogs, resting on thick organic soils, are generally nutrient-poor and not very diverse, with flora typical of acidic environments dominated by black spruce (*Picea mariana*), American larch (*Larix laricina*), various heath family plants, and sphagnum mosses (*Sphagnum* sp.). Richer but less extensive minerotrophic bogs are found along the edges of certain watercourses and are distinguished by more diverse herbaceous and shrubby vegetation. Wooded swamps and shrub swamps complete the picture, with a structure and floristic composition similar to those of wooded ombrotrophic bogs, but on thinner organic soils (<30 cm). Ponds and marshes are scarce in the landscape. Overall, the vegetation is typical of a fire-dependent boreal landscape, with a fairly homogeneous vascular flora and few notable elements. No plant species with special conservation status were observed during field inventories, and the potential for the presence of such species is considered low. No invasive alien plant species were detected. Finally, more than forty species of plants traditionally used by the Cree, which are abundant and common at the regional level, were inventoried, and ecotoxicological analyses conducted on blueberries (*Vaccinium* sp.) and Labrador tea (*Rhododendron groenlandicum*) revealed no concentrations of metals likely to raise concerns.

6.3.2 Aquatic wildlife (fish) and habitat

Surveys conducted between 2022 and 2025 documented the habitat of fish and benthic invertebrates in all water bodies and watercourses likely to be affected by the project, within the watersheds of Lac de la Corvette and La Grande. Benthic sampling, conducted in reference areas and in areas potentially exposed to mine effluent, highlights significant ecological heterogeneity in terms of both taxonomic richness and density. Benthic communities consist primarily of arthropods, mainly chironomids, followed by mollusks (bivalves and gastropods). Diversity levels range from low to moderate, reflecting the variability in the physical and trophic conditions of the lakes and watercourses, which are mostly oligotrophic and relatively shallow.

The ichthyological survey, supplemented by DNA analyses, confirms the presence of the following fish: northern pike (*Esox lucius*), brook trout (*Salvelinus fontinalis*), lake trout (*Salvelinus namaycush*), lake whitefish (*Coregonus clupeaformis*), black sucker (*Catostomus commersonii*), and red sucker (*Catostomus catostomus*), the pearl mullet (*Margariscus margarita*), the burbot (*Lota lota*), the round-snouted minnow (*Prosopium cylindraceum*), sculpin (*Cottus sp.*), and various cyprinids (*Cyprinidae sp.*). These species, many of which are of interest to both Indigenous and non-Indigenous communities, inhabit a mosaic of habitats distributed across the major lakes and their tributaries. The dominant ecological functions are rearing and feeding, while spawning potential is often limited by depth, substrate type, and siltation of certain shoals. No rare, threatened, vulnerable, or invasive exotic fish have been recorded, either within the LSA or within a 10-km radius.

Metal concentrations (mercury, arsenic, lead) measured in the flesh of northern pike and lake trout from Lakes L01, L27, and the reference lake L823 are comparable to those observed in natural lakes of the Canadian Shield, with exceedances of Health Canada criteria for large specimens, independent of the project's influence. The analyses do not reveal any significant differences between the exposed lakes and the reference lake; the values obtained thus serve as a baseline for future monitoring.

6.3.3 Herpetofauna

No inventory specifically targeting herpetofauna was conducted, but opportunistic surveys were carried out in 2023 and 2024, in parallel with avian inventories. These surveys, supplemented by analysis of automated recordings, identified five species of anurans widely distributed within the biophysical LSA: the cruciferous tree frog (*Pseudacris crucifer*), the American toad (*Bufo americanus*), the northern frog (*Rana septentrionalis*), the wood frog (*Rana sylvaticus*), and the leopard frog (*Rana pipiens*). No reptiles were detected, and the species potentially present based on their ranges—namely the blue-spotted salamander (*Ambystoma laterale*) and the northern two-lined salamander (*Eurycea bislineata*)—were not observed. No amphibian or reptile species with special status were documented in the LSA or the biophysical RSA.

6.3.4 Avian fauna

Avian fauna was the subject of a comprehensive inventory, covering the spring and fall migration periods, the breeding season, and the winter season between 2023 and 2025. This effort combined helicopter flyovers, daytime and twilight listening stations, automated recordings, and winter transects, supported by a review of literature and databases (CDPNQ, eBird, Breeding Bird Atlas, etc.). In total, several dozen species were recorded, including waterfowl, other aquatic birds, shorebirds, raptors, and land birds.

Helicopter-based and ground surveys identified 34 species of waterfowl, shorebirds, and aquatic birds. During the spring migration, diving ducks (notably the common merganser, *Mergus merganser;* and the white-fronted scaup, *Melanitta perspicillata*) and the ruddy duck (*Anas rubripes*) are particularly abundant. Thirteen species of waterfowl were recorded during flyovers during the nesting season, including family groups of red-breasted mergansers and common teals (*Anas crecca*), confirming their status as breeders. Nesting was also confirmed for the sandhill crane (*Antigone canadensis*). Four species of interest were identified in the biophysical LSA: the Canada Goose (*Branta canadensis*), the snow goose (*Anser caerulescens*), the Wilson's snipe (*Gallinago delicata*), and the American woodcock, all of which are migratory birds classified as game in Canada (Canadian Wildlife Service Waterfowl Technical Committee, 2023). Thirteen species of raptors have been recorded, including the golden eagle (*Aquila chrysaetos*), the short-eared owl (*Asio flammeus*), and the bald eagle (*Haliaeetus leucocephalus*), all of which are species of special concern. Nesting has been confirmed for the red-tailed hawk (*Buteo jamaicensis*) and is probable for the short-eared owl; an active red-legged hawk nest was observed on the outskirts of the LSA.

Automated recordings and listening posts revealed a diverse terrestrial avifauna, with nearly a hundred species detected, dominated by the white-throated sparrow (*Zonotrichia albicollis*), the slate-backed junco (*Junco hyemalis*), the American robin (*Turdus migratorius*), and the Canada jay (*Perisoreus canadensis*). Average densities of breeding pairs range from 35 to 37 pairs per 10 ha, with variations among habitat types (swamps, regeneration, mixed, coniferous, peatlands). Species prized for hunting, such as the willow ptarmigan (*Lagopus lagopus*), the spruce grouse (*Canachites canadensis*), and the ruffed grouse (*Bonasa umbellus*), are also present. In winter, the birdlife is less diverse, with only 13 species recorded, but certain boreal species (willow ptarmigan; spruce grouse; Canada jay; red-flanked bunting, *Acanthis flammea*) remain frequently observed.

A total of fifteen bird species with vulnerable status are likely to occur in the LSA, eleven of which were observed during the field surveys. Among the most frequently recorded are the rusty-backed grackle (*Euphagus carolinus*), the olive-sided flycatcher (*Contopus cooperi*), and the American nightjar (*Chordeiles minor)*. Other species (harlequin loon, *Histrionicus histrionicus*; common eider, *Bucephala islandica*; yellow rail, *Coturnicops noveboracensis*; ruff-necked sandpiper, *Limnodromus griseus*) were not detected, although the LSA lies within their potential range.

6.3.5 Mammals – Large Fauna

The large wildlife of the biophysical RSA includes caribou (forest and migratory; *Rangifer tarandus caribou*), moose (*Alces alces*), black bear (*Ursus americanus*), and gray wolf (*Canis lupus*). Forest caribou, an umbrella species classified as Vulnerable in Quebec and Threatened in Canada, depends on vast tracts of mature, undisturbed forest. In the West James Bay sector, the estimated population density is very low, with habitat heavily fragmented by human and natural disturbances. No individuals were observed in the LSA during recent inventories, but the area lies within the population's range. The migratory caribou of the Leaf River herd, whose wintering range overlaps with the RSA, has experienced a marked decline in recent decades; in fact, no individuals were recorded locally in 2023.

Moose are present at low densities in the RSA, but the availability of suitable habitat (a mosaic of forest and wetland environments) is considered favorable, and the regional population is considered stable or slightly growing. The black bear, widely distributed regionally, is primarily hunted or trapped by Indigenous communities; the estimated regional density reflects a relatively abundant population, although it is poorly documented locally. Finally, the gray wolf is present at low to medium densities and occupies a wide territory, depending on the availability of its prey (moose, caribou, beaver).

6.3.6 Mammals – Chiroptera

Acoustic surveys conducted between 2023 and 2025 confirmed the presence of several species of migratory and resident bats in the biophysical LSA. The recordings show a strong predominance of the ash-colored bat (*Lasiurus cinereus*), followed by the red bat (*Lasiurus borealis*) and the silver-colored bat (*Lasionycteris noctivagans*), while resident species (notably the greater brown bat, *Myotis lucifugus,* and the northern bat, *Myotis septentrionalis*) are less common. No known hibernaculum has been identified in the LSA, and the potential for hibernation there is considered low to nonexistent, due to the absence of natural cavities or suitable abandoned mines. In contrast, several potential maternity roosts have been identified in forested and riparian areas, some of which show high potential although no colonies have been confirmed. Several present or potential species are endangered or likely to be designated as threatened or vulnerable, particularly species of the genus *Myotis*, leading to the consideration of bats as a significant conservation concern.

6.3.7 Mammals – Other Species

Surveys of small mammals and a review of existing data indicate the presence of a variety of small and medium-sized species typical of the boreal forest. A trapping survey in 2023 detected several species of voles, shrews, and other small mammals, including Cooper's vole (*Synaptomys cooperi*), which is likely to be designated as threatened or vulnerable in Quebec. The rock vole (*Microtus chrotorrhinus*) was not observed, but potential habitats exist locally. Species such as the snowshoe hare (*Lepus americanus*), the porcupine (*Erethizon dorsatum*), the muskrat (*Ondatra zibethicus*), the Canadian beaver (*Castor canadensis*), and several mustelids are also likely to be present, consistent with the available habitats (forests, wetlands, riverbanks). Although these species do not have a specific conservation status, they play an important role for First Nations.

6.3.8 Flora and fauna species with special status

For flora, no confirmed occurrences were observed in the biophysical RSA, although ten species likely to be designated as threatened or vulnerable have a potential for presence linked to specific soil or habitat conditions. For fauna, 15 bird species, five bat species, two small mammal species, and one large mammal species have a potential presence or a confirmed presence in the biophysical LSA.

6.4 Human Environment

The project is located in the Nord-du-Québec administrative region (10), a vast territory divided between Eeyou Istchee James Bay and Nunavik. More specifically, it is located in Eeyou Istchee James Bay, a municipal territory administered by the Eeyou Istchee Baie-James Regional Government (GREIBJ).

The project study area is located 20 km south of the Trans-Taiga Road, approximately 220 km east of Radisson (Map 6). The Human LSA overlaps the traditional territory of the Cree communities of Chisasibi, Wemindji, and Mistissini. Although the Human RSA includes several other Cree communities (Eastmain, Waskaganish, Nemaska, Waswanipi) as well as Jamesian communities, all planned project infrastructure is located on the traditional territory of the Cree Nation of Chisasibi. The RSA is crossed by the Trans-Taiga and Billy-Diamond roads, which are essential for construction and spodumene concentrate transport activities.

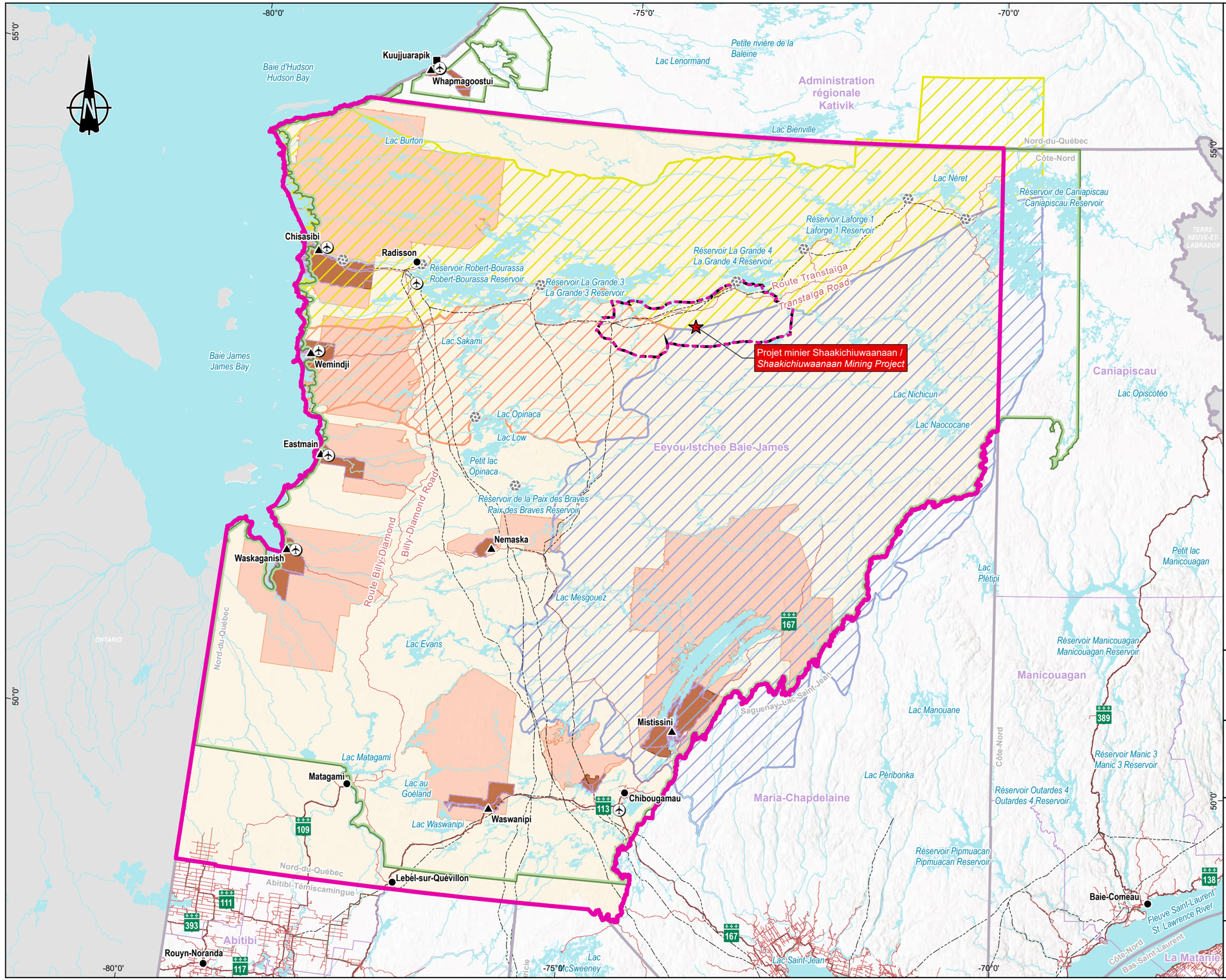
The territory is divided into traplines, each under the responsibility of a tallyman, who is regarded as the guardian of the territory. The trapline directly affected by the project is CH39, associated with the Cree Nation of Chisasibi, while the M02A (Mistissini) and VC26 (Wemindji) traplines are also located within the LSA (Map 7).

The Cree communities and Jamesian settlements that make up Eeyou Istchee James Bay each have their own demographic realities, but share a close relationship with the territory, particularly the Cree communities, for whom the practice of traditional activities remains a central element of community life.

6.4.1 Territorial Governance and Land Use Planning

Under the James Bay and Northern Quebec Agreement (JBNQA), the project is located on Category III lands. These lands permit use by both Cree and non-Cree uses, but the Cree hold exclusive rights to hunting, trapping, and fishing there. Governance of the territory has been the responsibility of the GREIBJ since 2014. The GREIBJ exercises the powers of a regional county municipality (RCM) over all Category III lands and operates under a joint structure comprising 11 Cree representatives and 11 Jamesian representatives, along with a provincial representative without voting rights. This structure aims to ensure joint management, particularly regarding land use, planning, and territorial regulation.

Forestry activities are overseen by local Integrated Resource and Land Management (GIRT) committees, which facilitate consultation among Cree authorities, the GREIBJ, and land users. At the same time, the Eeyou Planning Commission (EPC) develops the *Regional Land and Resource Use Plan* (RLRUP) for Category II lands and collaborates on harmonizing land-use practices on Category III lands. The overall objective of these initiatives is to reconcile economic development, environmental protection, and the traditional uses of Cree communities, while ensuring regional consistency in land-use planning decisions.



Projet / *Project*

- Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Zones d'étude / *Study Areas*

- Régionale - Humain / *Regional - Human*
- Locale - Humain / *Local - Human*

Repères géographiques / *Geographical Landmarks*

- Communauté crie / *Cree community*
- Village inuit / *Inuit village*
- Municipalité / *Municipality*

Terrains de trappage des communautés cries / *Cree Communities Traplines*

- Chisasibi
- Mistissini
- Wemindji

Infrastructures / *Infrastructure*

- Aéroport / *Airport*
- Centrale hydroélectrique / *Hydroelectric generating station*
- Ligne de transport d'énergie / *Electric power transmission line*

Réseau routier / *Road Network*

- Route nationale / *National road*
- Route régionale / *Regional road*
- Autre / *Other*

Limites / *Boundaries*

- Municipalité régionale de comté (MRC) et Territoires autochtones / *Regional County Municipality (RCM) and First Nations Territories*
- Territoire d'application du régime de protection de l'environnement et du milieu social (chap. 22, CBJNQ) / *Territory covered by the environmental and social protection regime (chap. 22, JBNQA)*

Terres de catégorie (CBJNQ) / *Category Lands (JBNQA)*

- Terres de catégorie I / *Category I lands*
- Terres de catégorie II / *Category II lands*
- Terres de catégorie III / *Category III lands*

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Résumé de l'étude d'impact sur l'environnement / *Summary of the Environmental Impact Assessment*

Carte 6 / *Map 6*
Inventaire du milieu humain dans la zone d'étude régionale / *Inventory of the Human Environment in the Regional Study Area*

Sources

SDA, 1/20 000, MRNF, 2024-02
RNCan, Frontières géopolitiques, 2002 / CBJNQ, Chap. 22, 1975
Canvec, 1/250 000, 1/5 000 000 et 1/15 000 000, RNCan, 2019
BDGA, 1/1 000 000, MRN Québec, 2014 / BDGA, 1/5 000 000, MRNF Québec, 2010
AQréseau+, réseau routier, MERN, 2024-03-01 / Bail de villégiature, MERN, mars 2021
FTGQ, MRNF Québec, 2010 / Réseau aéroportuaire, MTQ, 2024
Cree Trappers Association, 2018 / Contraites et restrictions, GESTIM, 2022

0 32,5 65 km

NAD 1983 Quebec Lambert

2026-03-31

Préparation / Prepared by : M. Lachance
Dessin / Drawn by : J. Roy
Approbation / Approved by : M-H. Brisson
CA0001724_3318_eie_resume_c06_09_260325.aprx
CA0001724_3318_eie_resum_c6_169_inv_hum_reg_260331

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. /
Boundary accuracy and measurements shown on this document are not intended for engineering or land delineation purposes. No land analysis has been performed by a land surveyor.

