8 Identification and assessment of impacts

This chapter presents the methodology used to assess the impacts of the mining project (section 8.1) and the impact assessment itself (section 8.2). The impacts are assessed for each of the VECs selected, which are grouped under the issue that includes them, as defined in the previous chapter. The order in which they are presented in no way reflects their priority and is based solely on the arbitrary numbering system that has been chosen.

8.1 Method for identifying and assessing impacts

This project is based on an environmental assessment approach that takes into account important issues related to the project. Through a consultation process led by both government agencies and the proponent, this approach requires the identification of key project issues raised by the stakeholders concerned.

During the impact analysis stage, this traditional approach first identified all valued ecosystem components (VECs) for the area concerned and the various project activities during the pre-construction, construction, operations, and closure phases. It then considered the possible interactions between the project activities and the ecosystem components, and assessed the significance of the impacts on the selected ecosystem components, i.e., those that could be impacted.

Two preliminary steps have been added to this approach given the issues at stake: identifying the issues on which there is consensus among stakeholders and identifying, among the VECs described in Chapter 6, those stemming from each of these issues. These two steps were completed in Chapter 7.

In this chapter, only the possible interaction between the selected VECs stemming from the issues and the various project activities is considered. The assessment of the significance of the resulting residual impacts is also presented as for the traditional approach.

8.1.1 Identification of potential impacts

At this stage, the possibility of interaction between the project activities (defined in Chapter 5 and presented on the y-axis of Table 8-1) and the VECs selected for each of the project issues (defined in Chapter 7 and presented on the x-axis of Table 8-1) is assessed using an interaction grid as illustrated in Table 8-1. Each possible interaction identified and corresponding to a potential impact is presented in the interaction grid. It should be noted that there may be various types of interactions for the same VEC/activity pair. For example, a given activity could have both positive and negative potential impacts on the same component.

Due to space constraints, the issues are not named in the interaction grid, but they are listed below:

- Issue 1: Preservation of aquatic habitat quality;
- Issue 2: Preservation of soil and groundwater quality;
- Issue 3: Preservation of wetlands and habitats of interest to terrestrial fauna and flora;

- Issue 4: Preservation of the quality of life of the local population;
- Issue 5: Preservation of the health, safety, and socioeconomic conditions of the regional population;
- Issue 6: Preservation of the traditional activities and practices of the Indigenous population and the activities and practices of the non-Indigenous population;
- Issue 7: Consideration of climate change.

Table 8-1 Grid of possible interactions between the ecosystem components and the activities

		Issue 1			Issue 2		Issue 3				Issue 4	Issue 5			Issue 6				Issue 7
Environmental component		**Hydrodynamic and hydro-sedimentary conditions**	**Surface water quality**	**Aquatic fauna and habitats**	**Soil quality**	**Groundwater quality**	**Wetlands and water environments**	**Wildlife species of special status**	**Terrestrial wildlife (large wildlife and other mammal species, avifauna)**	**Forest cover**	**Air quality**	**Physical, psychological, and social health**	**Economic activities**	**Road safety**	**Hunting and trapping of terrestrial wildlife and waterfowl**	**Fishing**	**Harvesting of valued plant species**	**Well-being on the land**	**Climate change mitigation (GHG emissions)**
Activities																			
Construction	Site organization, stripping, and clearing																		
	Surface preparation and access layout																		
	Construction of structures and infrastructure																		
	Transportation and traffic related to materials and supplies																		
	Production and management of residual and hazardous materials																		
	Workforce and procurement																		
Operations	Presence and operation of new infrastructure																		
	Water use and management																		
	Transportation and traffic related to ore and supplies																		
	Production and management of residual and hazardous materials																		
	Workforce and procurement																		
Closure	Presence of site remains																		
	Transport and traffic during the work																		
	Final restoration																		
	Production and management of residual and hazardous materials																		
	Workforce and procurement																		

Negative impact

Positive impact

Negative and positive impact

Lastly, it should be noted that the description of the potential impact will be included in 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

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 will be carried out for each phase of the project, namely construction, operations, and disassembly. A distinction will be made between positive and negative impacts. This assessment takes into account measures incorporated into the project design, as well as applicable mitigation and enhancement measures, and focuses on impacts that remain after these measures have been implemented.

The significance of the residual impact on a given VEC depends on three criteria: its intensity (determined based on the value of the component and the degree of disturbance anticipated), its extent, and its duration. The probability of occurrence is also assessed, but separately, as an additional qualifier of the impact. These elements are presented in Appendix 8-1.

Lastly, common mitigation measures that relate to the implementation of best practices or resulting from the legal application of laws, regulations, standards, or guidelines, which are considered an integral part of the project at this stage, are presented in Appendix 8-2. In addition to these common mitigation measures, specific mitigation measures tailored to the project can then be developed to reduce the significance of negative impacts on VECs; measures to enhance positive impacts can also be developed. These specific measures are presented in the sections on the analysis of residual impacts for each VEC selected.

Residual impacts classified as “high” will be considered as requiring mitigation measures. This need will be highlighted during the assessment process of the significance of residual impacts, but offsetting measures will be 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 hydro-sedimentary conditions)

Hydrology deals with the hydrodynamic and sediment-related conditions associated with the movement of water (flow rate, volume, etc.) and sediments (sediment transport, bank erosion), which may be disrupted by construction, operations, and restoration work. It should be noted that, within the scope of the project, hydrology is of interest due to the changes it may undergo, notably due to the significant hydrological modifications resulting from works associated with the development of the La Grande Complex. A **medium** ecosystem value was assigned to this VEC to reflect this level of interest.

Summary of current conditions

To determine the existing hydrological conditions in the biophysical LSA, eleven calculation points were selected within the three main watersheds that make up the area: those of the La Grande River, Lac de la Corvette, and Lac Pontois. With regard to average monthly flow rates, most of the stations (6 out of 11) show values well below 1 m^3/s, while one station (Lake L633) shows flow rates ranging from 0.09 m^3/s to 1.35 m^3/s. The three stations in the immediate vicinity of the mine site (Lake L01, Lake L27, and Watercourse CE15) show greater variability in average monthly flow rates, ranging from 0.4 m^3/s to 14.1 m^3/s. Finally, the last station, located at Lac de la Corvette, shows very high average monthly flow rates ranging from 13.8 m^3/s to 113 m^3/s.

As for ice conditions, the data show that ice cover begins to form between mid- and late November on small lakes and watercourses, but not until late November or early December on Lac de la Corvette. Similarly, the ice melts earlier in smaller lakes and watercourses (mid- to late May) than in Lake Lac de la Corvette (late May to early June).

Construction phase

Statement of potential impact

Changes in hydrodynamic and hydro-sedimentary conditions.

Sources of the impact

- Site organization, stripping, and clearing.
- Surface preparation and access layout.
- Transportation and traffic related to materials and supplies.

Detailed description of the impact

Two main factors may affect hydrodynamic and hydro-sedimentary 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 along access and traffic roads on the mine site.