Zones d'étude / *Study Areas*

- Projet / *Project*
- Régionale - Humain / *Regional - Human*
- Locale - Humain / *Local - Human*

Occupation du territoire cri / *Cree Territory Occupation*

- Terrain de trappage / *Trapline*

Repères géographiques / *Geographical Landmarks*

- Communauté crie / *Cree community*
- Village inuit / *Inuit village*
- Municipalité / *Municipality*

Camps et installations / *Camps and Facilities*

- Camp cri permanent / *Cree permanent Camp*
- Campement cri temporaire / *Cree temporary camp or campsite*
- Aire de camps et de campements / *Camps and campsites area*
- Autre type de camp / *Other camp type*
- Site de chasse / *Hunting site*
- Prélèvement d'eau potable / *Drinking water withdrawal*

Infrastructures / *Infrastructure*

- Aérodrome / *Aerodrome*
- Hydroaérodrome / *Hydroaerodrome*
- Héliport / *Heliport*
- Site d'extraction ouvert / *Open extraction site*
- Bâtiment industriel / *Industrial building*
- Tour de télécommunication / *Telecommunication tour*
- Centrale hydroélectrique / *Hydroelectric power plant*
- Poste électrique / *Electrical substation*
- Ligne de transport d'énergie / *Electric power transmission line*

Réseau routier / *Road Network*

- Route collectrice municipale / *Municipal collector road*

Contamination des sols / *Soil contamination*

- Site listé au Répertoire des terrains contaminés (RTC) du MELCCFP / *Site listed in the Contaminated Sites Directory (RTC) of the MELCCFP*

Baux de location / *Leases*

- Fins de villégiature / *Leisure purpose*
- Fins commerciales / *Commercial purpose*
- Fins industrielles / *Industrial purpose*
- Fins municipales / *Municipal purpose*

Parcs et aires protégées / *Parks and Protected Areas*

- Projet d'aire protégée / *Proposed protected area*

Feux de forêt / *Forest Fires*

- Feux 2023 / *2023 fires*

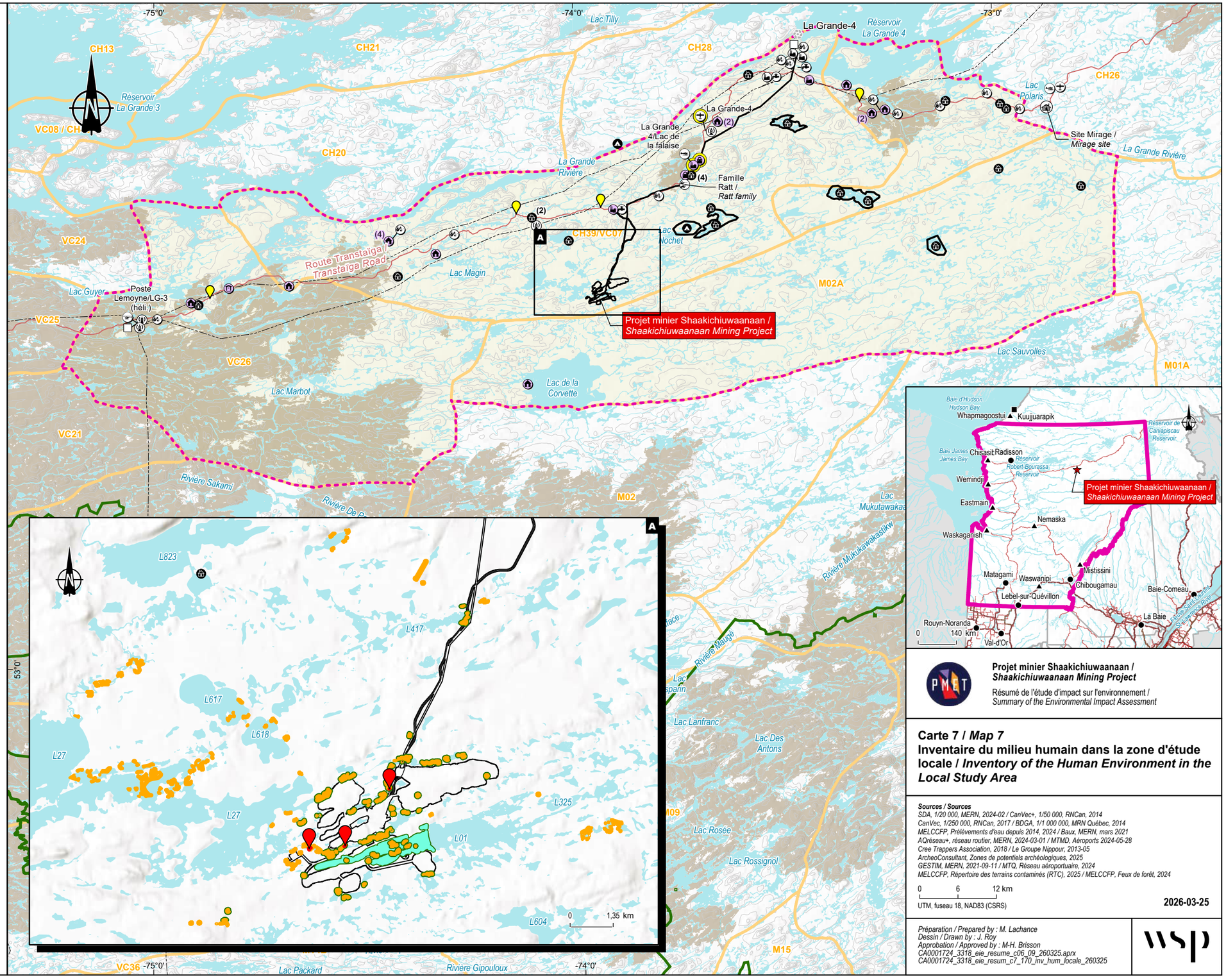
Archéologie / *Archaeology*

Zones de potentiel archéologique / *Areas of Archaeological Potential*

- Fort / *High*
- Moyen / *Medium*
- Subaquatique / *Underwater*
- Zone de l'inventaire 2025 / *2025 field inventory area*

Hydrographie / *Hydrography*

- Plan d'eau / *Waterbody*
- Cours d'eau / *Watercourse*



Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Résumé de l'étude d'impact sur l'environnement / *Summary of the Environmental Impact Assessment*

Carte 7 / *Map 7*
Inventaire du milieu humain dans la zone d'étude locale / *Inventory of the Human Environment in the Local Study Area*

Sources / Sources

SDA, 1/20 000, MERN, 2024-02 / CanVec+, 1/50 000, RNCan, 2014
CanVec, 1/250 000, RNCan, 2017 / BDGA, 1/1 000 000, MRN Québec, 2014
MELCCFP, Prélèvements d'eau depuis 2014, 2024 / Baux, MERN, mars 2021
AQréseau+, réseau routier, MERN, 2024-03-01 / MTMD, Aéroports 2024-05-28
Cree Trappers Association, 2018 / Le Groupe Nippour, 2013-05
ArcheoConsultant, Zones de potentiels archéologiques, 2025
GESTIM, MERN, 2021-09-11 / MTQ, Réseau aéroportuaire, 2024
MELCCFP, Répertoire des terrains contaminés (RTC), 2025 / MELCCFP, Feux de forêt, 2024

0 6 12 km

UTM, fuseau 18, NAD83 (CSRS)

2026-03-25

Préparation / Prepared by : M. Lachance
Dessin / Drawn by : J. Roy
Approbation / Approved by : M-H. Brisson

CA0001724_3318_eie_resume_c06_09_260325.aprx
CA0001724_3318_eie_resum_c7_170_inv_hum_locale_260325

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre. / Boundary accuracy and measurements shown on this document are not intended for engineering or land delineation purposes. No land analysis has been performed by a land surveyor.

6.4.2 Cree communities of Eeyou Istchee

Eeyou Istchee comprises ten Cree communities spread across a vast territory divided into more than 300 trapping grounds, which form the foundation of Cree social, cultural, and territorial organization. These communities, administered by the Cree Nation Government and the Grand Council of the Crees, have a young and rapidly growing population: the Cree population accounts for approximately 35% of the total population of Northern Quebec and has seen a significant increase in recent years.

Traditional activities—hunting, fishing, trapping, and gathering—remain essential to Cree culture and continue to shape relationships with the land. The Hunters and Tallyman Income Security Program, established under the JBNQA, helps support these practices, although participation is declining due to socioeconomic changes observed in several Cree communities. Families, however, maintain a strong and active relationship with their trapping territories, which play a central role in cultural transmission and the maintenance of intergenerational ties.

Health and social services are provided by the James Bay Cree Health and Social Services Board (CCSSSBJ), which manages a network of community clinics, a hospital, and a birthing centre. Several health indicators remain concerning and reflect the effects of colonialism, the forced displacement of many Cree communities, and persistent inequalities. Notably, life expectancy is lower than the Quebec average, premature mortality is high, the prevalence of diabetes and chronic diseases is greater, and the rate of teenage pregnancies is high. These issues are exacerbated by difficult socioeconomic conditions, including a higher cost of living, overcrowded housing, food insecurity, and graduation rates below the Quebec average.

6.4.3 Jamesian Municipalities and Localities

The James Bay municipalities and localities located within the RSA have varied demographic, economic, and social profiles, but share a common context marked by geographic isolation, limited access to specialized services, and significant dependence on natural resource industries.

Radisson, the community closest to the project, is an operational hub linked to hydroelectric activities in the James Bay region. The community hosts a fluctuating population of transient workers. Services there are limited, and access to specialized healthcare requires significant travel, which exacerbates the community's social vulnerability and dependence on provincial infrastructure. The local economy relies primarily on Hydro-Québec, transportation, and a few support businesses.

As the starting point of the Billy-Diamond Highway and home to a local rail network spanning over 3 km that facilitates rail trans-shipment, Matagami serves as a strategic hub for intermodal freight transport between Eeyou Istchee James Bay and the rest of the province. Historically developed around mining, Matagami shifted its economic focus toward logistics and transportation following the closure of the Matagami Mine in 2022. The municipality offers a variety of services: shops, elementary and secondary schools, a general education center, and a health center.

6.4.4 Regional Economy

The economy of Eeyou Istchee James Bay relies primarily on the exploitation of natural resources, particularly hydroelectricity, mining, and forestry, which underpin the majority of economic activities and employment. The large hydroelectric complexes in James Bay, along with the road and energy infrastructure that supports them, are major hubs for employment and mobility, and their presence shapes the regional spatial organization and economic dynamics. Mining activities also play an important role, although they are subject to cycles of closure and resumption.

James Bay municipalities serve as service hubs, particularly for logistics, vocational training, and supply.

In Cree communities, the economy combines income from wage employment with income from traditional activities, which hold significant cultural and social importance. The Cree Nation Government and its affiliated companies support local and regional economic development, particularly in the transportation, construction, services, and mining sectors. Regional economic partnerships are growing, particularly those related to the development of critical and strategic minerals and land development.

Overall, the regional economy remains robust but vulnerable to fluctuations in the extractive industries. The project is set against a backdrop where communities are seeking to diversify their activities, stabilize local employment, and benefit from transformative economic impacts, while ensuring the protection of traditional uses and community participation in development planning.

6.4.5 Transportation

Traffic in the RSA relies on the Billy-Diamond and Trans-Taiga roads, which are the only permanent land links to the Eeyou Istchee James Bay territory. These roads play an essential role in community mobility, supplying northern communities, and industrial project logistics. The Billy-Diamond Road, a north-south artery connecting Matagami to the hydroelectric complexes, carries traffic consisting of light vehicles, heavy trucks, worker buses, and specialized convoys related to Hydro-Québec operations. The Trans-Taiga Road, for its part, connects the southern part of the region to a series of hydroelectric sites and various infrastructure facilities, in addition to serving users in the area.

Spodumene concentrate transport is planned to take place on these roads. The anticipated traffic volumes will add to a road network already burdened by regional travel and various industrial activities, although traffic on these roads remains relatively low. The linear configuration of the roads, their distance from urban centers, harsh weather conditions, and the presence of unpaved sections may affect traffic safety and flow. The maximum number of vehicles expected on the Trans-Taiga Road and Billy Diamond Highway during the project's operational phase remains well below their capacity, which can handle several hundred vehicles per hour in all directions.

Local transportation also includes travel by snowmobile, boat, and all-terrain vehicle, used by members of the Cree communities to access camps, trapping grounds, and hunting and fishing areas. These seasonal modes of transport play a vital role in traditional activities and must be considered in the project's logistical planning to minimize the risk of conflicts over land use and disruptions to customary routes.

6.4.6 Archeology

The archaeological potential of the project area is linked to Cree occupation of Eeyou Istchee, which spans from prehistoric times to the present day. The practice of traditional activities such as hunting and fishing, seasonal travel along the local waterways, and the establishment of temporary camps may have contributed to the presence of archaeological remains. Although the region is vast and sparsely populated, several archaeological sites are documented in areas adjacent to the project study area, primarily portage routes, former seasonal camps, and sites associated with traditional activities.

The human LSA has a low density of historical occupation due to the terrain, the nature of the substrate, and its remote location from major waterways. Preliminary surveys show that no known archaeological sites are located in the immediate vicinity of the proposed infrastructure.

An archaeological survey took place in 2025 and uncovered 4 artefacts, one of which is inside a zone that may contain additional artefacts. Although this zone is not located within the project study area, it should be protected from disturbance in the case of additional development or project activities.

The possibility of chance artefact discoveries during construction work remains. Consequently, a chance find procedure was developed as a protocol to follow in the event of a chance discovery.

6.4.7 Landscape

The landscape in the study area is characterized by a mosaic of forested hills, rolling plains, large bodies of water, and linear infrastructure. Despite the vastness of the territory and its low human occupation, the visual perception of the landscape remains closely linked to traditional Cree uses, travel on major roads, and activities associated with bodies of water. The territory has a predominantly natural character, where coniferous forests, wetlands, and gentle relief shape the visual environment.

The landscape is divided into several distinct units. The valley unit, structured around the Grande Rivière and numerous lakes, offers deep perspectives thanks to a visual opening onto the bodies of water. However, the terrain and forest cover generally limit lateral visual range. Observers who frequent this unit—primarily users of Cree camps, recreational leaseholders, and travelers on the Trans-Taiga Road—perceive a landscape whose value lies in the simultaneous presence of calm waters and wooded hills.

The hills unit represents the largest portion of the landscape. It is characterized by a succession of gently sloping hills with dense coniferous stands, interspersed with narrow, elongated lakes. This unit is home to several Cree camps, a temporary camp, and the planned mine infrastructure. The terrain and vegetation create visual screens that limit the field of view, except when a lake or a hilltop opens up a vista. The visual experience here is dominated by the continuity of the forest and local topographic variations.

Finally, the lake units associated with Lac de la Corvette and the La Grande 4 reservoir create distinctive visual environments that are largely open and contrast with the density of the surrounding forest. The shores, islands, bays, and texture of the waters define a landscape highly valued for its open character and its historical connection to traditional Cree activities and hydroelectric operations.

Overall, the visual sensitivity of the territory is considered moderate. Although the landscape is predominantly natural, its visual accessibility remains limited due to the terrain, forest density, and the small number of visual corridors. However, the areas associated with the Trans-Taiga Road, large bodies of water, and hilltops offer increased visibility and hold particular value for local communities, which warrants specific attention in project planning.

7 Identification of Issues

The Impact Assessment Agency of Canada (IAAC) opened a public consultation period on the summary of the project description between February 19 and March 16, 2025, which identified several concerns among local land users regarding the territory, its use, and the potential effects on the Chisasibi community. A summary of the questions received was sent to the proponent (Summary of questions: https://iaac-aeic.gc.ca/050/evaluations/document/161673). On October 22 and 23, 2025, IAAC held a consultation session in the community of Chisasibi, where a summary of the concerns shared by community members and project stakeholders was presented to participants.

PMET reviewed the project EIA guidelines, local land user and project stakeholder questions, and the list of community concerns presented by IAAC throughout the project issue identification process.

PMET has organized information sessions beginning in 2022, which intensified throughout 2023, 2024, and 2025. As part of these efforts, the complete list of issues raised was presented to several key stakeholders, including the MELCCFP (July 18, 2025), IAAC, the Cree Nation Government(September 29, 2025), and the community of Chisasibi (October 22 and 23, 2025). The concerns identified during the various engagement activities were taken into account in the project planning, and PMET will continue to consider community and stakeholder concerns as it proceeds with the design and development of its project.

7.1 Identified Issues

An issue is defined as a major concern for the government, the scientific community, or the public—including potentially affected Indigenous communities—whose analysis could influence the government's decision regarding the approval or rejection of the project. As for valued environmental components (VECs), they can be defined as all significant elements and relevant components of natural and human environments likely to be affected by project activities.

Table 7-1 presents the seven selected issues, the VECs that were or were not selected for the impact assessment, the rationale for this choice, and the sections of the EIA report where the issues and VECs are addressed. It should be noted that the numbering assigned to the issues is arbitrary and does not represent an order of priority. Furthermore, although certain VECs may be included in more than one issue, they are addressed in only one to avoid redundancy.

Table 7-1 List of issues raised by the project and associated valued environmental components, selected or not selected for the impact assessment

Issues		Valued environmental components		Justification/Comment
Issue Name	**Selected for impact assessment (Y/N)**	**Component Name**	**Included in the impact assessment (Y/N)**	
Preservation of aquatic habitat quality	Y (Issue No. 1)	Hydrodynamic and hydrosedimentary conditions	Y	The project will result in changes to flow patterns due to the construction of dikes, the partial draining of Lake L01, and the construction of a diversion channel. The project could lead to potential changes in flow rates and sediment dynamics in the watercourse receiving the industrial effluent.
		Surface water quality	O	Maintaining surface water quality is a major concern for several stakeholders. The project could result in a change in surface water quality downstream of the industrial effluent discharge point, which will include surface water from the waste rock stockpiles.
		Sediment quality	N	The anticipated concentrations of contaminants in the industrial effluent, which will comply with the requirements of Directive 019, are considered too low to have a long-term effect on sediments.
		Fauna (fish) and aquatic habitats	O	Some loss of local aquatic habitats will be unavoidable due to the construction of the project's infrastructure, but a regional improvement is expected through various compensation projects identified by stakeholders.
Preservation of soil and groundwater quality	O (Issue No. 2)	Soil quality	O	The project involves soil disturbance and a temporary loss of fertile soil. Additionally, the storage of fuels on-site poses a risk of soil contamination in the event of an accidental spill.
		Groundwater Quality	O	Since the project involves deep excavation work, the industrial zone could potentially interact with groundwater. The accumulation of mining waste poses a risk of leaching at one of the waste rock stockpile 02.
Preservation of wetlands and habitats of interest to terrestrial flora and fauna	O (Issue No. 3)	Wetlands and aquatic environments	O	Losses of local wetlands and aquatic environments cannot be avoided due to infrastructure development, but a regional improvement is planned through various compensation projects identified by stakeholders.
		Wildlife species with special status	O	The project could impact the habitat of bird, bat, and small mammal species with special status listed on the project study area. Although the woodland caribou is present regionally, it will not be significantly affected by the project since the project study area does not constitute quality habitat for the species.
		Flora species of special concern	N	Searches of the CDPNQ databases revealed no occurrences of plants of special concern within a 15-km radius of the project study area. Furthermore, out of a list of 95 species of special concern for the greater Nord-du-Québec region, only ten species had the potential to be present in the biophysical LSA. Specific inventories conducted within the biophysical LSA did not identify any plant species with special status.
		Invasive Exotic Plant and Animal Species	N	Neither the searches conducted using the MELCCFP's online tool for invasive alien species nor the field inventories identified the presence of invasive alien plant or animal species.
		Terrestrial fauna (large wildlife, avifauna including migratory birds)	O	The project will have impacts on terrestrial wildlife as it will result in habitat loss, cause disturbances (noise, dust, light), and increase the risk of collisions on the various roads used by mining trucks.
		Terrestrial forest cover	O	The project will impact forest cover as the project footprint must be cleared of trees. This forest cover consists mainly of softwoods and regenerating forests with low density.

Issues		Valued environmental components		Justification/Comment
Issue Name	**Selected for impact assessment (Y/N)**	**Component Name**	**Included in the impact assessment (Y/N)**	
Preservation of the local population's quality of life	O (Issue No. 4)	Air quality	O	Potential impacts of the project on air quality are anticipated during the project's operational phase. Dust and exhaust emissions from the movement of machinery and mining trucks, in particular, could affect air quality on a local scale.
		Noise and Vibrations	N	The project will not have a significant impact on noise levels, as the mining site will be located far from sensitive receptors. The noise and vibration report in Appendix 6-2 of the EIA presents the results of modeling the projected conditions. It should be noted, however, that the noise environment will be taken into account in the analysis of the Terrestrial Fauna EIA as a nuisance that could affect terrestrial fauna.
		Lighting Conditions	N	The project will not have a significant impact on the light environment, since the mining site will be located far from sensitive receptors. The sectoral report in Appendix 6-3 of the full environmental impact assessment report presents the results of the modeling of projected conditions. It should be noted, however, that the light environment will be taken into account as part of the analysis of the Terrestrial Fauna VEC as a nuisance that may affect terrestrial fauna.
		Landscape	N	The project will not have a significant impact on the landscape, since the mining site will be located far from sensitive receptors. The sectoral report in Appendix 6-28 of the EIA presents the landscape study. It should be noted, however, that the landscape will be considered as part of the analysis of the VEC Well-being in the Territory as an element that may affect the general perception of well-being.
Preservation of the health, safety, and socioeconomic conditions of the regional population (Health, social, and economic conditions of Indigenous peoples)	O (Issue No. 5)	Physical, mental, and social health	O	A potential impact on the social climate in the community can be anticipated in light of the tensions caused by the construction of the LG-4 hydroelectric plant, which could be reignited by this new development project. The arrival of a large number of workers raises concerns about the negative impact this could have on certain social issues (e.g., drugs, prostitution, violence). Furthermore, the influx of workers could, to some extent, increase pressure on certain public services. These impacts will, however, be limited by the camp's relative isolation from local communities in the region. On the other hand, since workers would be housed in a camp set up on the mining site, the project will not result in increased pressure on the housing market. The health of project workers also raises concerns (exposure to contaminants and dust, drug and alcohol use, lifestyle habits, and the impact of commuting on families), and more specifically for the Cree (cultural security, racism, impact on families, and lifestyle habits).
		Economic benefits (job creation, economic partnerships)	O	The project will bring employment and business opportunities to communities in the region.
		Road safety	O	The increase in heavy traffic on the road network surrounding the project (Billy-Diamond Road, Trans-Taiga Road, and the road providing access to the mining site) during the construction phase (transportation of materials) and the project's operational phase (transportation of ore by truck) will be accompanied by increased risks to road safety.
Preservation of traditional activities and uses of Indigenous peoples and the activities and uses of non-Indigenous peoples (Current use of lands and resources for traditional purposes)	O (Issue No. 6)	Hunting and trapping of terrestrial wildlife and waterfowl	O	The project offers the potential to improve access to hunting and trapping territory. This could be accompanied by increased pressure on wildlife resources. Furthermore, changes in the acoustic and lighting conditions on the project's periphery could drive game animals away from their traditional habitats. Finally, some concerns raised by land users regarding the project relate to the risk of contaminant accumulation in the meat of the animals they consume.
		Harvesting of Valued Plant Species	O	Some concerns raised by land users regarding the project relate to the risks of contaminant accumulation in the plants they consume (e.g., blueberries, Labrador tea).
		Fishing	O	The body of water downstream of the effluent is used for fishing. Some concerns raised by land users regarding the project relate to the risks of contaminant accumulation in fish flesh.

Issues		Valued environmental components		Justification/Comment
Issue Name	**Selected for impact assessment (Y/N)**	**Component Name**	**Included in the impact assessment (Y/N)**	
		Well-being in the area	O	General concerns have been raised regarding the deterioration of environmental quality and cumulative impacts on the territory, which are likely to influence the continuation of the Cree way of life. Indeed, time spent on the territory is associated with various aspects of Cree culture and well-being, such as the transmission of Cree values and language, mental health and healing, memory, etc.
		Navigation	N	The watercourses and bodies of water at the project study area are not navigable waterways of interest to local communities, which do not engage in fishing activities on those directly impacted by the project (L01, L05, CE8, L07, CE11, L10, and CE15). Lake L27 is occasionally fished, but its navigability will not be affected.
		Archaeological Remains, Natural and Cultural Heritage	N	The project involves earthworks that could potentially damage archaeological remains unknown to date. An archaeological potential study and an archaeological potential validation study were therefore conducted to minimize this risk (Appendices 6-26 and 6-27 of the full environmental impact assessment report). These studies revealed the existence of several sites with archaeological potential within the project area, and four of the surveyed areas yielded remains of archaeological interest. However, none of the four areas will be affected by the facilities and work planned for the project. It should be noted, however, that a procedure for handling chance discoveries will be established before work begins.
Addressing Climate Change	O (Issue No. 7)	Adaptation of infrastructure to climate change	N	A study on climate change resilience is planned as part of the project. Throughout the project's entire lifespan, PMET aims to ensure the resilience of all its components and the surrounding environment. In this context, this component will be addressed in a separate section of the EIA (Chapter 11). Climate change adaptation measures will be proposed based on the identified climate hazards and the risks they pose. Climate change adaptation is therefore considered a project issue at the design stage but is not addressed within the scope of the impact assessment.
		Climate Change Mitigation (GHG Emissions) (Energy Transition)	O	Construction, operation, and closure activities will involve the movement of machinery and the use of equipment powered by fossil fuels. These will generate GHG emissions.

8 Impact Assessment

This chapter combines the methodology applied for assessing the impacts of the Shaakichiuwaanaan mining project (Section 8.1) and the impact assessment itself (Section 8.2). Impacts are assessed for each of the selected VECs, which are grouped under the overarching issue as defined in the previous chapter. The order of presentation does not constitute a prioritization of the issues and simply follows the arbitrary numbering that was chosen.

8.1 Method for Identifying and Assessing Impacts

This project is based on an environmental assessment approach focused on key project-related issues. This approach requires the identification, through a consultation process conducted by both government agencies and the project proponent, of the main concerns related to the project as raised by the relevant stakeholders. The issue-based approach consists of four main steps:

- identifying issues among local land users and project stakeholders (Chapter 7);
- identifying, among the VECs described in Chapter 6, those arising from each of these issues (Chapter 7);
- assessing the potential interaction between the selected VECs and the various project activities (Section 8.1.1, Table 8-1);
- assessing the magnitude of the residual impact on the selected VECs (Section 8.2).

8.1.1 Identification of Potential Impacts

At this stage, the possibility of interaction between the project activities (defined in Chapter 5) and the selected VECs for each of the project issues (defined in Chapter 7) is assessed using an interaction matrix. Each potential interaction identified and corresponding to a potential impact is presented in the interaction matrix. Note that there may be interactions of various kinds for a single VEC/activity pair. For example, a given activity could have both positive and negative potential impacts on the same component.

Finally, it should be emphasized that the description of the potential impact will be incorporated into the assessment of residual impacts as a description of the baseline impact occurring between a selected VEC and the various project activities that may affect it.

8.1.2 Assessment of Residual Impacts

The impact assessment involves determining the magnitude of the anticipated residual impacts on the selected VECs that will be caused by the various project-related activities. This assessment is conducted for each phase of the project: construction, operation, and decommissioning. A distinction is made between positive and negative impacts. This assessment takes into account measures integrated from the project's design phase, as well as applicable mitigation and enhancement measures, and focuses on impacts that persist after these measures are implemented.

The assessment of the residual impact on a given VEC depends on three criteria: its intensity (determined based on the value of the component and the anticipated degree of disturbance), its extent, and its duration. The probability of occurrence is also assessed, but separately, as an additional qualifier of the impact. These elements are defined in Appendix 8-1, while standard and specific mitigation measures are presented in Appendix 8-2. Residual impacts classified as "high" in significance will be considered to require compensation measures, which are presented in Chapter 14.

8.2 Assessment and Mitigation of Project Impacts

8.2.1 Issue No. 1 – Preservation of Aquatic Habitat Quality

8.2.1.1 Hydrology (hydrodynamic and hydrosedimentary conditions)

Hydrology concerns the hydrodynamic and hydrosedimentary conditions associated with the movement of water (discharge, volume, etc.) and sediments (sediment transport, bank erosion), which may be disrupted by construction, operation, and restoration activities. A **moderate** ecosystem value has been assigned to this VEC to reflect this importance.

Construction Phase

Two main impacts may affect hydrodynamic and hydrosedimentary conditions during the construction phase: the construction of the diversion channel and its connection upstream of the existing outflow from Lake L01, as well as the installation of culverts at access and traffic routes on the mine site.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on hydrodynamic and hydrosedimentary conditions			
Intensity:	Low	**Significance:**	Minor
Extent:	Local		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		Low	

Operational phase

The impact associated with the operational phase is primarily related to the diversion of surface or groundwater that normally feeds certain watersheds to the one receiving mine effluent. These diversions include the pumping of dewatering water, water collected from waste rock stockpiles and other storage areas, as well as water collected from the production site.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on hydrodynamic and hydrosedimentary conditions			
Intensity:	Low	**Significance:**	Minor
Extent:	Local		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		Low	

Closure phase

The impact during the closure phase is primarily positive, as the diversion channel will remain in place, Lake L01 will be refilled gradually, and the effluent flow rate is expected to decrease. During restoration work, very minor impacts related to potential encroachment into watercourses and water bodies are anticipated.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on hydrodynamic and hydrosedimentary conditions			
Intensity:	Low	**Significance:**	Minor (-) and Moderate (+)
Extent:	Local		
Duration:	Short (-), long (+)		
Probability of occurrence:		Low (-) and high (+)	
Reversibility:		High (-)	

8.2.1.2 Surface water quality

Surface water quality refers to all surface waters (runoff, streams, lakes) that may be affected by construction, operation, and closure activities. A **high** value will be used for the impact analysis of this VEC.

Construction phase

Two main impacts can affect surface water quality: the introduction of particles through the creation of erosion zones and dust generation, and the risk of contamination from accidental spills of petroleum products and other contaminants.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on surface water quality			
Intensity:	Moderate	**Significance:**	Minor
Scope:	Project		
Duration:	Short		
Probability of occurrence:		Moderate (MES)/Low (contamination)	
Reversibility:		High	

Operational phase

During the operational phase, two main sources of impact are anticipated: the introduction of particles into watercourses, primarily through dust emissions, and the discharge of mine effluent into watercourse CE11, which could alter its water quality.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on surface water quality			
Intensity:	Moderate	**Significance:**	Moderate[1]
Extent:	Local		
Duration:	Moderate		
Probability of occurrence:		High (effluent) / low (spill)	
Reversibility:		Moderate	

Note: 1 It should be noted that the expected residual impact on water quality is minor, since the design of the industrial wastewater treatment plant must ensure compliance with the standards of Directive 019. The result of moderate significance is primarily due to the fact that an average duration must be assigned to this impact based on established definitions, although this duration does not affect effluent quality in any way.

Closure Phase

During the closure phase, a gradual improvement in water quality is expected following the dismantling of facilities generating wastewater. A low risk of impact is associated with dust generation and the presence and handling of hazardous materials during restoration work. Note that the water treatment plant will remain in operation until the water quality objectives set with the MELCCFP are met.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on surface water quality			
Intensity:	High	**Significance:**	Minor (-)/Major (+)
Extent:	Project-wide (-)/Local (+)		
Duration:	Short (-)/Long (+)		
Probability of occurrence:		Moderate (-)/High (+)	
Reversibility:		High (-)	

8.2.1.3 Aquatic fauna (fish) and habitats

Aquatic fauna and habitats refer to all aquatic species (fish, benthos) and habitats (water bodies, watercourses) that may be disturbed by construction, operation, and closure activities. A **moderate** value will be used for the impact analysis of this VEC.

Construction phase

Two main impacts are associated with the construction phase: the loss of aquatic habitat area (57 ha), particularly due to the draining of the pit, and the degradation of habitat quality caused by the introduction of construction-generated particles into the water of ponds and watercourses.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on aquatic fauna and habitats			
Intensity:	High	**Significance:**	Medium
Scope:	Project		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		Moderate	

Operational phase

The operational phase generates two main impacts: the continued loss of habitat associated with the pit and the potential degradation of habitat quality due to dust settling in yards and water bodies (TSS) and the accidental introduction of contaminants (spills and leaks).

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on Aquatic Fauna and Habitats			
Intensity:	Moderate	**Significance:**	Moderate
Extent:	Local		
Duration:	Long		
Probability of occurrence:		Moderate	
Reversibility:		Moderate	

Closure phase

Upon mine closure, the gradual refilling of the pit, the maintenance of hydraulic structures to ensure the site's hydraulic stability, and revegetation efforts along riparian zones will gradually improve the quality of aquatic habitats.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on aquatic fauna and habitats			
Intensity:	Low	**Significance:**	Minor
Extent:	Project		
Duration:	Short		
Probability of occurrence:		Moderate	
Reversibility:		High	

8.2.2 Issue No. 2 – Preservation of soil and groundwater quality

8.2.2.1 Soil quality

Soil quality pertains to all surface soils that may be disturbed by construction, operation, and closure activities. Note that within the scope of the project, a **low** ecosystem value was assigned to this VEC.

Construction phase

During the construction phase, the main risks involve soil layer disturbance, the creation of erosion zones, soil compaction, and potential soil contamination.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on soil quality			
Intensity:	Low	**Significance:**	Minor
Scope:	Project-based		
Duration:	Short		
Probability of occurrence:		Moderate to high	
Reversibility:		High	

Operational phase

During the operational phase, the main risks involve contamination (accidental spills and leaks of contaminants), soil erosion, and erosion of waste rock stockpiles caused by wind and vehicle traffic.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on soil quality			
Intensity:	Low	**Significance:**	Minor
Scope:	Project		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		High	

Closure phase

Detailed description of the impact

As part of the site closure, most activities will have a positive impact on the site, with the release of a large portion of the occupied areas and their revegetation. However, traffic and transportation related to these works may result in the compaction of additional soil surfaces as well as accidental leaks or spills.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on soil quality			
Intensity:	Low (-) and high (+)	**Significance:**	Minor (-) and major (+)
Scope:	Project		
Duration:	Short (-) and long (+)		
Probability of occurrence:		Low (-) and high (+)	
Reversibility:		High (-)	

8.2.2.2 Groundwater quality

Groundwater quality refers to all water present in the various soil layers that may be affected by construction, operation, and closure activities. The value to be applied for this project is **moderate**.

Construction phase

During the construction phase, two main impacts are anticipated: risks associated with accidental spills of contaminants and the use of de-icing agents that could reach and contaminate groundwater.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on groundwater quality			
Intensity:	Moderate	**Significance:**	Minor
Extent:	Isolated		
Duration:	Short		
Probability of occurrence:		Low	
Reversibility:		Moderate	

Operational phase

During operation, impacts are associated with the risk of contaminated leachate seeping from certain waste rock stockpiles, the exposure of seepage water in the pit to dust generated by the operation of the pit, and the risks of accidental spills and leaks of contaminants.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on groundwater quality			
Severity:	Low	**Significance:**	Minor
Extent:	Isolated to local		
Duration:	Short to long		
Probability of occurrence:		Low	
Reversibility:		Moderate	

Closure phase

During the restoration phase, the negative impacts associated with the risk of groundwater contamination from accidental spills of petroleum hydrocarbons and hazardous materials, as well as the application of de-icing agents in winter, are addressed in the same manner as during the construction phase. Furthermore, the impacts are similar to those of the operational phase with regard to the infiltration of contact water from accumulation areas, given that the infrastructure (waste rock stockpiles) will remain in place despite the site's restoration.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on groundwater quality			
Severity:	Low (-) High (+)	**Significance:**	Minor (-) Major (+)
Scope:	Local (-) (+)		
Duration:	Moderate to Long (-) Long (+)		
Probability of occurrence:		Low (-) High (+)	
Reversibility:		Moderate (-)	

8.2.3 Issue No. 3 – Preservation of wetlands and habitats of interest to terrestrial flora and fauna

8.2.3.1 Wetlands and aquatic environments

Wetlands and aquatic environments encompass all types of wetlands (marshes, swamps, peatlands), shorelines (bodies of water and watercourses), and riverbanks that may be disturbed by construction, operation, and closure activities. The value applied for this project is **moderate**.

Construction phase

The impact generated by construction primarily concerns the loss of wetland and aquatic area (120.2 ha) due to various deforestation and land preparation activities for the construction of mine infrastructure.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the quality of wetlands and aquatic environments			
Intensity:	High	**Significance:**	Moderate
Scope:	Project		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		Moderate	

Operational phase

During the operational phase, the impact on wetlands is primarily associated with the generation of dust that may settle on these wetlands as a result of various traffic and handling activities at the mine site.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the quality of wetlands and aquatic environments			
Intensity:	Low	**Significance:**	Minor
Extent:	Local		
Duration:	Moderate		
Probability of occurrence:		Low	
Reversibility:		Moderate	

Closure phase

During the closure phase, the impact is primarily positive due to the release of most of the land occupied by mining facilities and their rehabilitation (land and slope restoration, revegetation). However, restoration work may cause impacts related to dust generation and the initiation of localized erosion.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the quality of wetlands and aquatic environments			
Intensity:	Low (-) and High (+)	**Significance:**	Minor (-) and Major (+)
Extent:	Project		
Duration:	Short (-) and Long (+)		
Probability of occurrence:		High (-) (+)	
Reversibility:		Moderate (-)	

8.2.3.2 Wildlife species with special status

Wildlife species with special status include all wildlife species that have been granted provincial protection status (potentially designated, vulnerable, or endangered) or federal protection status (least concern, threatened, endangered, or extinct) and that may be disturbed by construction, operations, and closure activities. The significance of this issue within the context of the project is **high**.

Construction Phase

During the construction phase, the main risks include habitat loss and fragmentation, disturbance from noise and other nuisances, collision risk, and potential degradation of habitat quality due to contamination. These impacts affect large wildlife and other mammals, bats, and birds.

Large wildlife and other mammals

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the activities of large wildlife species and other mammals with special status			
Intensity:	High	**Significance:**	Moderate
Extent:	Project		
Duration:	Moderate		
Probability of occurrence:		High (habitat loss, disturbance) Moderate (collision risk)	
Reversibility:		Moderate (Habitat loss) High (disturbance and collision risk)	

Bats

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the activities of bat species with special status			
Intensity:	High	**Significance:**	Moderate
Extent:	Project		
Duration:	Moderate (habitat loss) Short (disturbance/collision and accidental spill)		
Probability of occurrence:		High (habitat loss/disturbance) Moderate (collision) Low (accidental spill)	
Reversibility:		High (disturbance/collision) Moderate (habitat loss, accidental spill)	

Birdlife

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the activities of bird species with special status			
Intensity:	High (habitat loss) Moderate (disturbance/collision and accidental spill)	**Significance:**	Moderate (habitat loss, disturbance/collision) Minor (collision, accidental spill)
Extent:	Local (disturbance) Project (habitat loss, collision, accidental spill)		
Duration:	Moderate (habitat loss) Short (disturbance/collision, accidental spill)		
Probability of occurrence:		High (habitat loss, disturbance) Moderate (risk of collision) Low (accidental spill)	
Reversibility:		High (disturbance/mortality) Moderate (habitat loss, accidental spill)	

Operational phase

During the operational phase, the main risks involve disruption of predator-prey dynamics (for large wildlife and other mammals) associated with mining activities and the presence of equipment (primarily for woodland caribou), as well as disturbance from nuisances, collision risk, and potential degradation of habitat quality due to contamination.

Large wildlife and other mammal species

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on the activities of large wildlife species and other mammals with special status			
Intensity:	High	**Significance:**	Moderate
Extent:	Project		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		High	

Bats

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the activities of bat species with special status			
Intensity:	Moderate	**Significance:**	Moderate (disturbance/collision) Minor (accidental spill)
Extent:	Project		
Duration:	Moderate (malfunction/collision) Short (accidental spill)		
Probability of occurrence:		High (malfunction) Low (collision, accidental spill)	
Reversibility:		High (malfunction/collision) Moderate (accidental spill)	

Birdlife

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the activities of bird species with special status			
Intensity:	Moderate (disturbance/collision and accidental spill)	**Significance:**	Moderate (disturbance/collision) Minor (accidental spill)
Scope:	Project-wide (malfunction, collision, accidental spill)		
Duration:	Moderate (malfunction/collision) Short (accidental spill)		
Probability of occurrence:		High (malfunction) Low (collision, accidental spill)	
Reversibility:		High (malfunction/mortality) Moderate (accidental spill)	

Closure phase

Detailed description of the impact

During the closure phase, the expected impacts on wildlife species of special concern are the same as during the construction and operation phases.

During the closure phase, the expected impacts on woodland caribou are the same as during the construction and operation phases.

Impact on the activities of species in the various wildlife groups with special status			
Intensity:	High (+ habitat creation) Moderate (- disturbance and collision, spill)	**Significance:**	Major (+ habitat creation) Minor (- disturbance and collision, spill)
Scope:	Project-specific (-) (+)		
Duration:	Long-term (+ habitat creation) Short (- disturbance/collision, spill)		
Probability of occurrence:		High (-) (+)	
Reversibility:		High (disruption and collision) Moderate (-spills)	

8.2.3.3 Terrestrial wildlife (large wildlife and other mammal species, avifauna including migratory birds)

Terrestrial fauna includes all large wildlife species (e.g., moose, bear, wolf), other mammal species (e.g., beaver, hare, peccary, etc.), and birds that may be disturbed by construction, operation, and closure activities. The value applied for this project is **moderate**.

Construction Phase

During the construction phase, the main risks involve habitat loss and fragmentation, disturbance from noise and other nuisances, the risk of collision, and potential degradation of habitat quality due to contamination. These impacts affect large wildlife, other mammals, and avifauna.

Large wildlife and other mammal species

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the activities of large wildlife and other mammal species			
Intensity:	Moderate	**Significance:**	Moderate (habitat loss) Minor (disturbance and collision)
Extent:	Project		
Duration:	Moderate (habitat loss) Short (disturbance and collision)		
Probability of occurrence:		High (habitat loss and disturbance) Moderate (collision)	
Reversibility:		Moderate (habitat loss) High (disturbance and collision)	

Birdlife

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on terrestrial wildlife activities (birdlife, including migratory birds)			
Intensity:	Moderate (habitat loss) Low (disturbance/collision and accidental spill)	**Significance:**	Moderate (habitat loss) Minor (disturbance/collision, accidental spill)
Extent:	Local (disturbance/collision) Project-wide (habitat loss, accidental spill)		
Duration:	Moderate (habitat loss, disturbance/collision) Short (accidental spill)		
Probability of occurrence:		High (habitat loss, disturbance/collision) Low (accidental spill)	
Reversibility:		High (disturbance/collision) Moderate (habitat loss, accidental spill)	

Operational phase

During the operational phase , the main risks involve disruption of predator-prey dynamics (for large wildlife and other mammals) linked to mining activities and the presence of equipment (primarily for migratory caribou), disturbance from nuisances, collision risk, and potential degradation of habitat quality due to contamination.

Large wildlife and other mammal species

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on terrestrial wildlife activities (large wildlife and other mammal species)			
Intensity:	High	**Significance:**	Moderate
Extent:	Project		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		High	

Birdlife

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are as follows:

Impact on terrestrial wildlife (including migratory birds)			
Intensity:	Low (disturbance/collision and accidental spill)	**Significance:**	Minor (disturbance/collision, accidental spill)
Extent:	Local (malfunction/collision) Project (accidental spill)		
Duration:	Moderate (malfunction/collision) Short (accidental spill)		
Probability of occurrence:		High (malfunction/collision) Low (accidental spill)	
Reversibility:		Low (habitat loss) High (disturbance/collision) Moderate (accidental spill)	

Closure phase

During the closure phase, the expected impacts on all mammal and bird species are the same as during the construction and operation phases. At the end of operations, habitats will be restored or recreated and may eventually resume their functions for some mammal and bird species.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on terrestrial wildlife activities			
Intensity:	Moderate (+ habitat creation) Low (- disturbance/collision and - accidental spill)	**Significance:**	Moderate (+ habitat creation) Minor (- disturbance/collision, - accidental spill)
Extent:	Local (+ habitat creation - disturbance/collision) Project (- accidental spill)		
Duration:	Long (+ habitat creation) Short (- accidental spill, disturbance/collision)		
Probability of occurrence:		High (+ habitat creation - disturbance) Low (- accidental spill, collision)	
Reversibility:		High (- disturbance/collision) Moderate (- accidental spill)	

8.2.3.4 Forest cover

Forest cover refers to all terrestrial plant communities that may be disturbed by construction, logging, and closure activities. Note that within the scope of the project, forest cover is assigned an average ecosystem value, as it is of significant interest, but there is not necessarily a consensus regarding its conservation and protection. The value to be applied within the scope of the project is **average**.