Construction of the diversion channel

The primary impact associated with hydrodynamic and hydro-sedimentary conditions during the construction phase is linked to the opening of the diversion channel between Lake L01 and Lake L05 and the closure of Watercourse CE1 (the natural outflow from Lake L01), which currently flows into Lake L07. This diversion could lead to changes in the volume of water received (risk of flooding) and the flow rate of water in Lake L05 and Watercourse CE8, and could cause erosion and changes in existing sediment accumulation areas. In addition, the inflow of water from Lake L01 via Lake L05 and the Watercourse CE8 into Lake L07 could also cause changes in the dynamics of water movement and in the sediment deposition areas in this lake. It is also possible that areas of riparian erosion could develop in the vicinity of the outlet of Watercourse CE8 where it flows into Lake L07.

The study conducted by AtkinsRéalis (2025) (Appendix 8-3) on the modelling of flood zones and erosion caused by the construction of the diversion channel shows that:

- Annual flooding primarily affects vegetated areas, the rights-of-way of the affected watercourses, associated lakes, and the floodplains surrounding these water bodies for most return periods, except in the case of a 100-year flood, when they extend to Lakes L08 and L218, located immediately north of the drainage network between Lake L01 and Lake L27.
- Under normal conditions, the floodplain area between Lake L05 and Lake L27 covers 19.5 hectares, and this area could increase to 43.2 hectares when flood conditions exceeding a 100-year flood (or the maximum probable flood level) occur—a 120% increase from current levels. Table 8-2 shows the increase in these areas as a function of flood recurrence periods, and
  Figures 8-1 and 8-2 illustrate the flooded areas for a 2-year return period and in the event that the probable maximum flood occurs (>1:100 years).
- In the case of a 2-year return period (used for modelling because it is more frequent), erosion and deposition processes are possible in four areas between the outlet of the diversion channel into Watercourse E05 and Lake L27 (Figure 8-3), namely:
  - in Watercourse CE08, approximately 1.2 km downstream from the channel's outlet;
  - at the outlet of Lake L07, in Watercourse CE11, approximately 2.2 km downstream from the channel's outlet;
  - in Watercourse CE11, just upstream of Lake L10, approximately 2.9 km downstream from the channel's outlet;
  - in Watercourse CE15, approximately halfway between Lakes L10 and L27 and about 3.6 km downstream from the channel's outlet.

Table 8-2 Increase in flooded area by return period

Return period	Flooded area (ha)	Increase in the floodplain area (ha)	Increase in the flooded area (%)
Normal conditions	19.5	0	0
2 years	20.2	0.7	4
10 years	22.3	2.8	14
25 years	24.1	3.6	18.5
50 years	25.3	5.8	30
100 years	26.3	6.8	35
Probable maximum flood (>100 years)	43.2	23.7	121

These erosion processes could cause the affected areas to deepen by up to 0.4 m. However, modelling also shows that much of the eroded material is redeposited a short distance downstream from the erosion zone (10 m to 20 m further downstream). This is likely caused by a decrease in flow velocity associated with widenings in the flow channel and a decrease in flow velocity.



Figure 8-1 Areas flooded with a 2-year return period

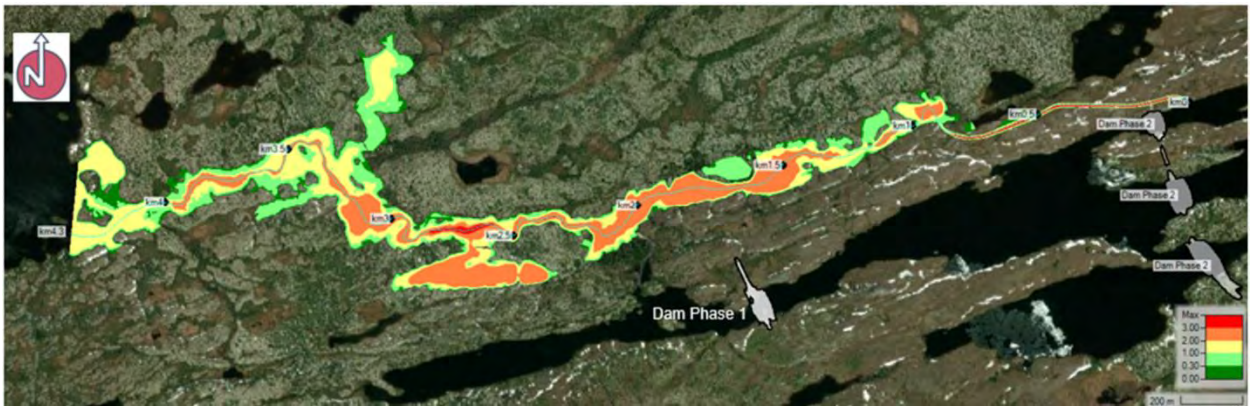


Figure 8-2 Areas flooded in the event of probable maximum flood (>100 years)



Figure 8-3 Potential erosion areas between the diversion channel and Lake L27

In general, the modelling results show that:

- although there has been a significant increase in the surface area subject to flooding, the consequences are minor since they do not affect any sensitive components;
- despite the presence of four erosion zones along the flow path between the diversion channel and Lake L27, the modelling shows only a minimal effect on the morphology of watercourses and bodies of water, while only minor changes are anticipated in the steeper flow zones.

Culvert installation

The installation of culverts along roads and traffic routes on the mine site may require temporary interruptions or diversions of the flow of the affected watercourses. In addition, this work involves excavation along the banks and at the bottom of the watercourse to install the culvert, as well as backfilling to restore the banks before the traffic route is completed. This work risks introducing sediment into the watercourse, altering the sediment distribution downstream of where the work is being carried out. Lastly, the culvert can act as an obstacle to water flow, slowing the flow rate upstream and creating a zone of accelerated flow at its outlet.

Mitigation measures

The common mitigation measures are presented in Appendix 8-2; in particular, some measures from the "Soil, surface water, and sediment quality" section apply to this VEC. However, with regard to this VEC, several measures were incorporated into the project design from the outset to minimize the anticipated impacts, including:

- the location and design of the diversion channel in an area of rocky substrate to minimize the risk of erosion in and around the channel;
- the design of the channel to ensure its capacity to handle the volumes potentially generated by various flood events (up to >100-year floods);
- reconnecting the channel to the same network of lakes and watercourses to which the current natural outflow is connected;
- the development of a model of the channel's potential effects on local hydrodynamic and hydro-sedimentary conditions (discussed above) to determine whether action will be required and, if so, in which location;
- the design of the culverts to be installed so that they allow water to flow freely, in accordance with the requirements of the *Regulation respecting the sustainable development of forests in the domain of the State* (RADF).

In addition to the common measures and those incorporated into the project design, the following specific measures are proposed:

- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).
- Develop and implement a monitoring program for the diversion channel to confirm its capacity to manage water volumes originating from Lake L01 and the absence of signs of erosion along its alignment (P30).
- Develop and implement a monitoring program to assess free water flow and erosion processes along the network of lakes and watercourses between the diversion channel connection point at Lake L05 and the mouth of watercourse CE15 at Lake L27. Areas at risk of erosion identified through the modelling conducted by AtkinsRéalis (2025) shall be specifically included in this program (P31).