Construction phase

The main impact associated with forest cover relates to the permanent loss of vegetation to clear the areas required for the development of mining facilities (roadways, industrial zone, open pit, waste rock stockpiles, and other storage areas, as well as locations for power line towers and substations), totaling 519 ha or 2.5% of the biophysical LSA.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on Forest Cover			
Intensity:	Low	**Significance:**	Minor
Scope:	Project		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		High	

Operational phase

During the operational phase, the main impacts on forest cover and its components relate to potential needs for additional land, damage to vegetation bordering the facility areas caused by off-road vehicle and machinery traffic, and the generation of dust from operations, which, when deposited on vegetation and other surfaces, can limit their growth (reduced photosynthetic capacity).

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on forest cover			
Intensity:	Low	**Significance:**	Minor
Extent:	Local		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		High	

Closure phase

The main impact during the closure phase is positive, as it involves the release and restoration of a large portion of the areas associated with the project. However, transportation and traffic may cause certain temporary impacts through encroachment outside work zones, and the presence of mining site remnants may limit the ability to fully revegetate previously occupied areas.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on Forest Cover			
Intensity:	Low (-) and high (+)	**Significance:**	**Minor (-) and Major (+)**
Scope:	**Project**		
Duration:	**Short (-) and long (+)**		
Probability of occurrence:		High (-) (+)	
Reversibility:		High (-)	

8.2.4 Issue No. 4 – Preserving the quality of life of the local population

8.2.4.1 Air quality

Air quality refers to compliance with existing levels of air pollutant and dust concentrations, which may be disrupted by construction, operation, and decommissioning activities. The value to be applied for this project is **moderate**.

Construction phase

Construction work will be a source of air pollution through emissions associated with vehicle and machinery exhaust, as well as fugitive emissions (dust/particles) generated by traffic on unpaved roads, blasting operations, and the handling of granular materials.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on air quality			
Intensity:	Low	**Significance:**	**Minor**
Scope:	**Local**		
Duration:	**Short**		
Probability of occurrence:		High (exhaust emissions, blasting) Moderate (dust emissions)	
Reversibility:		High	

Operational phase

Operations at the mining site will involve several sources of air emissions, including vehicle exhaust, loading, handling, and unloading of granular materials, traffic on unpaved roads, blasting and drilling activities, the operation of dust collectors and generators, and the exhaust outlets of the underground mine's ventilation equipment.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on air quality			
Intensity:	Low	**Significance:**	Minor
Scope:	Local		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		High	

Closure phase

The impact associated with this VEC during the closure phase is primarily positive, as the main activities generating air emissions and dust cease, the reclaimed areas and waste rock stockpiles will be revegetated, and the pit will gradually fill with water, reducing exposed bare surfaces. Nevertheless, the restoration work associated with this phase will require activities that will generate air emissions and dust, albeit to a lesser extent than during the construction phase.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on air quality			
Intensity:	Low (-) High (+)	**Significance:**	Minor (-) Major (+)
Extent:	Local (-)		
Duration:	Short (-) Long (+)		
Probability of occurrence:		High (-) (+)	
Reversibility:		High (-)	

8.2.5 Issue No. 5 Health, social, and economic conditions of Indigenous peoples

8.2.5.1 Physical, psychological, and social health

Physical, psychological, and social health encompasses all aspects that define the overall well-being of a community (in this case, Indigenous and non-Indigenous communities) that may be disrupted by construction, operation, and closure activities. The value to be applied within the scope of the project is **high**.

Construction and Operation Phases

The project is likely to have multidimensional impacts on human health, due to the mobilization of a large workforce—mostly commuters—and changes in land use, which is a central determinant of health and well-being for the Cree.

Finally, certain elements may have specific positive effects on health and well-being, such as access to certain camp services for land users or the opportunity for some Cree workers to spend more time on the land thanks to employment. However, these effects vary depending on individuals and land uses.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on the physical, psychological, and social health of regional populations			
Intensity:	Low	**Magnitude:**	Moderate
Scope:	Regional		
Duration:	Moderate		
Probability of occurrence:		Moderate	
Reversibility:		Moderate	

Closure phase

The closure of the project is likely to result in temporary socioeconomic and psychosocial impacts, primarily related to job losses and the reorganization of family and community dynamics. However, it is associated with positive effects on the local area and collective well-being, notably through the reduction of nuisances, site restoration, and the gradual reappropriation of the land. The impacts associated with the closure work remain temporary and limited, and the long-term effects are primarily determined by the socioeconomic transition capacity of the individuals and communities affected.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on the physical, psychological, and social health of regional populations			
Intensity:	Low (-) Moderate (+)	**Magnitude:**	Moderate (-) Major (+)
Scope:	Regional (-) (+)		
Duration:	Short (-) Long (+)		
Probability of occurrence:		High (-) (+)	
Reversibility:		Moderate (-)	

8.2.5.2 Economic benefits (job creation, economic partnerships)

The Economic Impact VEC encompasses all actions aimed at ensuring the vitality of local and regional development (job creation, procurement of goods and services, vocational training, etc.) that could be disrupted by construction, operation, and closure activities. The value to be applied within the scope of the project is **high**.

Construction phase

During the construction phase, the anticipated impact is largely positive, as the construction of the open-pit mine is expected to support approximately 7,500 person-years of employment in Quebec, including nearly 3,400 direct jobs. This corresponds to an average of approximately 2,200 jobs per year over the duration of the construction phase, including approximately 180 jobs per year at the regional level. For the underground mine, the construction phase is expected to support approximately 3,600 person-years of employment in Quebec, including about 1,400 direct jobs, representing an annual average of approximately 1,000 jobs, including nearly 75 regional jobs per year.

Following the application of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on Economic Benefits			
Intensity:	Strong	**Magnitude:**	Significant positive
Scope:	Regional		
Duration:	Short		
Probability of occurrence:		High	
Reversibility:		N/A	

Operational phase

During the operational phase, the anticipated impact is largely positive, as over the entire operational period—which includes the operation and maintenance of assets—the project is expected to support approximately 66,200 person-years of employment in Quebec, including about 43,600 direct jobs, corresponding to an average of approximately 3,500 jobs per year. At the regional level, the economic impact is estimated at an average of approximately 490 jobs per year over the duration of operations.

It should be noted that toward the end of operations, gradual layoffs will occur until the facility is fully closed. These layoffs could have a negative impact on the local and regional economy.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on Economic Benefits			
Intensity:	Low (-) and High (+)	**Significance:**	Moderate (-) and Major (+)
Scope:	Regional		
Duration:	Moderate		
Probability of occurrence:		High (-) (+)	
Reversibility:		Moderate (-)	

Closure phase

During the closure phase, the anticipated impact is both positive and negative. It is positive because some jobs will be maintained for the duration of the restoration work as well as for the various follow-up activities to be carried out after the facilities close. It takes on a negative aspect with regard to the loss of the majority of the jobs that were created during the operational phase.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on Economic Benefits			
Intensity:	Moderate	**Magnitude:**	Moderate
Scope:	Regional		
Duration:	Short (+) Moderate (-)		
Probability of occurrence:		High	
Reversibility:		Moderate (-)	

8.2.5.3 Road Safety

Road safety concerns issues related to traffic on the Trans-Taiga Road and the Billy-Diamond Road that may be disrupted by increased vehicle traffic volumes during various phases of the project. The value to be applied for this project is **moderate**.

Construction phase

Road safety may be impacted in three main ways: an increase in the number of vehicles, increased deterioration of road quality, and an increased risk of accidents.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on road safety			
Intensity:	Low	**Significance:**	Minor
Scope:	Regional		
Duration:	Short		
Probability of occurrence:		Low	
Reversibility:		High	

Operational phase

During the operational phase, the traffic study shows that the projected vehicle generation will result in an average increase of 70 to 71 vehicles per day, the majority of which are heavy vehicles transporting concentrate to Matagami (59 trucks/day) or supplies to the mine site (approximately 10 trucks/day). This number of additional vehicles will only moderately affect existing traffic volumes. Therefore, no significant impact on road deterioration or accident risks is anticipated.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on road safety			
Severity:	Low	**Significance:**	Moderate
Scope:	Regional		
Duration:	Moderate		
Probability of occurrence:		Low	
Reversibility:		High	

Closure phase

During the closure phase, the number of vehicles in circulation will have decreased significantly with the cessation of spodumene concentrate production, which will have a positive effect on the VEC. It should be noted, however, that a certain number of vehicles will remain in operation—albeit primarily on the mine site—during restoration work. This number is expected to be lower than during the construction phase, and therefore no significant impact on road deterioration or accident risks is anticipated.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on Road Safety			
Intensity:	Low (-) and moderate (+)	**Significance:**	Minor (-) and major (+)
Scope:	Regional		
Duration:	Short (-) and long (+)		
Probability of occurrence:		Low (-) and high (+)	
Reversibility:		High	

8.2.6 Issue No. 6 – Preservation of traditional activities and uses by Indigenous peoples and activities and uses by non-Indigenous peoples *(Current use of lands and resources for traditional purposes)*

8.2.6.1 Hunting and trapping of terrestrial wildlife and waterfowl

Hunting and trapping of terrestrial wildlife and waterfowl encompasses all such activities carried out by Indigenous and non-Indigenous peoples that may be disrupted by construction, operation, and closure work. The value to be applied within the scope of the project is **moderate**.

Construction Phase

Any activity that has a negative impact on wildlife is likely to indirectly affect hunting and trapping practices through the noise and vibrations generated, the loss and fragmentation of wildlife habitats, and the risk of collisions.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on hunting and trapping activities			
Intensity:	Low	**Significance:**	Minor
Extent:	Regional		
Duration:	Short		
Probability of occurrence:		High	
Reversibility:		High	

Operational phase

Mine operations will disrupt hunting and trapping activities for terrestrial wildlife and waterfowl due to the proximity of proposed infrastructure that may cause disturbances (noise, light, dust) and restrict access to the area.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on hunting and trapping activities			
Intensity:	Low	**Significance:**	Moderate
Scope:	Local		
Duration:	Long		
Probability of occurrence:		High	
Reversibility:		High	

Closure phase

Activities associated with mine closure will generate effects similar to those observed during the construction and operation phases, but of lesser intensity and over a shorter duration. Furthermore, the planned work will lead to the restoration of habitats for local wildlife, allowing for the gradual reappropriation of the territory for traditional activities, including hunting and trapping.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on hunting and trapping activities			
Intensity:	Low (-) Moderate (+)	**Significance:**	Minor (-) Major (+)
Scope:	Project area (- and +)		
Duration:	Short (-) Long (+)		
Probability of occurrence:		High (-) High (+)	
Reversibility:		High (-)	

8.2.6.2 Fishing

Fishing affects all Indigenous and non-Indigenous communities that engage in it and may be disrupted by construction, operation, and closure activities. The value applied for this project is **moderate**.

Construction phase

Any activity that has a negative impact on fish populations is likely to indirectly affect fishing, particularly through the loss and alteration of aquatic habitats and the degradation of habitat quality (contamination by dust and other pollutants).

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on fishing activities			
Intensity:	Low	**Significance:**	Minor
Scope:	Project		
Duration:	Short		
Probability of occurrence:		Low	
Reversibility:		High	

Operational phase

The operational phase is characterized by the continuation of the impact initiated during the construction phase, namely the loss of aquatic habitats, as well as potential effects on water quality due to industrial effluent, leaks, and accidental spills.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on fishing activities			
Intensity:	Low	**Significance:**	Minor
Extent:	Local		
Duration:	Moderate		
Probability of occurrence:		Low	
Reversibility:		High	

Closure phase

Upon mine closure, the pit will fill naturally and gradually. Existing hydraulic structures, such as diversion channels and dikes, will be maintained to ensure the site's hydraulic stability during and after this filling. PMET will also carry out revegetation of riparian strips and disturbed areas, thereby promoting a gradual improvement in the quality of aquatic and riparian habitats.

Once again, the use of mobile equipment could result in accidental oil leaks or spills, and the generation and management of waste and hazardous materials remain a potential source of contamination.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on fishing activities			
Intensity:	Low (-) Moderate (+)	**Significance:**	Minor (-) Moderate (+)
Scope:	Project-based (- and +)		
Duration:	Short (-) Long (+)		
Probability of occurrence:		Moderate (-) Moderate (+)	
Reversibility:		High (-)	

8.2.6.3 Harvesting of valued plant species

The harvesting of valued plant species primarily concerns Indigenous communities and includes both the gathering of fruits and other edible plants as well as plants with medicinal properties. This activity may be disrupted by construction, operation, and closure activities. The value applied for this project is **moderate**.

Construction phase

Construction work will result in an estimated permanent loss of vegetation covering 519 ha, reducing the available harvesting areas. It will also generate dust and potentially cause accidental spills and leaks of contaminants that affect plant quality, as well as nuisances that may inconvenience potential harvesters.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the harvesting of valued plant species			
Intensity:	Low	**Significance:**	Minor
Extent:	Project		
Duration:	Short		
Probability of occurrence:		Low	
Reversibility:		High	

Operational phase

During the exploration phase, the impact on the harvesting of valued plant species is characterized by the continuation of impacts from the construction phase, including lack of access to areas occupied by infrastructure, dust generation, the risk of accidental spills and leaks of contaminants, and noise pollution that may disturb potential harvesters.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on the harvesting of valued plant species			
Intensity:	Low	**Significance:**	Minor
Scope:	Project		
Duration:	Moderate		
Probability of occurrence:		Low	
Reversibility:		High	

Closure phase

During the closure phase, the anticipated impacts are mostly positive due to the release of land previously occupied by mining facilities and their reclamation. However, the work planned for the closure phase could generate certain impacts—albeit on a smaller scale—related to dust generation, localized erosion, and the management of waste and hazardous materials.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on the harvesting of valued plant species			
Intensity:	Low (-) Moderate (+)	**Significance:**	Minor (-) Moderate (+)
Scope:	Project-based (- and +)		
Duration:	Short (-) Long (+)		
Probability of occurrence:		Low (-) Moderate (+)	
Reversibility:		High (-)	

8.2.6.4 Well-being on the territory

Well-being in the territory refers to all activities carried out in the territory that are closely linked to Indigenous culture (transmission of values and language, mental health and healing, ancestral memory, etc.). Following an assessment, it was determined that this VEC largely overlaps with that related to physical, psychological, and social health. The project's impacts on well-being on the territory were therefore covered in Section 8.2.5.1 on health.

8.2.7 Issue No. 7 – Addressing Climate Change

8.2.7.1 Climate Change Mitigation (GHG Emissions, Energy Transition)

All construction, operation, and closure activities will involve the movement of machinery and the use of equipment powered by fossil fuels. These will generate greenhouse gas (GHG) emissions that may contribute to climate change. The scientific consensus is that these GHG emissions drive climate change phenomena on a global scale. GHG emissions refer to the quantities in metric tons of GHG emissions, primarily carbon dioxide ($_{CO_2}$), methane ($_{CH_4}$), and nitrous oxides (N_2 O), which are determined using the estimation methodologies of the MELCCFP (2025a) and ISO 14064-1:2006.

The project's GHG estimate considered direct emissions (Scope 1), such as fossil fuel consumption by machinery and equipment on-site during the construction phase, as well as process emissions and emissions associated with natural gas consumption for heating during the operational phase. The estimate also included certain indirect Scope 2 and 3 emissions, such as those attributable to electricity consumption and diesel consumption by trucks transporting the concentrate.

The value to be applied for the project is **an average**.

Construction phase

During the construction phase, the main sources of GHG emissions are associated with the movement of vehicles and machinery in work areas, logging activities, and logistics (supply) transportation.

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on climate change mitigation (GHG emissions, energy transition)			
Intensity:	Low	**Significance:**	Minor
Scope:	Regional/provincial		
Duration:	Short		
Probability of occurrence:		High	
Reversibility:		Low	

Operational phase

During the operational phase, the main sources of GHGs are associated with generators, natural gas-powered equipment (heating, concentrator plant equipment, etc.), the fleet of vehicles and machinery, the use of explosives, electricity consumption, logistics transportation (transportation of concentrate to Matagami and supply), and rail transportation (between Matagami and the La Baie port facility in Saguenay).

Following the implementation of mitigation measures, the results of the analysis of the magnitude of the residual impact are:

Impact on climate change mitigation (GHG emissions, energy transition)			
Intensity:	Low	**Significance:**	Moderate (total emissions during the operational phase)
Scope:	Regional/provincial		
Duration:	Moderate		
Probability of occurrence:		High	
Reversibility:		Low	

Closure phase

During the closure phase, activities likely to generate GHG emissions are primarily associated with the dismantling of infrastructure. The work planned for this phase will have impacts similar to or less than those of the construction phase. GHG emissions have not been calculated, as the necessary details of the dismantling have not been confirmed at this stage of the project.

Following the implementation of mitigation measures, the results of the analysis of the significance of the residual impact are:

Impact on climate change mitigation (GHG emissions, energy transition)			
Intensity:	Low (-) Moderate (+)	**Significance:**	Minor (-) Major (+)
Scope:	Regional/provincial		
Duration:	Short (-) Long (+)		
Probability of occurrence:		High (-) (+)	
Reversibility:		Low (-)	

9 Cumulative Impacts Assessment

This chapter presents the analysis of the project's cumulative impacts. The aim is to assess the possibility that the residual effects of the project on valued environmental components (VECs), even after mitigation, could combine with those of other projects, human activities, and natural disturbances—past, present, or future.

9.1 Methodology

The methodology is based on a standard definition of cumulative impacts: these are the changes experienced by the environment when the effects of a given project overlap with those of other human activities or natural disturbances, in time and space. The process follows five main steps:

- Identification of the selected VECs, i.e., those arising from the main issues and for which a moderate or significant residual impact is anticipated, provided that sufficient data is available on them. VECs associated primarily with a positive impact are not selected.
- Defining the spatial and temporal boundaries of the VECs. Spatial boundaries must encompass the project's effects, include projects that may have a cumulative effect, be representative of the VECs, be ecologically and socially acceptable, and allow for the collection and analysis of measurable data. Temporal boundaries must begin before the project's effects occur and extend until a return to initial conditions or a certain equilibrium is achieved.
- An inventory of relevant projects, actions, and events within the defined boundaries. The link to VECs is described using indicators such as lost habitat area, GHG levels, pressures on traditional activities, etc.
- A description of the baseline condition, which corresponds to the situation that prevailed a certain number of years ago—i.e., the past time frame—and historical trends that examine the influence of past projects on changes in the condition of a given VEC.
- The assessment of cumulative impacts involves first cross-referencing historical trends with the selected projects, then qualifying the effects based on their intensity, duration, and extent to determine a level of significance ranging from low to high. In cases of high significance, mitigation measures or additional compensation projects will be proposed.

A component is identified as a VEC if it constitutes a moderate-to-high-level project concern, if it is valued by communities or legally protected, if it is likely to be significantly affected by the project alone or in combination with other pressures, and if sufficient data exists for both the baseline condition and historical trends. The analysis remains primarily qualitative but draws on indicators and quantitative data when available.

9.2 Analysis Parameters

9.2.1 Overview of Project Issues

Seven major issues structure the analysis and are presented in Chapter 7.

9.2.2 Identification and justification of selected VECs

An evaluation of the various VECs considered for the project impact analysis was conducted to determine which ones would be selected for the cumulative impact analysis. A justification for retaining or excluding a VEC is presented in Table 9-1 of the EIA. Following this exercise, ten VECs were selected for the cumulative impact analysis:

- Surface water quality
- Wildlife (fish) and aquatic habitat
- Wetlands and aquatic environments
- Wildlife species with special status
- Terrestrial wildlife and wildlife habitats (large wildlife, small mammals, birds)
- Physical, psychological, and social health of the regional population (including well-being within the territory)
- Road safety
- Hunting and trapping (terrestrial wildlife and waterfowl)
- Well-being in the region (analyzed in conjunction with health)
- Climate change mitigation (GHG emissions / energy transition)

Certain VECs are excluded from the cumulative analysis due to a residual impact deemed minor (e.g., soil quality, groundwater, forest cover, fishing, and gathering of plant species), an absence of anticipated significant effects, or because they are addressed specifically in another chapter (adaptation of infrastructure to climate change).

9.2.3 Spatial and temporal boundaries

Generally, biophysical VECs (surface water, aquatic habitats, wetlands, wildlife) are assessed within a 50-km radius of the site. Human VECs (health, well-being, hunting/trapping, road safety, GHGs) are assessed in areas corresponding to those of the communities of Chisasibi, Mistissini, and Wemindji, as well as along the relevant road corridors (Trans-Taiga, Billy-Diamond). The analysis periods primarily cover 1970–2035, except for GHGs (2008–2035).

9.2.4 Projects, Actions and Events considered in the Analysis

The list of projects, actions, and events likely to influence the VECs is grouped into six major themes: natural resource extraction (Corvette/Shaakichiuwaanaan, Adina, Éléonore, Renard, borrow pits, La Grande hydroelectric complexes 1 through 4, Radisson), infrastructure and services (roads, power lines and substations, airports, Grande Alliance projects, landfills, telecommunications towers), land use (Cree villages, camps, vacation leases), wildlife areas and protected areas (Nibiischii National Park, proposed biodiversity reserves and land set aside for protected areas), natural disturbances (forest fires, SMB), and governance/land use planning (residential schools, JBNQA, Paix des Braves, Plan Nord, Grande Alliance, recovery laws and plans).

9.3 Cumulative Impact Analysis

9.3.1 Surface Water Quality

The cumulative impact assessment for surface water is addressed in conjunction with the Aquatic fauna and habitat VEC, as both VECs address the same cumulative aspects and impacts.

9.3.2 Wildlife (fish) and aquatic habitat

The study area overlaps the La Grande A and Pontois River watersheds, in a context where the northern half has been profoundly altered by large hydroelectric reservoirs. Sampling campaigns reveal low-productivity waters, a slightly acidic pH, good oxygenation, but also exceedances of criteria for certain metals (aluminum, iron, mercury, and occasionally fluorides and zinc), attributable in part to local geology. No fish with special conservation status have been recorded, but a diversity of species is present, and numerous bodies of water and watercourses serve as functional fish habitats.

Historically, the La Grande reservoirs have already caused major changes to aquatic habitats and an episode of mercury contamination, which has now returned to levels close to natural conditions, although monitoring is still ongoing. The mining project adds treated effluent to watercourse CE11, with expected local effects on certain parameters, but without exceeding the criteria for protecting aquatic life downstream, given the treatment measures.

Potential cumulative impacts primarily concern the introduction of contaminants and, to a lesser extent, changes in certain flow rates and water levels. Among other projects, only mining exploration and forest fires can cause comparable disturbances (SOM, pH changes, etc.) in the same watersheds. However, the probability of sufficient spatial overlap to generate a significant impact is considered low. The significance of the cumulative effect on wildlife (fish) and aquatic habitat is therefore assessed as low, and no additional measures are recommended beyond those outlined in Chapter 8.

9.3.3 Wetlands and Waterbodies

Wetlands account for nearly 12% of the biophysical LSA, dominated by forested or open ombrotrophic peatlands, followed by minerotrophic peatlands, shrubby and wooded swamps, marshes, and ponds. Prior to the project, only small portions of these habitats had been disturbed by human activities (roads, partial logging, drainage), although within a 50-km radius, hydroelectric developments, roads, and gravel pits had already caused additional losses.

The project is expected to encroach on approximately 120 ha of wetlands and aquatic habitats, constituting a moderate residual impact. Compared to other projects in the region, the only comparable sources of additional loss are mining exploration (local deforestation, access roads) and, in a more diffuse and unpredictable manner, forest fires. Other projects contribute primarily to dust deposition or local changes without significant additional encroachment, given their distance from the project study area.

Overall, the cumulative effect on wetlands and aquatic environments is considered to be of moderate significance, primarily due to the accumulation of small land-use losses associated with mineral exploration in the study area. No additional measures are proposed beyond those already planned (avoid, minimize, compensate).

9.3.4 Wildlife Species with Special Status

This EIA identifies 18 wildlife species of special concern confirmed on the site: 11 bird species (including the golden eagle, American nightjar, short-eared owl, bank swallow, olive-sided flycatcher, little ringed plover, and rusty-backed grackle), one large mammal (the woodland caribou), five bat species or complexes with special status (including the Myotis complex and the ash-colored bat), and one small mammal (the Cooper's lemming). The greater brown bat, which has no status, was also included in this section with the other bats, given its ecological similarity.

Analyses indicate an already unfavorable situation for the woodland caribou in the James Bay region, which faces a moderate to very high risk of extinction in a landscape heavily disrupted by fires. Regarding bats, historical data are limited and make it difficult to paint a picture of their historical trends. It is known that climate change is driving the northward expansion of certain species, but on the other hand, white-nose syndrome has caused significant mortality. For avifauna, data from RCO 7 indicate a marked decline in abundance indices since 1970 for most species, with a slight recent slowdown in some cases, but without a return to historical levels. The bank swallow, olive-sided flycatcher, little ringed plover, rusty-backed grackle, and American nightjar illustrate these trends.

The project contributes to habitat loss and fragmentation, disturbance (noise, dust, lighting), road collision risks, and, for certain species, potential habitat degradation due to contamination. The main projects that may contribute to habitat loss and fragmentation and to the degradation of habitat quality are mining exploration and forest fires. However, with regard to disturbances and collision risks, hydroelectric complexes, roads, power lines, fires, white-nose syndrome (for bats), and mining exploration may have an impact.

9.3.5 Terrestrial wildlife and wildlife habitats

This EIA concerns large wildlife (migratory caribou, moose, black bear, wolf), small mammals, and terrestrial birds that do not have a specific conservation status. The biophysical RSA constitutes a potential wintering area for the Rivière aux Feuilles migratory caribou herd, but data show a sharp decline in use over the past decade. Moose and black bears are present at low to moderate densities, typical of a northern environment. Twelve species of small mammals are likely to be present, and eight have been confirmed within the biophysical LSA. For avifauna, inventories confirmed the presence of 114 species, including 25 species of waterfowl and other aquatic birds, 9 species of shorebirds, 15 species of raptors, and 65 species of land birds. Information on historical trends in bird populations is available only based on RCO7 at the national level. The data show that more than 50% of species are stable or increasing, but that approximately 36% are declining due to various pressures on ecosystems.

Cumulative pressures on these species stem from habitat loss and fragmentation (mines, roads, power lines, reservoirs), recent particularly extensive wildfires, disturbance from transportation and industrial activities, as well as hunting. In this already disturbed context, the project's facilities and infrastructure result in additional habitat loss and a local increase in disturbance and collision risk. However, within a 50-km radius, the project's relative contribution remains limited in area and spatially concentrated. This contribution compounds the effects of mining exploration and forest fires regarding habitat loss and fragmentation, as well as the degradation of habitat quality.

However, all identified projects and activities (mining exploration, forest fires, operation and maintenance of existing facilities and infrastructure) may contribute to disturbance in limited areas that are, for the most part, a considerable distance from the project. Thus, the low presence of migratory caribou and the stability of populations of other mammal species in relation to the potential effects caused by the various projects under consideration result in a low cumulative impact. For bird species, the cumulative effect is assessed as moderate for habitat loss/fragmentation and low for disturbance.

9.3.6 Physical, Psychological, and Social Health of the Regional Population (Health, Social, and Economic Conditions of Indigenous Peoples)

Major waves of industrial development (hydroelectricity, roads, and now mining) have had significant social effects on Cree communities: tensions, rapid changes in lifestyle, the emergence or worsening of certain social and health issues, a sense of loss of control over the territory, and impacts on cultural transmission. Indigenous residential schools, the JBNQA, the Paix des Braves, the Plan Nord, and the Grande Alliance are part of this long history, with both positive effects (increased autonomy, governance powers, dedicated programs) and negative effects (increase in projects on the territory, perception of constant pressure on the way of life).

9.3.7 Road safety

Road safety is being analyzed along the Trans-Taiga and Billy-Diamond highways, which were built to handle traffic volumes much higher than those observed today. The project will increase heavy truck traffic, particularly during the operational phase, thereby raising the risk of collisions and pavement deterioration, even though the current accident rate remains low.

Cumulative effects result from the combination of traffic associated with the project and that from other mines, Hydro-Québec's operations, the Grande Alliance (roadwork, new roads, rail), and regular community travel. Overall, existing infrastructure retains significant capacity, but the increase in heavy traffic and accelerated road wear may heighten risks. The cumulative impact on road safety is assessed as moderate, justifying the rigorous implementation of planned measures (road maintenance, speed management, public awareness campaigns, coordination with road authorities).

9.3.8 Hunting and Trapping

The hunting and trapping VCA is examined in a context where Cree communities have exclusive or priority rights over vast portions of the territory, but where the proliferation of projects and infrastructure is gradually creating fragmentation and increasingly dense industrial occupation. Mining activities, roads, camps, airports, and the Grande Alliance projects are altering and will continue to alter the accessibility, tranquility, and availability of hunting and trapping territories.

The project adds an industrial footprint and additional access roads, which may, on the one hand, facilitate access to the territory for Cree hunters, but may also increase the number of areas perceived as less desirable or riskier (noise, dust, perceived contamination of wildlife). When combined with other projects, these effects may contribute to changes in land-use patterns, a loss of functional territory for certain tallyman families, and increased harvesting pressure in certain sectors. The cumulative effect is considered to be of moderate significance, although it remains difficult to quantify precisely.

9.3.9 Well-being on the Territory

Well-being on the territory encompasses all activities carried out on the territory that are closely linked to Indigenous culture (transmission of values and language, mental health and healing, ancestral memory, etc.). Following an assessment, it was determined that this CEA largely overlapped with that related to physical, psychological, and social health. The cumulative impacts associated with well-being on the territory have therefore been covered in Section 9.3.6 on physical, psychological, and social health.

9.3.10 Climate Change Mitigation (GHG Emissions)

The climate change mitigation (GHG emissions) VCA places the project's emissions within the context of provincial reduction targets. Mining activities, transportation, infrastructure operations, and major transportation infrastructure projects (roads, rail) all contribute to increased GHG emissions. The project adds an additional contribution, which remains modest on a provincial scale but is not negligible in a context where every ton counts toward meeting targets.

The cumulative analysis considers the percentage increase in emissions in the region, using data from 2008 as a baseline. The combination of resource development projects and new land access projects driven by the Northern Plan and the Grand Alliance will tend to increase traffic from combustion-engine vehicles and the use of fossil fuels. The cumulative effect is assessed as moderate, which justifies considering opportunities for reduction, energy substitution, and travel optimization, as proposed by the proponent.

9.4 Summary of Cumulative Impacts

In a context where the Eeyou Istchee James Bay region is already heavily impacted by large-scale hydroelectric developments, major roads, mining sites, and recent wildfires, the project adds additional pressures but does not, in and of itself, constitute the dominant factor in most of the cumulative effects analyzed.

The cumulative impacts are assessed as:

- Low for surface water quality, wildlife (fish) and aquatic habitats, bats, large wildlife and other mammals, as well as air quality.
- Moderate for wetlands and aquatic environments, certain wildlife species with special status (particularly birds), the health and well-being of regional populations, road safety, hunting and trapping, and GHG emissions.

No additional mitigation or monitoring measures are required specifically for cumulative impacts, beyond those already planned for the project's direct and indirect impacts. However, it is important to ensure rigorous monitoring of existing measures and ongoing collaboration with communities to track the evolution of social, cultural, and environmental issues in a changing region.

10 Summary of residual impacts

The project will have both negative and positive impacts on various components of the physical, biological, and human environments. The magnitude of residual impacts after the application of mitigation or enhancement measures during the project's various phases (construction, operation, and closure) is summarized in the project's environmental assessment (Table 10-1). The complete list of mitigation measures is provided in Appendix 8-2 of the EIA.

This analysis of residual impacts identifies several issues corresponding to negative impacts that retain a moderate residual significance. Recognition of these impacts is necessary because they have enabled the selection of environmental components that must be subject, on the one hand, to a cumulative impact assessment (Chapter 9) and, on the other hand, to potential environmental monitoring measures (Chapter 13). The components exhibiting residual impacts of moderate significance (the project does not generate any residual impacts of major significance) include:

- **Surface water quality**, which, during the operational phase, will experience a residual impact of moderate significance due to a constant inflow of water from mining effluent. Although this effluent is monitored regularly and its treatment will ensure compliance with standards, a minor increase in loads is anticipated in the receiving environment downstream of the effluent over the course of operations.
- **Aquatic fauna (fish) and habitats** that, during the construction and operation phases, are subject to a residual impact of moderate significance. During the construction phase, the impact is related to the loss of aquatic habitat due to the draining of part of Lake L01 to create the open pit and the installation of the diversion channel to drain water from Lake L01. This is because the natural outflow from Lake L01 is located in the area that must be drained. The diversion channel will introduce water from the lake upstream of the natural outflow. During the operational phase, it is the anticipated effect of the outflow on surface water quality that causes the moderate impact.
- **Wetlands and aquatic environments** that experience a moderate residual impact during the construction phase due to the encroachment on 120.4 ha of wetlands.
- **Wildlife species with special status** that, during the construction phase, show a residual impact of moderate significance, primarily associated with habitat loss (deforestation). A moderate residual impact during operation related to the effects of disturbances (disturbance) and the risks of collision and mortality is also anticipated.
- **Terrestrial wildlife (large wildlife, avifauna including migratory birds)**, which experiences a moderate residual impact during the operational phase, primarily related to disturbances and the risks of collision and mortality.

- **Physical, psychological, and social health**, which experiences a moderate residual impact during all phases of the project. During the construction and operational phases, the impact is primarily linked to job creation, which will provide additional income for some community members and require them to be away from home to work at the mine. Although these benefits are, at first glance, positive, they can lead to tensions within the community between those selected and those who were not. Furthermore, contact with outsiders can also generate tensions and various social problems. During the closure phase, the loss of well-paying jobs represents the main source of impact.
- **Road safety**, which, for the operational phase, shows a residual impact of moderate significance. Indeed, the increase in traffic on the Trans-Taiga and Billy-Diamond roads caused by the transport of ore to Matagami and supply needs could lead to accelerated road deterioration and increase the risk of accidents.
- **Hunting and trapping of terrestrial wildlife and waterfowl**, which presents a residual impact of moderate significance during the construction phase. This impact is primarily caused by the loss of available land for these activities and the opening up of the territory, which facilitates access for hunters who are not members of the region's Indigenous communities.
- **Well-being on the territory** concerns all activities carried out on the territory that are closely linked to Indigenous culture (transmission of values and language, mental health and healing, ancestral memory, etc.). Following an assessment, it was determined that this VEC largely overlaps with the one related to physical, psychological, and social health, and the analysis of the impacts of these two VECs was addressed in the section on health.
- **Climate change mitigation (GHG emissions, energy transition)**, which, during the operational phase, experiences a residual impact of moderate significance due to the regional nature of the impact and the higher quantities of GHGs generated during this phase.

In addition to the negative residual impacts, the project will result in various positive impacts, including:

- In terms of the physical environment, during the closure phase, as the de-watered portion of Lake L01 is gradually refilled, restoration activities will be carried out to return the soil, surface water, and groundwater to their pre-project conditions.
- In terms of the biological environment, during the closure phase, the restoration of vegetation cover, wetlands, and watercourses will contribute to improved habitat for fish, terrestrial wildlife, and wildlife species with special status.
- In terms of human impacts, during the construction, operation, and closure phases, the work associated with these phases will generate economic benefits for the regional population. Furthermore, a positive impact is anticipated during the closure phase for users of the CH39 trapping grounds, as the area will be cleared of facilities and disturbances will cease. Finally, the end of mining activities at this site will allow for a return to pre-project conditions regarding the traditional use of the territory.

Table 10-1 Summary of Impacts by Issue

Affected component	Project phase	Primary source of impact	Description of potential impacts	Common and specific mitigation (or enhancement) measures (Appendix 8-2)	Significance of residual impact
Issue No. 1 - Preservation of aquatic habitat quality					
Hydrology (Hydrodynamic and hydro-sedimentary conditions)	Construction	Site organization, stripping and clearing, surface preparation, access development, transport and traffic related to materials and supplies	Alterations to hydrodynamic and hydrosedimentary conditions associated with the construction of the Lake L01 diversion channel	Common mitigation measures: Section: Soil, surface water, and sediment quality Specific mitigation measures: P31 and P32	Minor
	Operations	Water use and management, as well as transport and traffic related to ore and supplies	Alterations in hydrodynamic and hydro-sedimentary conditions associated with mine effluent	Common mitigation measures: Section: Soil, surface water, and sediment quality Specific mitigation measures: P33	Minor
	Closure	Final restoration	Avoids additional impact by leaving the diversion channel in place and refilling the mine pits connected to Lake L01	Common mitigation measures: Section: Soil, surface water, and sediment quality Specific mitigation measures: N/A	Moderate (+) Minor (-)
Surface water quality	Construction	Site organization, stripping and clearing, surface preparation and access development, transport and traffic related to materials and supplies, production and management of residual and hazardous materials	Alteration of surface water quality	Common mitigation measures: Sections: Ambient air; Soil, surface water, and sediment quality Specific mitigation measures: P24 and P25	Minor
	Operations	Water use and management, transport and traffic related to ore and obtaining supplies, production and management of residual and hazardous materials	Alteration of surface water quality	Common mitigation measures: Sections: Ambient air; Soil, surface water, and sediment quality Specific mitigation measures: P25, P29, P30, and P38	Moderate[1]
	Closure	Final restoration, production and management of residual and hazardous materials	Gradual improvement in water quality Low risk of contamination during restoration work	Common mitigation measures: Sections: Ambient air; Soil, surface water, and sediment quality; Vegetation and wetlands Specific mitigation measures: P23 and P25	Major (+) Minor (-)
Aquatic wildlife (fish) and habitats	Construction	Site organization, stripping and clearing, surface preparation and access development, construction of structures and infrastructure, transport and traffic related to materials and supplies	Disturbance of wildlife activities and aquatic habitats due to loss of fish habitat surface area	Common mitigation measures: Sections: Ambient air; Soil, surface water, and sediment quality; Wildlife and wildlife habitat Specific mitigation measures: P25, P31, P32, and P33	Moderate
	Operations	Water use and management, transport and traffic related to ore and supplies, production and management of residual and hazardous materials	Disturbance of wildlife activities and aquatic habitats due to mine effluent discharge	Common mitigation measures: Sections: Ambient air; Soil, surface water, and sediment quality; Wildlife and wildlife habitat Specific mitigation measures: P25, P31, P32, P33, and P46.	Moderate
	Closure	Final restoration, production and management of residual and hazardous materials	Progressive restoration of aquatic ecosystem functions and improvement of habitat quality Low risk of contamination during restoration work	Common mitigation measures: Sections: Ambient air; Soil, surface water, and sediment quality; Wildlife and wildlife habitat Specific mitigation measures: P23 and P25	Minor

[1] It should be noted that the expected residual impact on water quality is minor, as the design of the industrial wastewater treatment plant is intended to ensure compliance with the requirements of Directive 019. The medium significance rating is mainly attributable to the assignment of a medium duration to this impact based on the established definitions, although this duration does not in any way affect effluent quality.