Assessment of residual impact

During the construction phase, the implementation of the various proposed mitigation measures is expected to result in a **moderate** level of disruption to hydrodynamic and hydro-sedimentary conditions. Given the low value assigned to this VEC, the impact intensity is **low**. This impact will be felt at the local level during the construction and operations phases (**medium** duration), resulting in a residual impact of **minor significance**. The likelihood of these impacts occurring is high, and the reversibility potential is **low**, as there are no plans to close the diversion channel once the work is complete, so as to avoid creating further disruption to this VEC after the system has stabilized during the operations phase.

Impact on hydrodynamic and hydro-sedimentary conditions			
Intensity:	Low	**Significance:**	Minor
Extent:	Local		
Duration:	Medium		
Probability of occurrence:		High	
Reversibility:		Low	

Operations phase

Statement of potential impact

Changes in hydrodynamic and hydro-sedimentary conditions.

Sources of the impact

- Water use and management.
- Transportation and traffic related to ore and supplies.
- Dewatering and keeping the mine dry.

Detailed description of the impact

The impacts associated with the operations phase are primarily related to the diversion of surface or groundwater that normally flows into certain watersheds to the watershed receiving the mine effluent. The volumes associated with the pumping of water from the underground mine and the open pit are determined through modelling, and these results are used in the calculations to determine the effect of water diversion on the average flows of the affected hydrological network. The sections below describe the process of pumping dewatering water and the results of the associated modelling, as well as the implications of water diversion.

Dewatering of the underground mine and the pit

The pumping operations required to dewater the underground mine and the pit will take place during the operations phase and will result in changes to the flow patterns of groundwater and, potentially, surface water. In fact, during the various stages of operations, groundwater seeping into the mine and the pit will be pumped to the surface to keep the work areas dry, thereby creating a drawdown cone.

A lowering of the water table in the rock and in the unconsolidated deposits thus will be observed on the perimeter of the underground infrastructure. The impact of dewatering activities on the flow regime is determined by hydrogeological characteristics, namely the hydraulic properties of geological formations and their connection to the surface water system. These characteristics are particularly complex in the case of hydrogeological systems in the fractured rock environment, as encountered on the site. This is why it is usual to proceed by digital modelling to represent the hydrogeological system and assess the potential impacts of the dewatering activities.

Hydrogeological modelling was performed to assess the impact of mining operations on the surrounding environment (drawdown of the water table) and to estimate dewatering flows at various stages of operations (Appendix 6-11: Mailloux, 2026). Predictive simulations were conducted to assess the rate of water seepage into the mine and the pit, as well as the anticipated drawdown. The final drawdown was evaluated and is shown in Map 8-1. Drawdown of the water table will reduce the contribution of groundwater to the base flow of watercourses. The drawdown of the water table extends 1,300 m to the southeast of the pit footprint, 1,100 m to the northwest, and 1,100 m to the southwest, according to Mailloux's simulations (Appendix 6-11). The decrease in base flows of lakes compared to current conditions was assessed during the modelling process and was used to estimate the anticipated reductions in average flows (Table 8-4). Groundwater infiltration estimates for the base case were calculated for 2032, 2036, 2040, 2044, and 2049 (Appendix 6-11). The expected dewatering flows at the end of operations (2049) are 3,200 m^3 per day for the open pit and 4,900 m^3 per day for the underground mine.

Catchment and diversion of surface water

During the operations phase, the anticipated impact on hydrodynamic and hydro-sedimentary conditions is primarily associated with the encroachment on portions of watersheds and the diversion of water (water catchment, pumping for drinking water, dewatering) from these watersheds to the one receiving the mine effluent, and more specifically into Watercourse CE11. Since some of the collected water did not flow through this sub-watershed, the mine effluent will add additional volume, which could exacerbate flooding and erosion. In addition, the surface water catchment from the mine site, as well as the pumping of drinking water and dewatering water, will affect the various sub-watershed concerned (Maps 8-1 and 8-2), since the diverted water will no longer flow into them.

-73°57'
-73°54'
53°33'
53°30'
INF-09
CV24-608
CV24-624
CV24-633
CV24-633A
INF-08
CV24-611
CV24-642
CV24-601
CV24-594
CV24-588
INF-04
CV24-569
INF-02
CV24-640
INF-01
CV24-640A
CV24-575
CV24-658
CV24-557
INF-07-B
INF-07-A
INF-06
CV24-566
CV24-544
CV24-729
CV24-560
INF-05
CV24-553
CV24-580
CV24-657
CV24-552
CV24-673
CV23-167
CV23-186
CV24-548
CV24-672
CV24-537
CV24-547
CV24-780
CV24-782
CV23-159
CV23-145
CV23-155
CV24-533
CV24-696
CV23-166
CV23-144
CV24-536
CV24-784
CV24-534
10
5
3
1
La Grande-4
Réservoir La Grande 4
La Grande 4 Reservoir
Réservoir La Grande 3
La Grande 3 Reservoir
Route Transtaiga
Transtaiga Road
Lac de la Corvette
0
15 km

Zones d'étude / *Study Areas*

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

Composantes du projet / *Project Components*

- Projetées / *Projected*

Hydrogéologie / *Hydrogeology*

- Puits d'observation / *Monitoring well*

Rabattement simulé (fin exploitation) / *Simulated drawdown (end of exploitation)*

- 10 (m)
- 1 (m)

Infrastructures / *Infrastructures*

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

Réseau routier / *Road Network*

- Route collectrice municipale / *Municipal collector road*

Composantes de l'écosystème / *Ecosysteme Componant*

- Milieu terrestre / *Terrestrial environment*

Milieux humides et hydriques / *Wetlands and Hydrous Environments*

- Marécage arborescent / *Treed swamp*
- Marécage arbustif / *Shrubby swamp*
- Tourbière minérotrophe boisée / *Treed fen*
- Tourbière minérotrophe ouverte / *Open fen*
- Tourbière ombrotrophe boisée / *Treed bog*
- Tourbière ombrotrophe ouverte / *Open bog*
- Marais / *Marsh*
- Eau peu profonde / *Shallow water*
- Plan d'eau / *Waterbody*

Cours d'eau / *Watercourses*

- Intermittent / *Intermitent*
- Permanent / *Permanent*

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Étude d'impact sur l'environnement / *Environmental Impact Assessment*

Carte 8-1 / *Map 8-1*
Rabattement simulé - fin de l'exploitation/ *Simulated drawdown - End of Exploitation*

Sources / Sources

AQréseau+, réseau routier, MERN, 2016
BDGA, 1M, MERN, 2014
CanVec, 250k,RNCan, 2017