Affected component	Project phase	Primary source of impact	Description of potential impacts	Common and specific mitigation (or enhancement) measures (Appendix 8-2)	Significance of residual impact
Issue No. 2 – Preservation of soil and groundwater quality					
Soil quality	Construction	Site organization, stripping and clearing, surface preparation and access development, transport and traffic related to materials and supplies, and production and management of residual and hazardous materials	Alteration of the physical and chemical quality of soils	Common mitigation measures: Section: Soil, surface water, and sediment quality Specific mitigation measures: N/A	Minor
	Operations	Transport and traffic related to ore and supplies, production and management of residual and hazardous materials	Alteration of the physical and chemical quality of soils	Common mitigation measures: Section: Soil, surface water, and sediment quality Specific mitigation measures: N/A	Minor
	Closure	Transport and traffic during closure work, final restoration, and production and management of residual and hazardous materials	Remediation of affected soils Low risk of temporary soil disturbance and contamination during closure work	Common mitigation measures: Section: Soil, surface water, and sediment quality Specific mitigation measures: N/A	Major (+) Minor (-)
Groundwater quality	Construction	Site organization, stripping and clearing, surface preparation and access development, construction of structures and infrastructure, transport and traffic related to materials and supplies, and production and management of residual and hazardous materials	Alteration of groundwater quality	Common mitigation measures: Sections: Soil, surface water, and sediment quality; Hydrology and hydrogeology Specific mitigation measures: P25	Minor
	Operations	Water use and management, transport and traffic related to ore and supplies, production and management of residual and hazardous materials	Alteration of groundwater quality	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P25 and P38	Minor
	Closure	Final restoration, production and management of residual and hazardous materials	Gradual improvement in groundwater quality Low risk of contamination during closure work	Common mitigation measures: Same as for the construction phase Sections: Soil, surface water, and sediment quality; Hydrology and hydrogeology Specific mitigation measures: P25	Major (+) Minor (-)
Issue No. 3 – Preservation of wetlands and habitats of interest to terrestrial wildlife and plants					
Wetlands and water environments	Construction	Site organization, stripping and clearing, surface preparation and access development, transport and traffic related to materials and supplies, production and management of residual and hazardous materials	Loss of area and disruption of the quality of wetlands and water environments.	Common mitigation measures: Sections: Ambient air; Soil, surface water, and sediment quality; Vegetation and wetlands Specific mitigation measures: P24 and P25	Moderate
	Operations	The presence and operation of new infrastructure , water use and management, transport and traffic related to ore and obtaining supplies, production and management of residual and hazardous materials	Disruption of the quality of wetlands and water environments	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P01, P245, P25, P29, P30, P31, P32 and P33	Minor
	Closure	Final restoration, production and management of residual and hazardous materials	Restoration of wetlands and water environments Low risk of contamination of wetlands and water environments during closure work	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P01, P23, P24, and P25	Major (+) Minor (-)
Wildlife species of special status	Construction	Site organization, stripping and clearing, surface preparation and access development, construction of structures and infrastructure, transport and traffic related to materials and supplies, production and management of residual and hazardous materials	Disturbance of activities and loss of habitat for wildlife species of special status	Common mitigation measures: Sections: Ambient air; Acoustic environment and vibrations; Soil, surface water, and sediment quality; Vegetation and wetlands; Wildlife and wildlife habitat; Planning, land use, and land tenure Specific mitigation measures: P03, P04, P24, P25, P39, P40, P41, and P43	Moderate
	Operations	The presence and operation of new infrastructure, water use and management, transport and traffic related to ore and supplies, production and management of residual and hazardous materials	Disturbance of activities of wildlife species of special status	Common mitigation measures: Sections: Ambient air; Acoustic environment and vibrations; Soil, surface water, and sediment quality; Vegetation and wetlands; Wildlife and wildlife habitat; Planning, land use, and land tenure Specific mitigation measures: P03, P04, P25, P39, P40, P41, and P43	Moderate
	Closure	The presence of site remnants, final restoration, production and management of hazardous waste materials	Improvement of habitats favouring the resumption of activities by wildlife species of special status Low risk of habitat contamination during closure work	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P03, P04, P23, P25, P39, P40, P41, and P43	Major (+) Minor (-)

Affected component	Project phase	Primary source of impact	Description of potential impacts	Common and specific mitigation (or enhancement) measures (Appendix 8-2)	Significance of residual impact
Terrestrial wildlife (large animals, avian fauna including migratory birds)	Construction	Site organization, stripping and clearing, surface preparation and access development, transport and traffic related to materials and supplies, production and management of residual and hazardous materials	Disturbance of terrestrial wildlife activities due to nuisances and habitat loss	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P25, P39, P40, P41, and P43	Minor to Moderate
	Operations	The presence and operation of new infrastructure, transport and traffic related to ore and supplies, production and management of residual and hazardous materials	Disturbance of terrestrial wildlife activities due to nuisances	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P25, P39, P41, and P43	Moderate
	Closure	The presence of site remnants, final restoration, production, and management of residual and hazardous materials	Improvement of habitats favouring the resumption of terrestrial wildlife activities Low risk of habitat contamination during closure work	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P23, P25, P39, P41, P43, and P44	Moderate (+) Minor (-)
Forest cover	Construction	Site organization, stripping and clearing, surface preparation, and access development	Loss of forest cover associated with clearing land required for mine infrastructure and operations	Common mitigation measures: Sections: Soil, surface water, and sediment quality; Vegetation and wetlands; Wildlife and wildlife habitat; Planning, land use, and land tenure Specific mitigation measures: P23, P24, and P25	Minor
	Operations	Presence and operation of new infrastructure, transport of mineral, procurement and traffic	Disturbance of forest cover maintained on the edges of the site (damage caused by traffic, dust)	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P23, P24, P25, P29, and P30	Minor
	Closure	Transport and traffic during the work, site remnants, and final restoration	Restoration of cleared areas through revegetation Potential damage to forest cover components and area not cleared for revegetation	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P23, P24, and P25	Major (+) Minor (-)
Issue No. 4 – Preserving the quality of life of the local population					
Air quality	Construction	Site organization, stripping and clearing, surface preparation and access development, construction of structures and infrastructure, transport and traffic related to materials and supplies, production and management of residual and hazardous materials	Alteration of air quality due to the emission of air pollutants and dust	Common mitigation measures: Sections: Ambient air; Vegetation and wetlands and water environments Specific mitigation measures: P01, P19, P24, P25, P29, and P30	Minor
	Operations	The presence and operation of new infrastructure, transport and traffic related to ore and supplies, and the production and management of residual and hazardous materials	Alteration of air quality due to the emission of air pollutants and dust	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P01, P19, P25, P29, and P30	Minor
	Closure	Transport and traffic during the work, final restoration, production and management of residual and hazardous materials	Gradual improvement in air quality Low risk of temporary disruption to air quality during closure work	Common mitigation measures: Ambient air section Specific mitigation measures: N/A	Major (+) Minor (-)
Issue No. 5 – Preservation of the health, safety, and socioeconomic conditions of the regional population					
Physical, psychological, and social health	Construction	Water use and management, Transport and traffic related to materials and supplies, production and management of residual and hazardous materials, workforce, and purchasing of goods	Disruption to the physical, psychological, and social health of regional populations	Common mitigation measures: Sections: Ambient air; Acoustic environment and vibrations; Soil, surface water, and sediment quality; Vegetation and wetlands; Wildlife and wildlife habitat; Planning, land use, and land tenure; Quality of life and well-being; Traditional land use by Indigenous peoples Specific mitigation measures: P14, P15, P16, P17, P19, P20, P21, P22, P24, P25, and P45	Moderate
	Operations	Water use and management, transport and traffic related to ore and supplies, production and management of residual and hazardous materials			
	Closure	The presence of site remnants, final restoration, production and management of residual and hazardous materials, workforce, and purchasing of goods and services	Disruption to the physical, psychological, and social health of regional populations Gradual reclaiming of the land	Common mitigation measures: Same as for the construction and operations phases Specific mitigation measures: P06, P10, P11, P13, P21, P23, and P42.	Moderate (-) Major (+)

Affected component	Project phase	Primary source of impact	Description of potential impacts	Common and specific mitigation (or enhancement) measures (Appendix 8-2)	Significance of residual impact
Economic benefits (job creation, economic partnerships)	Construction	Site organization, stripping and clearing, surface preparation and access development, construction of structures and infrastructure, transport and traffic related to materials and supplies, workforce, and purchasing of goods and services	Contribution to local and regional economic development	Common mitigation measures: Sections: Population, economy, and employment; Quality of life and well-being Specific mitigation measures: N/A	Major (+)
	Operations	The presence and operation of new infrastructure, transport and traffic related to minerals and supplies, workforce, and purchasing of goods	Contribution to local and regional economic development	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P19	Major (+) Moderate (-)
	Closure	Final restoration, workforce, and purchasing of goods and services	Loss of local and regional economic benefits	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P09, P10, P11, P19, and P42	Moderate (-) (+)
Road safety	Construction	Transport and traffic related to materials and supplies	Increased risks of deterioration in road safety	Common mitigation measures: Sections: Quality of life and well-being; Traditional land use by Indigenous peoples; Infrastructure and public services Specific mitigation measures: P26, P34, P35, and P36	Minor
	Operations	Transport and traffic related to ore and supplies	Increased risks of deterioration in road safety	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P26, P34, P35, and P36	Moderate
	Closure	Final restoration	Reduced risk of road safety disruption	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P26, P34, P35, and P36	Major (+) Minor (-)
Issue No. 6 – Preservation of the traditional activities and practices of Indigenous peoples and the activities and practices of non-Indigenous peoples					
Hunting and trapping of terrestrial wildlife and waterfowl	Construction	Site organization, stripping and clearing, surface preparation and access development, transport and traffic related to materials and supplies	Disturbance of hunting and trapping activities	Common mitigation measures: Sections; Acoustic environment and vibrations; Quality of life and well-being; Traditional land use by Indigenous peoples; Planning, land use, and land tenure; Wildlife and wildlife habitat Specific mitigation measures: P14, P15, P19, P24, P25, and P45	Minor
	Operations	The presence and operation of new infrastructure, water use and management, transport and traffic related to minerals and supplies	Disturbance of hunting and trapping activities	Common mitigation measures: Sections: Acoustic environment and vibrations; Soil, surface water, and sediment quality; Quality of life and well-being; Traditional land use by Indigenous peoples; Planning, land use, and land tenure; Wildlife and wildlife habitat Specific mitigation measures: P14, P15, P19, P24, P25, and P45	Moderate
	Closure	The presence of site remnants, final restoration, production and management of residual and hazardous materials	Gradual improvement in hunting and trapping conditions Low risk of contamination of hunting and trapping areas during the work	Common mitigation measures: Same as for the operations phase Specific mitigation measures: P23 and P25	Major (+) Minor (-)
Fishing	Construction	Site organization, stripping and clearing, surface preparation and access development, transport and traffic related to materials and supplies, production and management of residual and hazardous materials	Disturbance of fishing activities	Common mitigation measures: Sections; Soil and surface water quality; Hydrology and hydrogeology; Vegetation and wetlands; Traditional land use by Indigenous peoples Specific mitigation measures: P14, P15, P19, and P25	Minor
	Operations	Water use and management, transport and traffic related to minerals and supplies, production and management of residual and hazardous materials	Disturbance of fishing activities	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P14, P15, P19, and P25	Minor
	Closure	Final restoration, production and management of residual and hazardous materials	Gradual improvement in fishing conditions Low risk of contamination of fishing areas during closure work	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P23 and P25	Moderate (+) Minor (-)

Affected component	Project phase	Primary source of impact	Description of potential impacts	Common and specific mitigation (or enhancement) measures (Appendix 8-2)	Significance of residual impact
Harvesting of valued plant species	Construction	Site organization, stripping and clearing, surface preparation and access development, transport and traffic related to materials and supplies, production and management of residual and hazardous materials	Disturbance of activities involving the gathering of valued plant species	Common mitigation measures: Sections: Ambient air; Soil, water, and sediment quality; Vegetation and wetlands; Planning, land use, and land tenure; Traditional land use by Indigenous peoples Specific mitigation measures: P14, P15, P19, P24, and P25	Minor
	Operations	The presence and operation of new infrastructure, water use and management, transport and traffic related to minerals and supplies, and the production and management of residual and hazardous materials	Disturbance of activities involving the gathering of valued plant species	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P14, P15, and P25	Minor
	Closure	The presence of site remnants, final restoration, production and management of residual and hazardous materials	Gradual improvement in harvesting conditions for valued plant species Low risk of contamination of fishing areas during closure work	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P14, P23, P24, and P25	Moderate **(+)** Minor (-)
Well-being on the land	Well-being on the land refers to all activities carried out on the land that are closely linked to Indigenous culture (transmission of values and language, mental health and healing, ancestral memory, etc.). After assessment, it was determined that this VEC largely overlapped with that relating to physical, psychological, and social health, and the analysis of the impacts of these two VECs was addressed in the section on health.				
Issue No. 7 – Consideration of climate change					
Climate change mitigation (GHG emissions, Energy transition)	Construction	Site organization, stripping and clearing, surface preparation and access development, construction of structures and infrastructure, transport and traffic related to materials and supplies, production and management of residual and hazardous materials	Contribution to the overall increase in GHG emissions	Common mitigation measures: Sections: Ambient air; Vegetation and wetlands Specific mitigation measures: P25 and P26	Minor
	Operations	The presence and operation of new infrastructure, the transport and traffic related to minerals and supplies, production and management of residual and hazardous materials	Contribution to the overall increase in GHG emissions	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P25 and P26	Moderate
	Closure	Transport and traffic during construction, final restoration, production and management of residual and hazardous materials	Reduction in overall GHG emissions Low contribution to GHG emissions during closure work	Common mitigation measures: Same as for the construction phase Specific mitigation measures: P25 and P26	Major (+)Minor (-)

11 Climate change resilience

The project guidelines for conducting an EIA require the integration of climate change resilience. This chapter addresses the project's adaptation and resilience to current and future climate conditions. It summarizes the methodology applied and the key findings of the assessment of risks and vulnerabilities related to climate change.

11.1 Methodology

The approach follows the guidelines set out in the document *Climate Change and Environmental Assessment: A Guide for Project Proponents* by the MELCCFP, in accordance with ISO 31000:2018 and ISO 14901:2021 standards.

Preliminary Stage

Description of the project, its environment, its duration, and applicable codes.

Step 1 — Identification of hazards and components

Climate hazards likely to affect the project's components are identified for each phase. Positive opportunities are also identified. Interactions between hazards and components are then established.

Step 2 — Defining component vulnerability

Vulnerability is assessed by combining the sensitivity of components and their adaptive capacity, taking into account design thresholds and measures already in place.

Step 3 — Likelihood of Impacts

The likelihood of potential impacts is estimated based on the probability of climate change and vulnerability. Interactions with low or very low likelihood are not considered.

Step 4 — Determination of the initial risk level

The initial risk is determined based on the likelihood and severity of the consequences.

Step 5 — Adaptation Measures

Mitigation and adaptation strategies are proposed to reduce moderate to very high risks in order to improve the project's resilience.

11.2 Future Climate Hazards

Climate change will affect the water cycle and the frequency of extreme weather events, either positively or negatively, influencing construction costs and the durability of infrastructure. The hazards identified for the site include:

- extreme precipitation and flooding;
- freezing rain;
- heat waves;
- freeze-thaw cycles and winter thaws;
- drought and wildfires;
- strong winds and thunderstorms;
- snowfall;
- extreme cold waves;
- lengthening of the summer season.

11.2.1 Existing Climate

The study area has a cold, humid continental climate (Dfb) according to the Köppen classification, with high seasonal variability and precipitation evenly distributed throughout the year. The average annual temperature is −2.7°C, with average extremes of 2.8°C and −8.1°C.

11.2.2 Future Climate Profile

Projections based on the SSP5-8.5 scenario for time horizons covering the project's lifespan—namely the short term (2011–2040), medium term (2041–2070), and long term (2071–2100)—indicate:

- a marked increase in annual temperatures, with hotter summers and milder winters;
- an increase in annual and extreme precipitation, both in duration and intensity, increasing the risks of flooding and erosion;
- an increase in rain-on-snow events and freeze-thaw cycles affecting infrastructure stability;
- overall stability in freezing rain, with a possible slight increase in the medium and long term;
- significant uncertainty regarding winds but an expected increase in dusty days;
- an increase in forest fire indicators, particularly the duration of the fire season and the Forest-Weather Index (FWI).

11.3 Mitigation measures

No specific analysis was conducted for the construction phase, given its short duration, but the short-term time horizon (2011–2040) allows for the representation of risks under current conditions.

As part of the risk profile for the short- and medium-term operational phases, very low and low risks should be managed by existing design standards, while moderate to very high risks require specific measures.

Detailed adaptation measures, grouped by component, are proposed to minimize the impacts on the project. The chapter also recommends:

- that all emergency plans be reviewed due to the increased frequency and intensity of extreme weather events;
- adjusting existing repair and replacement budgets;
- anticipating more frequent operational disruptions.

The estimated residual risk level after implementing the measures remains indicative, as its confirmation depends on their actual performance.

The risk profile for the restoration and post-restoration phases, assessed for the medium-term (2041–2070) and long-term (2071–2100) horizons, has been established. As with the operational phase, very low and low risks are manageable through existing norms and standards, while moderate to very high risks require adaptation measures.

The proposed measures by component, as well as the estimated residual risk level if implemented, have been determined. The chapter also recommends:

- reviewing all emergency plans due to the increased frequency and intensity of extreme weather events
- adjusting existing repair and replacement budgets.

The level of residual risk remains an estimate, depending on the implementation and actual effectiveness of the measures.

12 Risk management

12.1 Introduction

This chapter outlines the approach to understanding potential accidents and failures related to project activities, as well as the assessment of their probability and consequences. The first line of defense relies on best practices in environmental and health and safety, the use of high-performance technologies, rigorous control of discharges, and training.

Despite prevention efforts, incidents may occur, hence the need for mitigation measures and an emergency response plan (ERP). The site, located approximately 9 km from any permanent facilities, poses little risk to the public; however, an accident could affect people on site, property, the environment, and sensitive areas. PMET aims to reduce risks at the source and maintain a risk level as low as reasonably achievable.

12.2 Major Technological Accident Risk Assessment

12.2.1 Objectives and Scope

The purpose of the analysis is to identify potential hazards, assess their consequences, and define protective measures to prevent or reduce the frequency and effects of accidents. It focuses on major accidental events that could have consequences off-site, affecting the public or the environment, without covering routine risks to worker health and safety during normal operations.

12.2.2 Methodology for Risk Assessment

The concept of risk combines hazards, the severity of consequences, and the probability of occurrence. The first steps involve identifying sensitive environmental elements, external hazards (natural and human-induced), and hazards associated with activities and facilities, followed by compiling an accident history for similar facilities. Accident scenarios are then developed, their potential consequences and probabilities estimated, and safety measures proposed. A risk management plan, including an Emergency Response Plan (ERP), is established to manage residual risks.

12.2.2.1 Hazard Identification and Accident Scenario Development

Hazards are categorized into external hazards of natural origin, external hazards of human origin, and hazards associated with the project's activities, infrastructure, and equipment. The objective is to determine the worst-case accident scenarios, their causes, and the associated preventive and control measures.

12.2.2.2 Assessment of the severity of accident scenario consequences

Severity is assessed in terms of people, the environment, and property. Two substances stored on-site—compressed natural gas and ammonium nitrate—exceed the thresholds set by the Environmental Emergencies Regulation; their consequences are therefore quantified through modeling.

12.2.2.3 Estimation of Probabilities of Occurrence

The probabilities of accident scenarios are determined primarily based on accident history at similar sites, facility analysis, and existing preventive measures.

12.2.2.4 Determination of risk levels

Risk levels are determined based on severity and probability, using a risk matrix and acceptability criteria. The criteria and categories include:

- Five qualitative classes (very high, high, moderate, low, very low) that describe the expected frequency, ranging from common events that may occur more than once a year to highly improbable events associated with exceptional circumstances.
- Severity levels (very high to very low) are defined separately for the community, workers, the environment, and property. The level assigned to an accident is the highest among these components.
- The probability-severity matrix is used to assign a risk level (very low to very high). The level takes into account the robust preventive measures already in place. The acceptability criteria describe, for each risk level, whether the risk is acceptable or not, as well as the need for mitigation and monitoring.

12.2.3 Identification of Sensitive Elements in the Environment

Sensitive elements, identified within a radius of approximately 2 km, include public places, infrastructure, and sensitive or protected natural environments.

Hydrology: The site is located in the La Grande Rivière and Pontois watersheds, with several lakes, including L01 and L27, near the facilities.

Infrastructure: the Billy-Diamond Road and the Trans-Taiga Road, managed by Hydro-Québec and maintained by the SDBJ, as well as a rest stop and emergency telephones.

Current land and resource use: The project is located within the Eeyou Istchee James Bay territory, in trapping lot CH39 of the Chisasibi Cree community, where several camps are in use, situated primarily along the Trans-Taiga and La Grande Rivière.

Vegetation: lichen-covered spruce forest, immature forest resulting from past fires, presence of various types of wetlands.

Terrestrial wildlife: Confirmed presence of woodland caribou, migratory caribou, moose, black bear, gray wolf, and eight species of small mammals.

Avifauna: 109 bird species, including 11 at risk, and 94 migratory bird species as defined by federal law.

Bats: five species and species groups are present, with no critical habitats identified, but with the possibility of maternity roosts.

Archaeological sites: four sites identified within approximately 30 km, none in the immediate vicinity of the project.

12.2.4 Accident history

The accident history is compiled from the ARIA database (BARPI, France) for comparable activities (mining, industrial gases, gaseous fuels, fertilizers, road transport, etc.).

Since 2015, 14 incidents related to extractive activities have been recorded, including dam failures or overflows, landslides or ground subsidence, releases of contaminated water, fires, and explosions. Causes include extreme weather conditions, management errors, inadequate design, malicious acts, and maintenance failures.

12.3 Hazard Identification

External hazards of natural or human origin may affect the operation or integrity of the site; hazards are also associated with the project's activities and infrastructure.

12.3.1 External hazards of natural origin

12.3.1.1 Climate Change

The main climate risks are related to extreme precipitation, wildfires, high winds, and extreme temperatures. They affect the stability of mining infrastructure, worker safety, and operational continuity, with water accumulation in the pit, underground mine, and treatment ponds, as well as risks of erosion and slope instability. The risk of flooding in the pit and underground mine is taken into account and can be reduced through the measures identified in the climate resilience study.

12.3.1.2 Earthquakes

Seismic activity is low in the region, with no earthquakes recorded since 1980 within a 200-km radius. The risk is considered negligible. Structural facilities will comply with applicable seismic standards.

12.3.1.3 Flooding

Flooding may be associated with weirs, narrow riverbanks, or ice jams. For the site, effects are expected to be limited to localized accumulations, which will be drained by the drainage system. The risk of major flooding is considered low.

12.3.1.4 Ground Instability

The site has a gently sloping topography with a low elevation difference. The risk of landslides in surface deposits is considered negligible, although erosion and landslides could be triggered by extreme precipitation or an increase in annual precipitation.

12.3.1.5 Exceptional weather conditions

Events such as heavy rain, hail, high winds, heavy snowfall, and ice storms can cause overloads and affect the integrity of buildings and equipment. Infrastructure will be designed in accordance with current codes to withstand these overloads, but these conditions remain plausible scenarios to consider, especially in the context of climate change.

12.3.1.6 Forest fires

The site is located in SOPFEU's northern protection zone, where the strategy prioritizes monitoring and targeted response. The probability of forest fires near the site is high and is expected to increase with climate change. The risk is considered very high.

12.3.2 External anthropogenic hazards

12.3.2.1 Air transport

The nearest airport, La Grande-4, is approximately 50 km away. The site is located outside the landing and takeoff maneuvering areas and the main navigation corridors. The probability of an aircraft crash at the site is considered very low.

12.3.2.2 Power transmission

A Hydro-Québec transmission corridor (735 kV) runs 14 km north of the site, along the Trans-Taiga road. A 120 kV line is planned for the project. These infrastructures present typical external risks associated with energy transmission and supply.

12.3.2.3 Vandalism and Intrusion

The site could be targeted by intrusions or vandalism. Risks are mitigated by a guardhouse, access controls, surveillance cameras, perimeter fencing, and underground storage of explosives.

12.3.3 Identification of hazards related to on-site activities

The main infrastructure includes the open-pit mine, the underground mine, garages and workshops, loading areas, processing and backfill plants, waste rock and overburden stockpiles, water management facilities, power supply, roads, worker camps, warehouses, and fuel and explosives storage areas.

The identified hazards relate to: open-pit and underground mining operations, ore processing, air systems, the storage and use of chemicals, explosives, petroleum products, and flammable gases, the wastewater treatment plant, the storage of waste rock and tailings, the presence of retention dams, and the transport of hazardous materials and concentrate.

12.4 Potential Accidents

12.4.1 Open-pit mining

Two accident scenarios have been identified for the pit: flooding and rockfall/landslide.

12.4.1.1 Pit flooding

Surface or groundwater infiltration may result from rock damage, faults, or significant flooding, requiring pumping and interrupting operations.

Measures include geological and geotechnical studies, monitoring of blasting effects, installation of pumps, diversion of stormwater, design in accordance with dam safety requirements, implementation of the operating manual, an inspection program, and monitoring of water levels.

The probability is considered moderate, the severity high (injuries potentially leading to disability, prolonged downtime), and the risk level moderate.

12.4.1.2 Rockfall and landslides along the pit walls

Measures include geological and hydrogeological studies, slope design in accordance with mining regulations, a landslide monitoring system, and adequate sizing of landings.

The probability is considered low, the severity high, and the risk level moderate.

12.4.2 Underground mine

Three scenarios are being studied: flooding, fire, and underground subsidence.

12.4.2.1 Mine flooding

Fractures connected to aquifers can lead to flooding.

Preventive measures include an oversized pumping system, level probes, generators, pump redundancy, temporary shutdown of activities, shelter rooms, an evacuation plan and monitoring of water levels.

The probability is moderate, the severity is high, and the risk is moderate.

12.4.2.2 Fire in the underground mine

A fire can occur in the presence of flammable materials, fuel, oils, tires, conveyors, explosives, or electrical equipment.

Measures include a mine rescue team, firefighting equipment, automatic fire suppression systems, vehicle maintenance, refueling procedures, inspections, refuge chambers, and an emergency response plan (ERP) that includes an evacuation and fire response procedure.

The probability is moderate, the severity is moderate, and the risk is moderate.

12.4.2.3 Underground subsidence

Unstable rock or high stress levels can cause subsidence.

Measures include a mining design adapted to the rock mass, supervision by rock mechanics specialists, surface monitoring, inspections, stress monitoring, closure of high-risk areas, and an evacuation plan.

The probability is very low, the severity very high, and the risk moderate.

12.4.3 Ore processing

Four scenarios are considered: fire, non-compliant atmospheric emissions, chemical spills, and exposure to ionizing radiation (mentioned but not elaborated on in the detailed excerpt).

12.4.3.1 Fire

Fires can be caused by hot work, conveyor friction, electrical overheating, defective heating equipment, or negligence.

Measures include conveyor maintenance, use of appropriate oils, maintenance of hydraulic systems, installation of sprinklers and alarms, control of hot work, availability of fire extinguishers, fire sprinkler systems, and sprinklers in buildings, training of a fire brigade, and maintenance of a water supply.

The probability is low, the severity is high (effects on health, equipment, and the environment), and the risk is moderate.

12.4.3.2 Non-compliant environmental discharge (atmospheric release)

Handling and crushing operations may emit dust. Failures in purification or monitoring equipment may cause an accidental release.

The measures include the maintenance and monitoring of dust collectors, extraction systems, water spraying in certain areas and an inspection program.

The probability is moderate, the severity is low (limited, local impacts), and the risk is moderate.

12.4.4 Storage and Use of Chemicals

Products used for ore and water treatment (ferrosilicon, ferric sulfate) may be spilled during transport, handling, or storage.

Measures include compliant storage (WHMIS-GHS, CNPI, Hazardous Materials Regulations), dedicated storage areas, containment devices, temporary storage of spent materials, safe handling practices, wearing PPE, training (transportation of hazardous materials, WHMIS), the use of compliant containers, the availability of spill kits, emergency showers, and an appropriate emergency response plan.

The probability is low, the severity is high (health risks and certain reactive substances), and the risk is moderate.

The products listed in the tables (FeSi, Magnofloc 10) are stored according to defined methods (bags, original containers, pallets, dry and ventilated warehouses) with annual and maximum quantities.

The storage, handling, training, transportation, emergency response equipment, and emergency plan measures described above are intended to reduce the risk of spills; the risk to the environment is considered low to localized, but certain substances may pose significant hazards to workers.

12.4.5 Storage and Handling of Explosives

Ammonium nitrate-based emulsion explosives are used for mining. Storage activities take place both above and below ground.

Two major scenarios are considered: uncontrolled explosion and theft of explosive material.

12.4.5.1 Uncontrolled explosion (above or below ground)

The explosion may result from a transport accident, a fire in a storage facility, or a poorly controlled blasting operation.

Measures include handling by a specialized supplier, worker training and certification, keeping heat sources at a distance, monitoring drill holes, taking weather conditions into account, complying with mining regulations, posting no-smoking signs, monitoring emissions during detonations, compliant and secure storage, separating products, regulated transport, and an appropriate emergency response plan.

The probability is very low, the severity is very high (potential loss of life, significant damage, environmental impacts), and the risk is moderate.

12.4.5.2 Explosives material theft

The theft could lead to malicious use.

Measures include monitoring deliveries, maintaining inventory records, using fenced storage areas, and establishing a risk management plan that includes a procedure in case of theft.

The probability is very low, the severity very high, and the risk moderate.

12.4.6 Storage and use of petroleum products

Diesel tanks (under construction and in operation), a backup power plant, and oils/greases are planned.

Three scenarios are being studied: petroleum product spill, petroleum product fire/explosion, and oil and grease spill.

12.4.6.1 Spill of petroleum products

Possible causes include transportation accidents, collisions, equipment leaks, corrosion, overflows, or human error.

Measures include the availability of emergency kits, equipment inspection, maintenance and refueling precautions, restricting activities to authorized areas, marking of construction sites, compliance with transportation and hazardous materials regulations, required permits for high-risk tanks, compliant design during operation, double-walled tanks with retention basins, level detection systems, separators, receiving and distribution procedures, preventive maintenance, training, spill kits, an inspection program, and a PMU.

The probability is high, the severity is moderate (impact on soil, wetlands, or waterways, but generally containable), and the risk is high.

12.4.6.2 Fire and/or explosion involving petroleum products

The measures are similar, with the addition of a fire brigade, a water supply, and internal compliance inspections.

The probability is very low, the severity is very high (injuries to people, property damage, thermal and blast effects), and the risk is moderate.

12.4.6.3 Spills of oils and greases

Causes include equipment failure or handling errors.

Measures include containment devices, training and awareness, spill kits, and an emergency response team.

The probability is low, the severity is low, and the risk is low.

12.4.7 Storage and use of flammable gas

CNG will be delivered by high-pressure trailers, used for both transport and storage, with up to six trailers on site.

CNG is a flammable gas composed mainly of methane, with explosive limits of 5 to 15%, a very low flash point, and a very high auto-ignition temperature. It is less dense than air and must not be in the presence of strong oxidizers.

12.4.7.1 Fire involving a CNG tank

A fire may occur in the event of a leak and the presence of an ignition source.

Preventive measures include compliant design, receiving and distribution procedures, maintenance, training, a fire brigade, internal inspections, a water supply, and a fire suppression system. The probability is very low, the severity is high, and the risk is moderate.

12.4.7.2 CNG tank explosion

A leak can form an explosive cloud, leading, in some cases, to a domino effect on other tanks. The measures are similar, with particular attention to cooling the tanks using a water reserve and procedures in the event of a natural gas leak. The probability is very low, the severity very high, and the risk moderate.

12.4.8 Mine water treatment

A malfunction in the treatment system, equipment failure, or human error can lead to non-compliant discharge of the final effluent. Measures include periodic analyses, continuous monitoring of certain parameters, and integration into an automation network. The probability is low, the severity is high (potential contamination of lakes and waterways, impact on aquatic fauna), and the risk is moderate.

12.4.9 Accumulation areas and retention structures

Overburden stockpiles, organic materials, waste rock stockpiles, as well as ponds and dikes, constitute accumulation and retention areas.

12.4.9.1 Potential collapse

Slope instability can cause a landslide or collapse outside containment areas, triggered by extreme weather conditions or construction errors. Measures include hydrogeological and geotechnical studies, a stability analysis, and a monitoring program. The probability is low, the severity is high, and the risk is moderate.

12.4.9.2 Failure of a retention structure

Possible causes include extreme weather events, earthquakes, errors, or aging.

Measures include a risk analysis, compliant design (dam standards), diversion channels, geological and hydrogeological studies, consideration of seismic data, application of the operating manual, an inspection and maintenance program, monitoring instrumentation, and a specific emergency response unit (PMU).

The probability is very low, the severity very high (flooding of the reservoir and downstream areas, impacts on CE15, L27, and cabins), and the risk moderate.

12.4.10 Road transport

Access is via the Trans-Taiga road. Two categories of hazards are analyzed: accidents involving hazardous materials and accidents involving ore concentrate trucks.

12.4.10.1 Accident involving hazardous materials

Trucks transport petroleum products and chemicals. Causes include loss of control, collision, or driver illness.

Mitigation measures include the use of roads that meet standards, driver training, preventive vehicle maintenance, and an emergency response unit with appropriate procedures.

The probability is low, the severity is conservatively assessed as high (potential impacts on soil, wetlands, fauna, flora, and aquatic environments), and the risk is moderate.

12.4.10.2 Accident involving an ore concentrate truck

Spodumene concentrate will be transported in enclosed semi-trailers. The measures are similar to all road transport activities (suitable roads, training, maintenance, emergency response plan). The probability is low, the severity is low (localized impact, mainly sedimentation), and the risk is low.

12.4.11 Risks associated with external hazards

12.4.11.1 Forest fire

Forest fires are common in the area and can be caused by lightning or human activity.

Measures include removing peat around facilities, brush clearing, inspections, public awareness campaigns, an agreement with SOPFEU, monitoring of fire danger indices, a water reserve, a water supply network, a response team, and a special emergency management unit.

The probability is high, the severity is moderate (impacts on facilities, vegetation, wildlife, aquatic environments, and herpetofauna), and the risk is high.

12.4.11.2 Extreme weather conditions

High winds, heavy snowfall, ice storms, and lightning are considered.

Measures include compliant design, emergency generators, spare equipment, and an emergency management unit with evacuation procedures.

The probability is very low, the severity is high (damage to infrastructure and prolonged disruption), and the risk is moderate.

12.4.12 Risk summaries

Most risks are moderate; a few are low or high, notably wildfires and oil spills.

12.5 Quantitative Consequence Assessment

12.5.1 Incident Involving Hazardous Materials

Consequence modeling was performed for scenarios involving CNG and ammonium nitrate emulsion, substances exceeding the RUE thresholds.

12.5.1.1 Methodology

PHAST software (version 7.2) is used to model emissions, dispersion, explosions, and thermal effects of CNG. For ammonium nitrate emulsion, the calculation is based on Kingery-Bulmash shock wave parameters, as PHAST only handles liquid or gaseous substances.

12.5.1.2 Scenarios Assessed

Compressed natural gas

Standard scenarios (complete tank rupture), alternative scenarios (leak through an opening), and scenarios with domino effects (four and then twelve tanks) are evaluated. Maximum impact distances are calculated for emergency planning thresholds (1 psi overpressure, 5 kW/m² heat flux) and for domino effects (3 psi, 8 kW/m²). The explosion of 12 tanks is the most catastrophic scenario.

Ammonium nitrate

The explosion of 30,000 kg of emulsion stored in the surface storage facility is considered. The shock wave extends over several hundred meters.

12.5.1.3 Modeling results (impact distances)

Compressed natural gas

Standard scenario

The scenario involving a CNG tank, which has the greatest impact distance, is the standard scenario (complete emptying of the tank). For such a scenario, the greatest calculated impact distances are:

- 1,425 m for a thermal radiation of[5] kW/m^2;
- 1,313 m for an overpressure of 1 psi.

Alternative scenario

For the evaluated alternative scenario (leak escaping from a 0,5-cm-diameter hole in a CNG tank), the calculated impact distances for the thermal effect and overpressure are 16 and 17 m, respectively.

Domino Effects

The calculated impact distances for the domino effect thresholds are:

- 1,119 m for thermal radiation;
- 667 m for overpressure.

Consequently, the explosion of a CNG tank in a trailer would cause the other tanks in that trailer to explode, as well as the trailers nearby.

If one of the two trailers explodes (four tanks), the calculated maximum impact distances are:

- 2,120 m for thermal radiation of 5 kW/m^2;
- 2,084 m for a pressure surge of 1 psi.
- For the explosion of the tanks in the three trailers, i.e. 12 tanks, the calculated maximum impact distances are:2,890 m for thermal radiation of 5 kW/m^2;
- 3,006 m for a pressure surge of 1 psi.

An explosion involving all 12 tanks represents the most catastrophic scenario for this product. Both domino effect scenarios could potentially impact the second location where the CNG trailers are stored.

Ammonium Nitrate

The explosion of an ammonium nitrate emulsion tank would cause all tanks stored in the surface storage area to explode, resulting in the explosion of 30,000 kg of emulsion. This scenario is the most catastrophic for this product. The calculated shock wave resulting from this scenario extends 648 m from the explosion site.

12.5.1.4 Potential impacts on sensitive environments

Scenarios involving CNG could lead to the evacuation of all buildings, as well as impacts on waste rock stockpiles, retention dams, nearby lakes and waterways, wetlands, and fishing areas. Scenarios involving ammonium nitrate could also affect wetlands and lakes (including L027 and L207).

12.5.2 Retention dam failure

A breach study was conducted for the retention dams at Lake L01. Water levels and arrival times at various sensitive areas (effluent, CE15, L027, cabins) are estimated for favorable and aggravating weather conditions.

A breach of the western dam at L01 would primarily impact the basin (flooding), while a breach of the eastern dam would have downstream impacts, including on cabin at Lake L027, with a significant rise in water levels.

12.5.2.1 Potential consequences for sensitive areas

The pit, PMET facilities, downstream watercourses and lakes, as well as cabins, would potentially be affected by a breach, with flooding and damage to the banks.

12.6 Risk management program

A risk management program will be implemented to manage residual risks. It includes the implementation of an environmental and health and safety management system, environmental monitoring, safe operating procedures, a maintenance and inspection program, worker training, visual identification of products and piping, safe storage of chemicals, accident and incident investigations, and a change management process. PMET's environmental and OHS policies provide the framework for this program.

12.7 Preliminary Emergency Response Plan (ERP)

An ERP is an essential tool for ensuring a rapid and effective response when an emergency arises. The developed emergency plan will be known to internal responders, updated annually, readily accessible in an emergency, and easy to consult. It will serve as a liaison with municipal/regional authorities as well as with affected communities. Response measures will comply with applicable regulations and industry best practices. When required, this plan will be revised and adapted to any new activities on-site.

13 Monitoring and follow up program

As part of the activities associated with the project's construction, operation, and closure phases, PMET will dedicate the necessary human and financial resources to implementing the project's environmental monitoring and follow-up program. The following sections outline the proposed activities for this program.

13.1 Environmental Monitoring

The project will be subject to environmental monitoring to ensure compliance with the proponent's environmental commitments and obligations, as well as applicable laws, regulations, and conditions. A due diligence review will be conducted to ensure compliance with the specific provisions set forth in the government decree and any contractual conditions included in the plans and specifications. The implementation of the mitigation measures and commitments presented in the environmental impact study, as well as in the addenda submitted in response to questions and comments from the MELCCFP and the AEIC, or any other authority, will also be ensured as part of this monitoring. This monitoring will begin as soon as the site is mobilized, continue throughout construction, and remain in place until the environment is restored.

13.2 Environmental Follow-up

An environmental follow-up program will be implemented during the construction, operation, and closure phases of the project. The closure phase comprises two distinct periods: the post-operational sub-phase, corresponding to the interval between the cessation of production and the completion of restoration work, and the post-restoration sub-phase, which begins once restoration work is completed and continues until a state deemed satisfactory for the protection of the receiving environment is achieved.

The restoration program and associated monitoring will be subject to a five-year review, in accordance with the requirements of the Mining Act and the procedures set forth in the *Guide for the Preparation of Mine Site Reclamation and Restoration Plans in Quebec* (MRNF, 2024).

This environmental monitoring program will be refined based on the conditions set forth in the authorizations issued for the project. It aims to detect and document any environmental changes relative to the baseline condition, whether or not attributable to the project, to verify the accuracy of the impact assessment, and to evaluate the effectiveness of the mitigation measures outlined in the EIA.

Throughout the various stages of the project, the proposed monitoring will focus on, but not be limited to, the aspects presented in Table 13-1.

This program will be carried out in accordance with the municipal and government requirements applicable to the project. Monitoring activities may be adjusted based on the results obtained, or additional monitoring may be proposed as the project progresses.

Table 13-1 Proposed Environmental Monitoring

Monitoring	Components Monitored
Monitoring associated with mining operations Mining operations	Geochemistry of ore, waste rock, and tailings
	Water management structures and storage areas
	Environmental incidents and accidents
	Waste and hazardous materials management
	Drinking water distribution networks
	Sanitary water
Monitoring related to the physical environment	Ambient air
	Greenhouse gases
	Noise and vibrations
	Soil
	Hydrology
	Mine effluent
	Surface water
	Sediments
	Hydrogeology and groundwater quality
Monitoring related to the biological environment	Vegetation and wetlands
	Fish fauna
	Benthos
	Avian fauna
	Mammals – Large wildlife
	Mammals – Bats
	Mammals – Other species
	Species with special status
Monitoring related to the social environment	Community well-being and human health
	Current land and resource use (Fish meat, game meat, and plants valued by the Cree)
	Infrastructure and public services (traffic and road safety, collisions with large wildlife)
	Archaeology
	Monitoring Committee
Other monitoring related to habitat compensation projects	Wetland and aquatic habitat compensation
	Fish habitat compensation
Annual Monitoring and Follow-up Report	
Monitoring Schedule	

14 Preliminary habitat compensation program

14.1 Summary of losses of fish habitat, wetlands, and aquatic environments

Table 14-1 summarizes the anticipated direct losses of fish habitat, wetlands, and aquatic environments associated with the project.

Table 14-1 Summary of estimated direct losses of fish habitat, wetlands, and aquatic environments

Milieu	Catégorie	Type de milieu	Total (ha)
Hydrique	**Habitat du poisson**		
	Littoral	Cours d'eau	0,78
		Plans d'eau	56,35
		Milieu humide sous la limite du littoral	0,05
	Sous-total milieux hydriques habitat du poisson		**57,18**
	Pas un habitat du poisson		
	Littoral	Cours d'eau	0,00
		Plan d'eau	0,03
		Milieu humide sous la limite du littoral	4,93
		Sous-total littoral pas un habitat du poisson	**4,97**
	Rive	Milieu humide	3,63
		Milieu forestier	6,09
		Non forestier	0,82
		Sous-total rive	**10,53**
	Sous-total milieux hydriques pas un habitat du poisson		**15,50**
Humide	**Milieux humides hors littoral ou rive**		**104,68**
Total des pertes estimées d'habitat du poisson, de milieux humides et hydriques			**120,19**

14.2 Fish Habitat Compensation Plan

14.2.1 Background and Losses to Be Compensated

As part of the project, spodumene mining will be carried out using a hybrid approach combining an open-pit and underground mining method to reduce direct impacts on fish habitat. Despite these efforts, infrastructure development will result in the direct loss of approximately 57.18 ha of aquatic habitat, primarily due to the partial draining of Lake L01.

These habitats are primarily occupied by the black sucker (*Catostomus commersonii*) and the northern pike (*Esox lucius*), with a lesser presence of lake trout (*Salvelinus namaycush*). Brook trout (*Salvelinus fontinalis*) have also been observed in the lake's outlet, which offers good potential for feeding and spawning for lithophilic species but limited potential for phytophilic species.

Mitigation measures are planned, including fish relocation and the creation of a diversion channel modeled after a natural watercourse to maintain connectivity. However, residual impacts remain and require the implementation of a compensation plan aimed at restoring or improving equivalent habitats, in accordance with regulatory requirements, in consultation with the Cree community and government authorities.

14.2.2 Project Identification

The search for compensation projects was based on two complementary components. First, consultations were conducted with rights holders, regional organizations, and government authorities to identify priority issues and gather project ideas. Second, a site analysis using photo interpretation identified disturbed areas or those with restoration potential, such as altered watercourses, obsolete culverts, borrow pits, and abandoned mining sites.

These consultations revealed several major concerns, including mercury contamination in fish flesh, which remains a significant issue for the Chisasibi community; the presence of invasive alien species, exacerbated by fishing tournaments and the arrival of tourists with their boats; and water quality in certain watercourses, which trap masters consider a cause for concern.

These efforts led to the development of a list of potential projects aimed at offsetting fish habitat loss in accordance with the principles of the Policy on the Implementation of Measures to Offset Adverse Effects on Fish and Fish Habitat (DFO, 2025), while incorporating the cultural values and fisheries management priorities of Indigenous communities.