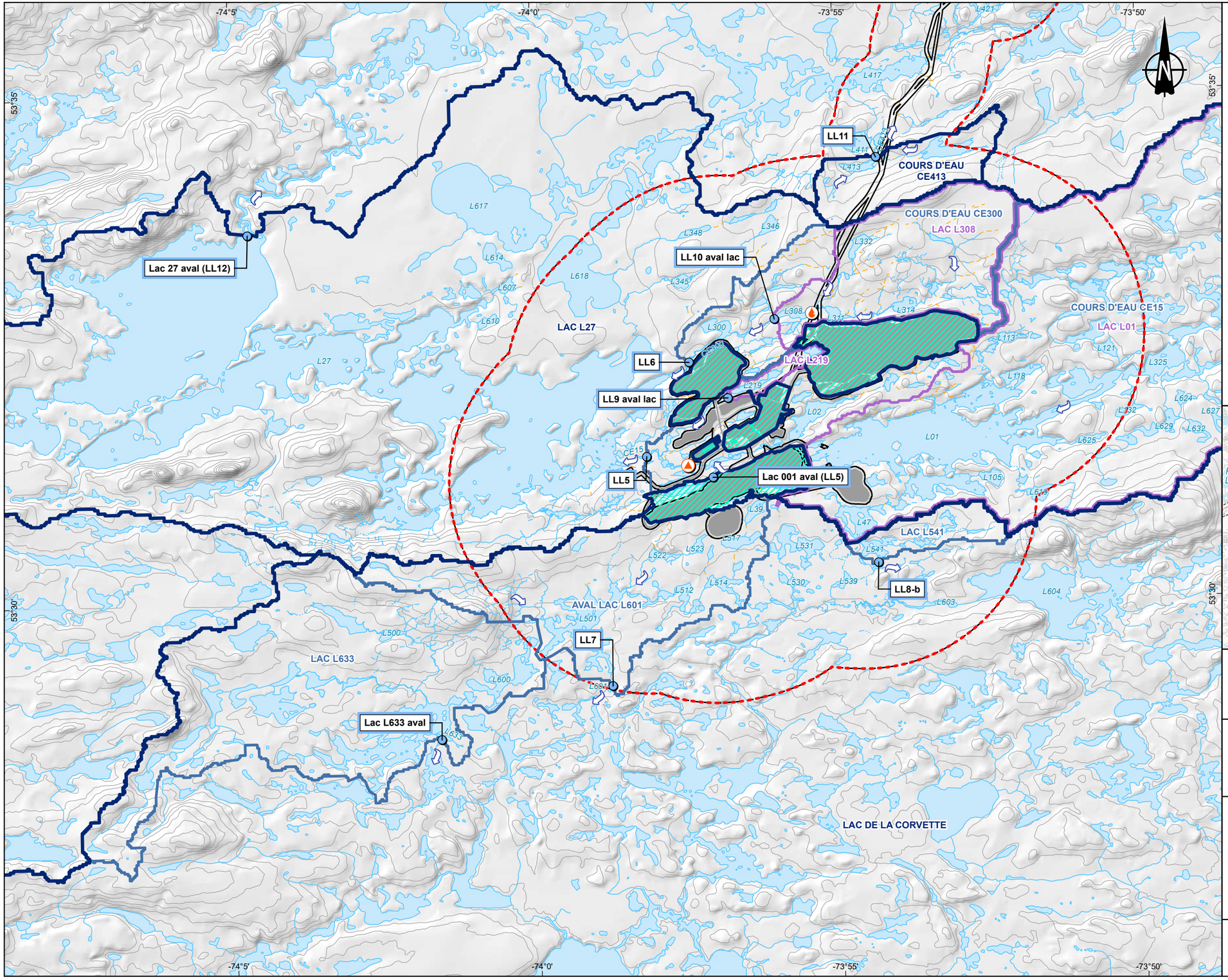
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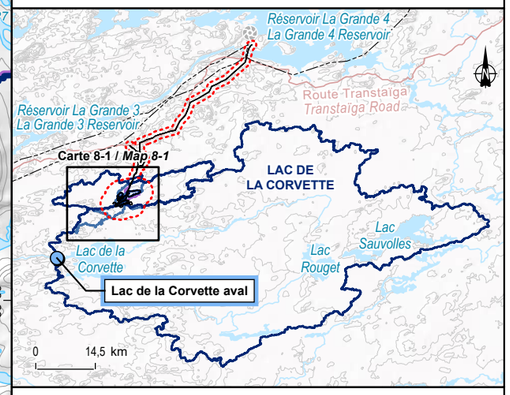
UTM, fuseau 18, NAD83 (CSRS)

2026-03-24

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CA0001724_3318_eie_c08_1_151_rabattement_260324

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*
- Locale - Biophysique / *Local - Biophysical*

Hydrologie / *Hydrology*
- Sens d'écoulement de l'eau / *Waterflow direction*
- Point de calcul / *Calculation point*
- Zone de collecte d'eau de ruissellement / *Runoff water collection area*

Bassins versants projetés / *Projected Watersheds*
- Principal / *Principal*
- Intermédiaire / *Intermediate*
- Sous-bassin versant / *Sub-watershed*

Composantes du projet / *Project Components*
- Effluent minier / *Mining effluent*
- Prise d'eau / *Water intake*
- Autres composantes projetées / *Other projected components*

Hydrographie / *Hydrography*
- Plan d'eau / *Waterbody*

Cours d'eau / *Watercourses*
- Intermittent / *Intermitent*
- Permanent / *Permanent*
- Souterrain / *Underground*

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Étude d'impact sur l'environnement - Impacts / *Environmental Impact Assessment - Impacts*

Carte 8-2 / *Map 8-2*
Bassins versants, bassins intermédiaires et sous-bassins potentiellement affectés par le projet / *Watersheds, Intermediate Basins, and Sub-Watershed Potentially Affected by the Project*

Sources :
CanVec, 1/250 000, RNCan, 2017
BDGA, 1M, MERN, 2014
Cartographie écologique de la végétation du Nord Québécois, MFFP, 2013

0 700 1 400 m
NAD 1983 CSRS UTM Zone 18N

2026-03-24

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CA0001724_3318_eie_c08_2_109_hydrologie_260324

According to the results (Table 8-3), the sub-watersheds that will be most affected are those of Lakes L219 and L308, located to the north and northeast of Stockpile 02, as well as the sub-watershed of watercourse CE300, which receives water from the sub-watershed of Lake L308 before discharging it into Lake L27. The Lake L219 sub-watershed is expected to see a reduction in its average flow of approximately 34% over the course of each year, while Lake L308 is expected to see a reduction in its average flow ranging from 12% to 17%, with the largest reductions occurring from December through April. Lastly, the sub-watershed of Watercourse CE300 would experience a reduction in its average flow ranging from 11% to 15%, with the largest reductions occurring during the months of December through April. These sub-watersheds will be primarily affected by the pumping of water from Lake L308 to supply the mine site with drinking water and by the encroachment of Stockpiles 01 and 02, while runoff collected from these areas will be directed to treatment facilities before being discharged into Watercourse CE11 via the mine effluent.