14.2.3 Identified Projects

The selected projects fall into different categories:

- Water Level Enhancement
- Restoration of watercourses and water bodies
- Development of spawning grounds and seagrass beds
- Unimpeded fish movement (fish passage)
- Culvert rehabilitation
- Restoration of disturbed sites (dredging sites, abandoned mining sites)
- Measures related to invasive species and contaminants

Some projects were rejected because they did not meet the compensation criteria or presented major constraints. Others are currently under review and will be presented in detail at a later date. The projects currently selected are considered active and have concrete potential to compensate for fish habitat loss.

14.2.4 Summary

Following the steps taken, several projects were selected based on their relevance and feasibility. Table 14-2 provides a summary of these projects, indicating for each one the targeted issue, the planned work, the anticipated gain in area, and the main challenges to consider.

Table 14-2 Summary of Potential Fish Habitat Loss Compensation Projects

Project Name	Issue	Proposed work	Expected gain (ha)	Potential issues
Raising the water level of Lake L01 (N01)	Partial drying up of Lake L01 and significant loss of fish habitat. Habitats suitable for northern pike spawning are very rare (<1% of the shoreline) and aquatic vegetation is scarce.	Raise the water level of Lake L01 using the dike planned for the mining site to increase the area and volume of fish habitat. This measure will also allow for spring flooding of the shorelines, promoting northern pike spawning and improving ecological functions (fry rearing, shelter, feeding).	2.15 to 20.71 (depending on the elevation scenario: +10 cm to +60 cm).	Proximity to mining infrastructure and issues related to site closure. Validation of the volume of water retained by the dike to determine the type of structure (high- or low-capacity).
Development of multi-species spawning grounds at the mining site (FH03)	Scarcity of habitats suitable for spawning of lithophilic species in watercourses CE8 and CE11 at the site.	Develop multi-species spawning grounds at the crossings of watercourses CE8 and CE11 by preserving the natural riverbed, adding suitable substrate, and installing weirs to ensure water conditions favorable for the spawning of lithophilic species.	Between 0.05 and 0.1 ha (exact gain to be confirmed according to the management plan).	To be determined (depending on the design of the crossings and hydrological conditions).
Development of aquatic vegetation beds at Lake L01 (FH04)	Lack of spawning habitats for northern pike due to the scarcity of aquatic plant beds and steep banks.	Reprofile certain banks to create or expand floodable bays during the spawning period, then revegetate with suitable plant communities to ensure the rapid establishment of aquatic plant beds conducive to northern pike reproduction.	2.5 ha (six preliminary sites identified, with the possibility of increasing the area).	To be determined (depending on site selection and topographical constraints).
Watercourse near LG-4 Airport (RCP01)	Past impacts: three crossings and the presence of an embankment disrupting the watercourse.	Restore the banks at the former crossing points and create a water body in the embankment area, including depressions to reach the water table, gentle slopes to promote aquatic vegetation, the spreading of topsoil, and revegetation work (seeding, reforestation, transplantation).	0.41 ha (fish habitat).	Proximity to the landing strip and land ownership.
Watercourse (north) to Lake Desaulniers (RCP02)	Decline in fishing site quality (spread of willows) and uncertain water quality; free movement of fish not documented.	Restore the spawning ground and banks overrun by willows, improve water quality, and address fish movement if necessary.	To be determined.	To be determined.

Project Name	Issue	Proposed work	Expected gain (ha)	Potential issues
Stream (west) to Lake Desaulniers (RCP03)	Problematic water quality (rusty color), possible contamination from a nearby landfill.	Implement a corrective measure to address the contamination causing the water discoloration and improve the quality of the aquatic environment.	To be determined.	To be determined.
Restoration of a brook trout spawning ground (FH01)	Brook trout spawning ground near the Chisasibi public beach.	Implement measures to restore the spawning ground, including site characterization and interventions to improve habitat quality and functionality.	To be determined.	To be determined.
Restoration of a walleye spawning ground (FH02)	Whalleye spawning ground near LG-4 power plant; spawning site unsuitable since the removal of a bridge or culvert.	Restore the spawning ground by improving habitat quality and functionality, and implement corrective measures related to the removal of the bridge or culvert.	To be determined.	To be determined.
Restoration of a fish passage (LC01)	Damaged fishway preventing the free movement of fish between water bodies and the Robert-Bourassa Reservoir.	Redesign the fish passage to restore connectivity and allow species to migrate between watercourses and the reservoir.	Up to 124 ha (upstream water bodies).	The dam and fish pass are owned by Hydro-Québec; legal obligations and willingness to carry out the work.
Culvert at Lake Yasinski (T02)	Issue of free fish movement; developed spawning ground underutilized; risk of eggs being exposed on the jetty.	Rehabilitate the culvert to restore connectivity and optimize the existing spawning ground by improving hydraulic conditions and correcting the jetty (uniform level, removal of the insulating fabric, adjustment of the protective arm) to reduce the risk of eggs being exposed.	Up to 137.9 ha (water bodies) and 0.169 ha (spawning grounds).	Complex logistics (Billy-Diamond Road, single-lane Nord-Radisson route); preserve the integrity of the existing spawning ground.
Culverts at km 77 of Chisasibi Road (T03)	Culverts in poor condition hindering the free movement of fish; risk of complete deterioration.	Replace the culverts with a durable structure (e.g., arch culvert) that ensures free passage at all times and preserves a natural flow channel.	Up to 36.17 km of watercourses and 183.18 ha of water bodies.	Complex logistics (single road to Chisasibi); maintain road traffic during construction.
Culvert at the entrance to Chisasibi borrow pit 1 (T04)	Issue of free fish passage; water accumulation upstream of the culvert; presence of a brook trout spawning ground upstream.	Implement appropriate measures to restore connectivity, including technical characterization of the culvert and design of a structure facilitating free fish passage.	To be determined.	Maintain flow if the borrow pit is still in operation.

Project Name	Issue	Proposed work	Expected gain (ha)	Potential issues
Culverts near LG-4 (T05)	Crossings and culverts that may impede free fish movement and degrade habitat quality.	Implement appropriate measures to restore connectivity, including the assessment of culverts and the design of structures that facilitate the free passage of fish.	To be determined.	Road ownership (potentially Hydro-Québec).
Chisasibi Borrow Pit 1 (BE04)	Deteriorated environment; crossbeams hindering traffic; presence of an excavation pond.	Restore the borrow pit by removing residual material, apply the “rough and loose” method, enlarge the excavated water body, and create an adjacent wetland (gentle slopes, flow channels, topsoil, vegetation). Replace or adapt culverts to restore free fish passage.	2.5183 ha (fish habitat) + additional aquatic and wetland areas.	Project at risk if the borrow pit is still active (access for heavy machinery).
Culvert in Chibougamau (T01)	Heavily damaged culvert hindering free fish movement; elevated water level upstream.	Replace the culvert with a suitable structure to restore connectivity between the two bodies of water and ensure the free passage of fish at all times.	Up to 26.05 km of waterways and 683.5 ha of water bodies.	To be determined (ownership, technical and logistical constraints).
Icon Sullivan (M01)	Straight, unmeandering channel; steep banks; contamination from tailings; old road along the bank.	Develop a diversion channel with a basin from the existing canal; stabilize the banks at strategic locations to limit runoff; renaturalize a former road northeast of the site.	1.168 ha (fish habitat: 0.7003 ha; banks: 0.4677 ha).	Presence of contaminants and instability in several areas.
Boat wash station (EEE01)	Risk of introducing invasive alien species due to fishing tournaments and the growing number of tourists arriving by boat from the south.	Set up a mobile washing station that can be moved as needed (tournaments, critical periods) and/or a fixed station at a strategic location to intercept boats coming from the south.	N/A	Ensure that the mobile station is present at the right water bodies at the right time; validate sites for a fixed station.
Environmental Contaminants – Traditional Food (R01)	Presence of mercury in the flesh of freshwater fish, raising concerns about the health and food safety of the Chisasibi community.	Identify environmental contaminants (particularly mercury) in traditional food; conduct sampling and analysis; disclose results and raise public awareness.	N/A	To be determined (related to methodology, sampling sites, and reporting of results).

References: (Niigaan. 2025) (DFO, 2025)

14.3 Wetland and Water Compensation Plan

14.3.1 Background and Losses to Be Compensated

The planned developments will result in the loss of 120.19 ha of wetlands and water bodies.

The project area contains a total of 285 wetlands. The vast majority of these wetlands—89%—are part of a wetland complex, while 92% have a water connection (direct or indirect). It includes a shallow water area, a pond, four marshes, 43 wooded swamps, 17 shrubby swamps, eight wooded minerotrophic peatlands, 45 open minerotrophic peatlands, 66 wooded ombrotrophic peatlands, and 100 open ombrotrophic peatlands.

14.3.2 Project Search

Due to the abundance of wetlands and aquatic environments in the region, and the limited number of disturbed areas requiring restoration, the search for compensation alternatives could not be limited to seeking gains comparable to losses in terms of area. Particular attention was paid to identifying projects that could address the losses in terms of affected ecological functions, even though such gains are more difficult to quantify.

Consultations with communities affected by the project were also a central element of the compensation process. The selected projects must meet the expectations of community members, who know and use the land and who will be directly affected by the project's impacts. The main concerns expressed centered on fish habitat. However, tallymen are concerned about the increased presence of invasive alien species—a phenomenon exacerbated by fishing tournaments and the influx of tourists with their boats—as well as water quality in certain waterways.

Among other concerns expressed by the Cree community during consultations conducted as part of the human environment assessment, we highlight the importance of certain traditional activities related to the territory, including wetlands and water bodies. Goose, duck, and bear hunting, in particular, may be avenues to explore within wetland or water body management plans.

14.3.3 Identified Projects

Four main avenues have been identified as promising for wetland and aquatic habitat compensation projects in the project region:

- Indirect benefits from fish habitat compensation projects
- Restoration of former borrow pits
- Restoration of contaminated sites
- Research component: exploring carbon sequestration in peatlands

The projects selected to date are considered active and offer real potential for offsetting wetland and aquatic habitat losses.

14.3.4 Summary

Table 14-3 presents a summary of the various potential projects selected, outlining for each the identified issues, the proposed interventions, the expected benefits, and the main challenges to be considered

Table 14-3 Summary of potential projects to offset the loss of wetlands and water bodies

Project Name	Issue	Proposed work	Expected gain (ha)	Potential issues
Raising the water level of Lake L01 (N01)	Partial drying up of Lake L01 and significant loss of fish habitat. Habitats suitable for northern pike spawning are very rare (<1% of the shoreline) and aquatic vegetation is scarce.	Raise the water level of Lake L01 using the dike planned for the mining site to increase the area and volume of fish habitat. This measure will also allow for spring flooding of the shorelines, promoting northern pike spawning and improving ecological functions (fry rearing, shelter, feeding).	2.15 to 20.71.	Proximity to mining infrastructure and issues related to site closure. Validation of the volume of water retained by the dike to determine the type of structure (high or low capacity).
Creation of aquatic plant beds at Lake L01 (FH04)	Lack of spawning habitats for northern pike due to the scarcity of aquatic plant beds and steep banks.	Reprofile certain banks to create or expand floodable bays during the spawning period, then revegetate with suitable plant communities to ensure the rapid establishment of aquatic plant beds conducive to northern pike reproduction.	2.5 (six preliminary sites identified, potential to increase the area).	To be determined (depending on site selection and topographical constraints).
Watercourse near LG-4 Airport (RCP01)	Past impacts: three crossings and the presence of an embankment disrupting the watercourse.	Restore the banks at the former crossing points and create a water body in the embankment area, including depressions to reach the water table, gentle slopes to promote aquatic vegetation, the spreading of topsoil, and revegetation work (seeding, reforestation, transplantation).	Riversides: 0.28; wetlands: 0.44.	Proximity to the landing strip and land ownership.
Watercourse (north) to Lake Desaulniers (RCP02)	Decline in fishing site quality (spread of willows) and uncertain water quality; free movement of fish not documented.	Restore the spawning ground and banks overrun by willows, improve water quality, and address fish movement if necessary.	To be determined.	To be determined.
Chisasibi Borrow Pit 1 (BE04)	Deteriorated environment; crossbeams hindering movement; presence of an excavation pond.	Restore the borrow pit by removing residual material, apply the “rough and loose” method, enlarge the excavated water body, and create an adjacent wetland (gentle slopes, flow channels, topsoil, vegetation). Replace or adapt culverts to restore free fish passage.	Shores: 0.81; wetlands: 1.23.	Project compromised if the borrow pit is still active (access for heavy machinery).

Project Name	Issue	Proposed work	Expected gain (ha)	Potential issues
Icon Sullivan (M01)	Straight, unmeandering channel; steep banks; contamination from tailings; old road along the bank.	Construct a diversion channel with a basin branching off from the existing channel; stabilize the banks at strategic locations to limit runoff; renaturalize a former road northeast of the site.	Banks: 0.4677.	Presence of contaminants and instability in several areas.
Site 4	Sand pit open under certain conditions; environment degraded by material removal, the creation of access roads, and the movement of heavy machinery.	Site restoration through the creation of wetlands by removing material, re-contouring the terrain, planting vegetation, and establishing floodplains.	2.84.	To be determined.
Site 5 -33G06-1	Gravel borrow pit open under certain conditions; environment degraded by gravel removal, the creation of access roads, and the movement of heavy equipment.	Site restoration through the creation of wetlands by removing material, re-contouring the terrain, planting vegetation, and establishing floodplains.	2.32.	To be determined.
Site 7- 33F07-1	Crushed stone borrow pit open under certain conditions; environment degraded by material removal, the creation of access roads, and the movement of machinery.	Site restoration through the creation of wetlands by removing debris, reshaping the terrain, planting vegetation, and establishing floodplains.	4.56.	To be determined.
Site 8 – 33I02-12	Closed sand extraction site, environment degraded by material removal, the creation of access roads, and the movement of heavy machinery.	Site restoration through the creation of wetlands by removing material, re-contouring the land, planting vegetation, and establishing floodplains.	2.40.	To be determined.
Site 9 – 33F04-1	Closed sand extraction site, environment degraded by material removal, the creation of access roads, and the movement of heavy machinery.	Site restoration through the creation of wetlands by removing material, re-contouring the land, planting vegetation, and establishing floodplains.	1.98.	To be determined.

Project Name	Issue	Proposed work	Expected gain (ha)	Potential issues
Site 10 – 33F04-0	Closed gravel extraction site, environment degraded by material removal, the creation of access roads, and the movement of heavy equipment.	Site restoration through the creation of wetlands by removing material, re-contouring the terrain, planting vegetation, and establishing floodplains.	8.26.	To be determined.
Site 11 – 32N06-1	Closed sand extraction site, environment degraded by material removal, the creation of access roads, and the movement of heavy equipment.	Site restoration through the creation of wetlands by removing material, re-contouring the land, planting vegetation, and establishing floodplains.	11.50.	To be determined.
Site 12 – 32N06-5	Closed gravel extraction site: environment degraded by material removal, the creation of access roads, and heavy machinery traffic.	Site restoration through the creation of wetlands by removing material, re-contouring the land, planting vegetation, and establishing floodplains.	8.10.	To be determined.
Site 1 - WJ/6-054	Contaminated site: environment degraded by soil disturbance, machinery traffic, and probable soil contamination.	Site restoration through soil remediation, land grading, and the creation of wetlands.	To be determined.	To be determined.
Site 6 - WJ/6-028	Contaminated site: environment degraded by soil disturbance, machinery traffic, and probable soil contamination.	Site restoration through soil decontamination, land reprofiling, and wetland restoration.	To be determined.	No access road, located in the middle of a wetland complex, near the river.
Site 7 – Former Dump Site	Former illegal dump containing about fifteen abandoned cars, old tanks, and various other waste.	Site restoration through soil decontamination, land grading, and wetland restoration.	4.0.	In the middle of a wetland complex (machinery traffic).

Project Name	Issue	Proposed work	Expected gain (ha)	Potential issues
Research component				
Creation of conservation areas (AMCE)	Project implemented in a peatland complex.	A specialized carbon study would be conducted, including the MELCCFP's method for quantifying carbon stocks.	To be determined.	Determine the site selection in consultation with all stakeholders.
Knowledge acquisition	Gather knowledge on the impact of establishing a mining project (with an underground component) on the ecological functions and ecosystem services of wetlands in general, and peatlands in particular.	Mapping of plant communities, review of studies on peatlands, field campaigns for characterization, installation of monitoring devices, hydrological and physico-chemical measurements, carbon and groundwater modeling.	To be determined.	To be determined.

References: (Niigaan, 2025), (DFO, 2025), (Megnan, 2024)

References

ATKINSRÉALIS, 2025. Technical Note. Flood, Erosion, and Dispersion Studies of the Diversion Channel and CE 15 River at Post-Construction of Minin Facility. 30 p.

BISHOP, C.A. et J.M. BROGAN. 2013. Estimation de la mortalité aviaire attribuable aux collisions automobiles au Canada. Écologie et conservation des oiseaux 8(2): 2.

COMITÉ TECHNIQUE SUR LA SAUVAGINE DU SERVICE CANADIEN DE LA FAUNE. 2023. Situation des populations d'oiseaux migrateurs considérés comme gibier au Canada – 2023. Rapport du Service canadien de la faune sur la réglementation concernant les oiseaux migrateurs numéro 58.

FAHRIG, L. ET T. RYTWINSKI. 2009. Effects of roads on animal abundance: an empirical review and synthesisi. Ecology and society. 14(1), 21 pp.

G MINING SERVICES. 2025. *CV5 Pegmatite Lithium-Only Feasibility Study NI 43-101 Technical Report – Shaakichiuwaanaan Project*. En ligne *:* https://www.sedarplus.ca/csa-party/records/document.html?id=b944fb9b7b9517d520fe3eddc3098098f386e154c39fba4b5530fda03de2bc2a Rapport préparé pour Ressources PMET. 792 pages.

KING M. D., J. E. ELLIOTT et T. D. WILLIAMS. 2021. Effects of petroleum exposure on birds: A review. Science of The Total Environment. 755 (1)

LESSARD, É., P. D. WALKER et E. VANDER WAL. 2026. Northern development and Rangifer risks: A review of the impacts of resource extraction for caribou and reindeer. Environmental Reviews, 34, 1–13.

MAGNAN, G., M. GARNEAU, L. PERRIER, J. BEAULNE, N.K. SANDERSON, G. PRIMEAU et D. LACHANCE. 2024. Guide d'inventaire pour l'estimation des stocks de carbone dans les milie ux humides – version mai 2024, Québec, ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs, Direction des milieux humides, 20 p. + annexes

MRNF. 2024. Guide de préparation du plan de réaménagement et de restauration des sites miniers au Québec. Direction de la restauration des sites miniers. ISBN 978-2-550-98873-1. 116 p. avec annexes. PDF en ligne : https://cdn-contenu.quebec.ca/cdn-contenu/ressources-naturelles/mines/Documents/restauration/GM_Restauration-sites-miniers.pdf

NIIGAAN. 2025. Projet Shaakichiuwaanaan – Plan de compensation – Recherche de projets et étude de préfaisabilité. Rapport du projet 151024013 (22-0095-15). 84 pages.

PÊCHES et OCÉANS CANADA. 2025. Politique sur l'application de mesures visant à compenser les effets néfastes sur le poisson et son habitat. 38 p.

PLANTE, S., C. DUSSAULT, J. H. RICHARD et S. D. CÔTÉ. 2018. Human disturbance effects and cumulative habitats loss in endangered migratory caribou. Biological Conservation, Volume 224, 129-143 p.

POST, E. ET D. R. KLEIN. 1999. Caribou calf production and seasonal range quality during a population decline. The journal of wildlife management, 63(1), 335-345.

RAYMOND-BOURRET, E. 2017. Détermination des impacts respectifs de la perte et de la fragmentation de la forêt mature sur l'écologie spatiale des grands mammifères. Mémoire de maîtrise, Université du Québec à Rimouski, Département de biologie, chimie et géographie, 111 p.

REIJNEN, R., R. FOPPEN, et G. VEENBAAS. 1997. Disturbance by traffic of breeding birds: evaluation of the effect and planning and managing road corridors. Biodiversity and Conservation 6: 567-581.

SHANNON, G., M.F. MCKENNA, L.M. ANGELONI, K.R. CROOKS, K.M. FRISTRUP, E. BROWN, K.A. WARNER, M.D. NELSON, C. WHITE, J. BRIGGS, S. MCFARLAND et G. WITTEMYER. 2015. A synthesis of two decades of research documenting the effects of noise on wildlife. Biological Review, 91 (4): 883-1148.

TREMBLAY, J.A. ET J. JUTRAS. 2010. Les chauves-souris arboricoles en situation précaire au Québec – Synthèse et perspectives. Le Naturaliste canadien 134(1): 29-40

WEIR, J. N., S. P. MAHONEY, B. MCLAREN et S. H. FERGUSON. 2007. Effects of mine development on woodland caribou Rangifer tarandus distribution. Wildlife Biology, 13(1), 66-74.

WSP. 2026. Projet minier Shaakichiuwaanaan. Étude d'impact sur l'environnement. Eeyou Istchee Baie-James. Rapport produit pour Ressources PMET Inc.Réf. WSP : CA0001724.3318. Pagination multiple et annexes.

YAMAZAKI, Y., H. YAMADA, M. MUROFUSHI, H. MOMOSE et K. OKANOYA. 2004. Estimation of hearing range in raptors using unconditioned responses. Ornithol Sci 3: 85–92.