An intermediate watershed located south of the open pit—specifically that of Lake L601—will also experience a reduction in its average flow. This reduction will be significantly smaller, as it is estimated to be around 3% for each year. This reduction is likely due to the encroachment of the pit and Stockpile 04, as well as the pumping required to dewater the pit.

All encroachments and diversions of surface water will have only a minor effect on the average flow at the outlet of Lake L01, with an estimated average annual reduction of 3.6%.

Mine effluent

With regard to the impact of mine effluent, modelling carried out by AtkinsRéalis (2025) shows that the addition of the associated volumes will have only a minor to negligible effect on rising water levels and on the morphology of the affected water bodies. As for the effects on average flow, estimates were made for Watercourse CE15 and the outlet of Lake L27 (Table 8-3). Hydraulic modelling and flow calculations show a slight decrease in flow at these two points during May and June, possibly caused by surface water being retained in the watersheds, thereby reducing the spring flood. For all other months, the results show an increase in average flow due to effluent inflow, which is particularly noticeable during the winter months, when inflow from natural sources is reduced but effluent inflow remains steady.

Mitigation measures

The common mitigation measures are presented in Appendix 8-2; in particular, some measures from the “Soil, surface water, and sediment quality” section apply to this VEC. However, with regard to this VEC, several measures were incorporated into the project design from the outset to minimize the anticipated impacts, including:

- The development of a model of the potential effects of mine effluent on local hydrodynamic and hydro-sedimentary conditions (discussed above) to determine whether action will be required and, if so, in which location;
- The development of a model of hydrological conditions and flow calculations to anticipate the effects of the diversion of surface water from certain peripheral watersheds into Watercourse CE11.
- The design of the surface water collection and treatment system at the mine site to ensure sufficient retention capacity and facilitate control of the flow of mine effluent into Watercourse CE15.

Table 8-3 Impact (in %) of catchment and diversion of water, as well as mine effluent, on the average flow of watersheds

Watershed name	Average flow rate (%) per month											
	January	February	March	April	May	June	July	August	September	October	November	December
Lake L01 (LL1)	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6
Lake 27 (LL12)	6.1	8.5	10.7	3.2	-1.2	-0.8	5.3	4.7	0.7	0.3	3.9	2.5
Lake L633	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lac de la Corvette	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
CE15 (LL5)	12.8	17.5	21.7	7.4	-1.2	-0.5	11.1	10.0	2.3	1.7	8.5	5.9
CE300 (LL6)	-13.4	-14.1	-14.7	-12.6	-10.9	-11.0	-11.5	-11.4	-11.3	-11.4	-11.5	-12.4
Downstream Lake L601 (LL7)	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1
Lake L540 (LL8-b)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lake L219 (LL9)	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2
Lake L308 (LL10)	-15.3	-16.2	-17.0	-14.1	-11.8	-12.0	-12.6	-12.5	-12.3	-12.5	-12.7	-13.8
CE413 (LL11)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

In addition to the common measures and those incorporated into the project design, the following specific measures are proposed:

- Develop and implement a monitoring program to track water flow and erosion along the network of lakes and watercourses receiving mine effluent, particularly where they intersect with transportation routes (P32).
- Develop and implement a program to monitor the quality of dewatering water before it enters the polishing pond to confirm the absence of contaminants (other than suspended solids) that may require treatment (P37).

Assessment of residual impact

During the operations phase, based on the results of the projected flow rate calculations and with the implementation of the various proposed mitigation measures, it is expected that there will be only a **minor** impact on hydrodynamic and hydro-sedimentary conditions. Given the low value assigned to this VEC, the impact intensity is **low**. This impact will be felt at the local level throughout the entire period of operations (medium duration), resulting in a residual impact of **minor significance**. The likelihood of these impacts occurring is **high**, and the reversibility potential is **low** regarding the effects of surface water diversion and effluent inflow, since the stockpiles as well as the effluent will need to be managed beyond the closure phase.

Impact on hydrodynamic and hydro-sedimentary conditions			
Intensity:	Low	**Significance:**	Minor
Extent:	Local		
Duration:	Medium		
Probability of occurrence:		High	
Reversibility:		Low	

Closure phase

Statement of potential impact

Restoration of hydrodynamic and hydro-sedimentary conditions.

Sources of the impact

- Final restoration.

Detailed description of the impact

As part of mine site closure, the diversion channel will be left in place, and a breach will be created in one of the dikes in order to restore the natural flow of water into the open pit. The open pit will fill gradually until reaching a piezometric equilibrium with the surrounding environment.

Water collection and diversion around the waste rock piles and the treated mine effluent will also be maintained during the post-operations period until the completion of restoration works. However, a reduction in flow is anticipated for this effluent, as most of the site will be regraded to restore natural runoff conditions, with the exception of drainage capture at Waste rock stockpile 02. Overall, no impacts are anticipated on this component, aside from very minor risks of disturbance of watercourses and water bodies during restoration works, and a slight positive effect associated with the reduced flow from the mine effluent.

During the post-restoration period of the project, once water quality has been confirmed, dismantling of the water management system—including the creation of breaches in the dikes of the collection ponds associated with waste rock stockpiles 01 and 02—and site topography will result in four final effluents to be monitored, namely two effluents at waste rock stockpile 01 and two effluents at waste rock stockpile 02. The final effluent at the outlet of the project's water treatment system will have been dismantled.

Mitigation measures

The common mitigation measures are presented in Appendix 8-2; in particular, some measures from the "Soil, surface water, and sediment quality" section apply to this VEC.

Assessment of residual impact

During the closure phase, the implementation of the various proposed mitigation measures is expected to result in only **minor** disruption and improvement in hydrodynamic and hydro-sedimentary conditions. Given the low value assigned to this VEC, the intensity of the negative and positive impacts is **low**. These impacts will be felt locally and only during restoration activities (short-term) in the case of negative impacts, whereas positive impacts will be felt beyond the closure (long-term). The result is a negative residual impact of **minor significance** and a positive impact of **moderate significance**. The probability of the negative impact occurring is **low**, whereas the probability of the positive impact occurring is **high**. As for the potential for reversibility, it is **high** for negative impacts.

Impact on hydrodynamic and hydro-sedimentary 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, watercourses, lakes) that may be affected by construction, operations, and closure activities. It should be noted that, within the scope of the project, surface waters are assigned a medium ecosystem value, as they are of significant interest and their conservation and protection are a priority. They are also considered to have significant socioeconomic value because they are deemed essential and are used by a significant portion of the affected populations. Since the value to be applied is the higher of the two, a **high** value will be used to analyze the impacts of this VEC.

Summary of current conditions

A total of 29 sampling stations located throughout the biophysical LSA—six in the area exposed to mine effluent and 23 in the reference area—were sampled for surface water quality between 2022 and 2025. Detailed results can be found in the sectoral report on surface water and sediments (Niigaan, 2025) presented in Appendix 6-7.

All of the lakes under consideration are oligotrophic, slightly acidic (average pH 6–6.5), well oxygenated at the surface, and have low biological productivity. The main exceedances observed in surface water samples were for pH, dissolved oxygen, and certain total extractable metals, notably aluminum, iron, and mercury. A few instances of exceedances of fluoride and zinc concentrations were also observed. The metals with the highest exceedances were aluminum (CWQG) and mercury (CPC [EO], CPC [O], and CFTP). These exceedances may be related to the local geology and rock composition of the region.

Finally, it should be noted that samples taken from the reference lake located to the northwest outside the biophysical LSA exceeded quality criteria for pH, dissolved oxygen, and aluminum.

Construction phase

Statement of potential impact

Alteration of surface water quality.

Sources of the impact

- Site organization, stripping, and clearing.
- Surface preparation and access layout.
- Transportation and traffic related to materials and supplies.
- Production and management of residual and hazardous materials.

Detailed description of the impact

Surface water quality can be altered physically by increased turbidity associated with particulate emissions, or chemically by the introduction of contaminants. TSS or contaminated water can be introduced directly or indirectly, via runoff water.

Increase of TSS in surface waters

During construction work, particulate matter may be carried into watercourses through dust raised by the work and through runoff flowing over exposed surfaces. In fact, during the stripping, clearing, and development of the areas required for the mine site (storage areas, areas for buildings and support infrastructure, new access roads), large tracts of bare land will be exposed to wind and runoff for the duration of the work. Dust stirred up by the wind and generated by passing vehicles can, as it settles, contribute to increased TSS concentrations in nearby water bodies and watercourses. Runoff will carry particulate matter—released as a result of soil exposure—into watercourses and bodies of water located near the work site.

Accidental introduction of petroleum hydrocarbons and other contaminants into surface water

Construction work can lead to accidental leaks and spills of petroleum hydrocarbons associated with the use of, among other things, mobile equipment. These leaks and spills can be caused by breakdowns in mobile equipment or by improper handling of petroleum products during refuelling or when receiving and storing them. Surface water contamination can occur directly if construction work or the handling of petroleum products takes place near a body of water or a watercourse. Contamination can also be indirect, as runoff carries contaminants spilled onto the ground into water bodies and watercourses. Another source of contamination is associated with the handling and management of hazardous waste that may have been improperly stored and exposed to the elements.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those measures in the "Ambient air" and "Soil, surface water, and sediment quality" sections apply in whole or in part to this VEC. In addition to these, the following specific measures must be taken into account:

- Whenever possible, preserve the forest cover along the road of the mine site and revegetate bare areas with native plants after completion of the work (P23).
- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).

Assessment of residual impact

As mentioned above, the value assigned to this VEC is high. The degree of disturbance is considered **low** because the anticipated impacts, after application of the mitigation measures, do not alter the integrity of surface water quality or its use, resulting in an impact of **medium** intensity. The extent of the impact will be limited to the **project** area, and it will be felt over the **short** term—specifically, only during the construction phase (less than two years). The significance of the residual impact is therefore **minor** for impacts related to TSS and contaminant spills or leaks. Despite the implementation of numerous mitigation measures designed to control the release of TSS into watercourses during construction, the probability of such an occurrence remains **medium**, whereas the probability of contamination by hydrocarbons or other substances is considered **low**. As for the potential for reversibility, it is considered **high** for both types of impacts.

<table>
<tr><th colspan="4">Impact on surface water quality</th></tr>
<tr><td>Intensity:</td><td>Medium</td><td rowspan="3">Significance:</td><td rowspan="3">Minor</td></tr>
<tr><td>Extent:</td><td>Project</td></tr>
<tr><td>Duration:</td><td>Short</td></tr>
<tr><td colspan="2">Probability of occurrence:</td><td colspan="2">Medium (TSS)/Low (contamination)</td></tr>
<tr><td colspan="2">Reversibility:</td><td colspan="2">High</td></tr>
</table>

Operations phase

Statement of potential impact

Alteration of surface water quality.

Sources of the impact

- Water use and management.
- Transportation and traffic related to ore and supplies.
- Production and management of residual and hazardous materials.

Detailed description of the impact

Given that, as a result of the construction work, a surface water catchment system will have been installed in the work areas and on access and traffic routes, the main sources of surface water contamination are associated with three primary sources: the discharge of TSS and other contaminants when the catchment system is overwhelmed by the volume of water collected, dust emissions, and mine effluent.

Introduction of TSS and other contaminants into surface water

In the operations phase, the network of ditches that redirects all surface water (both contact and non-contact) on the mine site—so that it can be treated and recirculated into the mine process or discharged into the environment—will be functional. Particulate matter washed away by runoff at the mine site should therefore not enter the natural watercourses and bodies of water. All collected runoff water will be treated either directly in the sedimentation pond, followed by the polishing pond or via the industrial wastewater treatment plant, followed by the polishing pond (see Chapter 5, Figure 5-8).

In addition, wind erosion of tailings and bare surfaces, as well as vehicle and machinery traffic on the site, is likely to generate dust that can be carried over a certain distance (Section 8.2.4.1 on air quality) and eventually settle in water bodies and watercourses, contributing to increased TSS concentrations.

Mine effluent

Water management includes collection, analysis, treatment of collected water on the mine site (runoff and contact water), and recirculation in the treatment plant process or discharge in the final effluent. The increase in mining operations will result in changes in the quality of contact water (i.e., water that has come into contact with potentially acid-generating tailings and waste rock), which will be treated accordingly to comply with the various applicable standards. In fact, the water treatment plant is designed so that the final effluent meets the discharge criteria set out in MELCCFP Directive 019 as well as those of the Metal and Diamond Mining Effluent Regulations (MDMER; see Table 8-4). In addition, it was designed to produce treated effluent that generally meets the surface water quality standards necessary to protect aquatic life, in accordance with the best available technology economically achievable (BATEA; AtkinsRéalis, 2026, see Appendix 5-10). AtkinsRéalis (2026) calculated the anticipated concentrations of contaminants in the final effluent. Table 8-3 presents the maximum concentrations calculated over a one-year period under normal precipitation conditions, as well as the quality criteria from Directive 019.

Table 8-4 Maximum metal concentrations calculated in the final effluent and quality criteria set forth in Directive 019 and the MDMER

	Aluminum (mg/l)	Antimony (mg/l)	Arsenic (mg/l)	Cadmium (mg/l)	Copper (mg/l)	Lithium (mg/l)	Nickel (mg/l)	Uranium (mg/l)
Final effluent	0.04	0.019	0.063	0.005	0.001	0.012	0.012	0.005
Directive 019	-	-	0.1	-	0.1	-	0.25	-
MDMER	1	-	0.1	0.1	0.25	-		

Following water treatment, parameters that will differ from the initial state established will possibly be found in low concentrations in the effluent water while complying with the water quality criteria in force.

An accidental spill of untreated water could occur exceptionally via the emergency spillways of the retention structures. An accidental spill (e.g., breach of tailings and waste rock management infrastructure, treatment equipment failure) could also result in an accidental discharge of untreated contaminated water. However, the consideration of this technological risk is addressed in Chapter 12, Accident risk management.

Mitigation measures

The same common mitigation measures recommended in the construction phase will be applied in the operations phase when work involves the same sources of potential impacts. Protection of water quality is governed by several regulations and standards, particularly for mining projects. These will be strictly followed, along with the mitigation measures set out in Appendix 8-2. Finally, the following specific mitigation measures will also be applied:

- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).
- The non-active areas of the stockpiles will be watered using a water truck as needed (P28).
- Dust suppressants will be used on the slopes and final (outer) surfaces of the stockpiles (P29).
- A program to monitor the quality of dewatering water before it enters the polishing pond will be developed and implemented to confirm the absence of contaminants (other than TSS) that may require treatment (P37).

Assessment of residual impact

Overall, the degree of disturbance is considered low at the effluent discharge point because; without compromising its environmental integrity, the impact results in a barely noticeable reduction in water quality due to compliance with standards for the protection of aquatic life. Given that the VEC value is high, this results in a **medium** intensity. The extent of the impact will be **local.** The impact of the effluent discharge will be felt over the medium term, i.e., for a period not exceeding the project's lifespan and its closure. The significance of the residual impact is therefore **moderate** over the entire period of operations. The probability of occurrence is **high**, but **low** for accidental spills. The potential for reversibility is considered medium. Finally, it should be noted that a monitoring program will be implemented to assess the quality of the surface water receiving the effluent and to determine the effluent's range of influence (Chapter 13).

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

[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.

Closure phase

Statement of potential impact

Alteration of water quality.

Gradual improvement in surface water quality.

Sources of the impact

- Final restoration.
- Production and management of residual and hazardous materials.

Detailed description of the impact

Alteration of water quality

During the closure phase, the demolition of buildings and infrastructure, soil remediation work (loosening, reprofiling, and spreading of organic soil), as well as the vehicle and machinery traffic required for these activities, may generate dust that, when settled, can contribute to increased TSS concentrations in water bodies and watercourses in the area surrounding the site. In addition, the operation of motorized equipment that requires the use of various pollutants (fuels, oils, etc.) can be a source of direct or indirect accidental contamination (via runoff) of water bodies and watercourses adjacent to the construction site. Improper handling and storage of these hazardous materials and the resulting hazardous waste can also contribute to such contamination.

Improvement of water quality

In general, the rehabilitation of the mine site and the revegetation of bare areas, including the various stockpiles, will significantly reduce dust emissions and limit the TSS load in runoff water.

It should also be noted that the water treatment plant and the polishing pond will remain in operation to treat leachate, particularly from Stockpile 02, which contains potentially acid-generating materials. This equipment must remain operational until the objectives of the post-restoration follow-up program for mine effluent (see Chapter 13, Section 13.2.2.7) are met. During this period, the mine effluent could continue to discharge contaminants which, although they would comply with current standards, could exceed baseline concentrations for some parameters.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the "Ambient air," "Soil, surface water, and sediment quality," and "Vegetation and wetlands" sections apply in whole or in part to this VEC. In addition to these, the following specific measure must be taken into account:

- Work together with the tallyman of trapline CH39 in carrying out rehabilitation, restoration, and revegetation activities and returning the site to its natural state (P22).
- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).

Assessment of residual impact

The anticipated impact on surface water quality is negative specifically with regard to the site closure work, but positive with regard to the site rehabilitation.

Thus, in terms of negative impacts, the level of disturbance is considered **low** after the implementation of mitigation measures. In fact, the effects will remain limited because, although they are similar to those during the construction phase, the work carried out during the closure phase is on a smaller scale. The intensity of the expected impact is therefore **medium.** This impact will be limited to the **project** area and will have a **short** duration, lasting only while the closure work is being carried out. Consequently, the residual impact is considered to be of **minor** significance. The probability of occurrence was assessed as **medium** and reversibility as **high**. Consequently, the residual impact is of **minor** significance.

The restoration of the site, including the revegetation of the areas and the gradual reduction of discharges into the mine effluent, has a positive impact. The degree of improvement is considered **high** for this VEC, resulting in a **high** positive impact. Stopping the effluent discharge will allow the environment to return to conditions similar to those found in natural environments, and the effects will be felt further downstream, throughout the mixing zone (**local** extent). These changes will naturally take several years to be felt, but for the stoppage of discharge, the impact will be immediate and long-term. The result is a positive impact of **major** significance. The probability of occurrence of the impact is assessed as **high**.

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

8.2.1.3 Aquatic wildlife (fish) and habitats

Aquatic wildlife and habitats include all aquatic species (fish, benthos) and habitats (bodies of water, watercourses) that may be disturbed by construction, operations, and closure activities. It should be noted that, within the scope of the project, aquatic wildlife and habitats are assigned a medium ecosystem value, as they are of significant interest and their conservation and protection are a concern. They are also assigned a medium socioeconomic value, as they are considered important and are used by a proportion of the populations concerned. Since the value to be applied is the higher of the two, a **medium** value will be used to analyze the impacts of this VEC.

Summary of current conditions

Inventories were conducted in 2022, 2023, 2024 and 2025 to characterize fish and benthic invertebrate habitats. These inventories covered all bodies of water and watercourses likely to be directly or indirectly affected by the project, including those exposed to the anticipated mine effluent. Reference components were also characterized to detect any changes in the aquatic environment. The detailed results of these inventories are presented in the sectoral reports prepared by Niigaan in 2025, which is available in Appendices 6-16 and 6-17.

Inventories of fish and fish habitats made it possible to avoid the placement of mine tailings or waste rock within their habitat and to preserve habitat integrity and have confirmed the presence of several species in the biophysical LSA, the most significant of which, for both Indigenous and non-Indigenous communities, are the northern pike, brook trout, lake trout, whitefish, and burbot. No rare, threatened, or vulnerable species were identified in the study area or within a 10-kilometre radius of the project site. No invasive alien species were detected.

The biophysical LSA had been subdivided into seven sectors to facilitate the organization of data from the inventories. Three of these sectors are most likely to be affected by mine operations: Lake L01, La Grande A, and Lake L27. Most of the bodies of water, as well as eight watercourses in the Lake L01 sector, are considered fish habitats, and eleven other watercourses are considered potential habitats. Lake L01 stands out in the sector for its wide variety of fish, as well as for its physical characteristics that are conducive to growth, feeding, and spawning (on coarse substrates and in vegetated areas). However, despite favourable environmental conditions, the targeted inventory of potential spawning shoals proved inconclusive, and the potential for lake trout remains limited due to the presence of clogged substrate.

The La Grande A sector (north of Lake L01) includes 27 bodies of water and 106 watercourses. Nearly all bodies of water and 35 watercourses are confirmed fish habitats, and 6 other watercourses are potential habitats. In this sector, Lake L10 stands out for having the greatest diversity of fish species, with 10 species identified.

The L27 lake sector comprises 42 bodies of water and 82 watercourses, of which 6 bodies of water and a significant number of watercourses have been confirmed as fish habitats. Lake L27 plays a key structural role in the sector.

For benthic inventories, a total of 13 stations were used in the reference area and 6 in the area exposed to mine effluent. Most stations showed considerable variability in the structure of their benthic communities, and six exhibited high organism density, significant taxonomic richness, and indicators suggesting diverse and well-distributed communities. From a taxonomic point of view, arthropods dominate most stations, mainly represented by chironomids, followed by mollusks (bivalves and gastropods).

Construction phase

Statement of potential impact

Disturbance of wildlife activities and aquatic habitats.

Sources of the impact

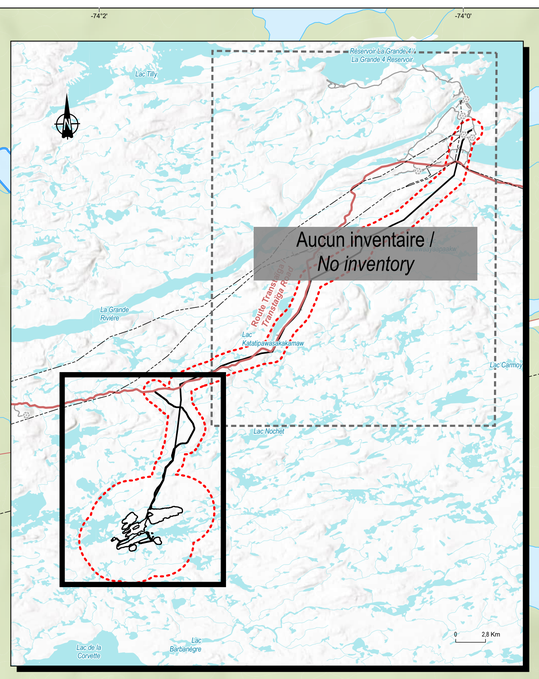
- Site organization, stripping, and clearing.
- Surface preparation and access layout.
- Transportation and traffic related to materials and supplies.
- Production and management of residual and hazardous materials.

Detailed description of the impact

In accordance with the development plan, the first phase of the project involves diking and draining on approximatively 13,5% of Lake L01 to create an open pit mine, which will result in the direct loss of approximately 57 hectares of fish habitat and will require the relocation of the existing fish populations (Map 8-3). The second phase, which involves the development of an underground mine, will involve the construction of dikes and diversion channels designed to maintain hydraulic connectivity and ensure the free passage of fish locally.

Habitat loss primarily affects the littoral areas with coarse, fine, and rocky substrates, shoals, and two pools ranging in depth from 6 to 8 metres. It also affects various functional habitats used for feeding, shelter, and potentially spawning by lithophilic species, including lake trout, brook trout, whitefish, and chub. These habitats are located primarily along the shoreline and near an islet in Lake L01, situated at the point where the lake's outflow—Watercourse CE1—begins, in areas exposed to prevailing winds. The loss also includes the isolation of habitats suitable for spawning by phytophilic species, particularly pike. These habitats are located in the littoral zone near the shoreline of the SH7 segment of the lake (Map 6-15), where there is a concentration of aquatic vegetation at the mouths of tributaries. In addition, potential spawning areas for lake trout are found in segment SH5, which is characterized by an abundance of pebbles, boulders, and coarse substrate. Segment SH9, on the other hand, offers spawning potential for brook trout due to the presence of finer, well-oxygenated substrates.

The drainage work will temporarily alter the waterline and expose the substrate, which will directly disrupt aquatic fauna—particularly benthic communities—even before fish relocation operations begin. Subsequently, the dike construction, pumping for drainage, and commissioning of the diversion channel will cause hydraulic changes in the bodies of water and watercourses located downstream of Lake L01. These operations could cause a one-time rise in water levels, as well as fluctuations in flow rate and velocity in some watercourses leading to Lake L27. Such variations are likely to affect the stability of riverbeds and banks, alter the distribution of available habitats, and influence the conditions necessary for fish migration, feeding, and reproduction.



Zones d'étude / *Study Areas*
- Projet / *Project*
- Locale - Biophysique / *Local - Biophysical*

Composantes du projet existantes / *Existing project components*
- Chemin d'accès / *Access road*
- Chemin d'accès à démanteler / *Access road to be dismantled*

Caractérisation de l'habitat / *Habitat Characterization*
- Herbier aquatique / *Aquatic plant*

Habitat du poisson / *Fish Habitat*
- Habitat / *Habitat*
- Pas un habitat / *Not a habitat*

Hydrographie / *Hydrography*
- Plan d'eau / *Waterbody*

Cours d'eau / *Watercourses*
- Intermittent / *Intermittent*
- Permanent / *Permanent*
- Permanent partiellement souterrain / *Permanent partially underground*
- Souterrain / *Underground*

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*

Projet minier Shaakichiuwaanaan /
Shaakichiuwaanaan Mining Project

Étude d'impact sur l'environnement /
Environmental Impact Assessment

Carte 8-3 / *Map 8-3*
Empiètement du projet sur l'habitat du poisson / *Project Encroachment on Fish Habitat*

Sources / Sources
AQhistoire+, Réseau routier, MERN, 2016
BDGA, 1M, MERN, 2014
Carrivec, 250k,RNCan, 2017

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UTM, fuseau 18, NAD83 (CSRS)

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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.

At the same time, activities such as stripping, material handling, pumping, and traffic in the construction zone will lead to an increase in airborne particulate matter. Particulate matter resulting from changes in the hydrological regime, soil erosion, and mine effluent will degrade water quality by increasing turbidity, which will reduce light penetration and limit oxygen availability for aquatic organisms. This increased turbidity will lead to sediment deposition in the Lake L27 outflow basin as well as in certain sections of downstream watercourses when hydrological conditions are conducive to particulate transport. These deposits could degrade habitat quality by clogging the substrates used for spawning and by affecting benthic communities, which serve as a vital food source for many fish species.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the "Ambient air," "Soil, surface water, and sediment quality," and "Wildlife and wildlife habitat" sections apply in whole or in part to this VEC. In addition to these, the following specific measures must be taken into account:

- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).
- Develop and implement a monitoring program for the diversion channel to confirm its capacity to handle the water volumes coming from Lake L01 and to ensure there are no signs of erosion along its course (P30).
- Develop and implement a monitoring program to track water flow and erosion along the network of lakes and watercourses from the point where the diversion channel connects to Lake L05 to the mouth of Watercourse CE15 at Lake L27. The areas at risk of erosion identified by the modelling carried out by AtkinsRéalis (2025) must be specifically included in this program (P31).
- Develop and implement a monitoring program to track water flow and erosion along the network of lakes and watercourses receiving mine effluent, particularly at their intersections with transportation routes.(P32).

Assessment of residual impact

Despite the implementation of the proposed measures—including on-site environmental monitoring, water management, stabilized diversion, fish rescue, and operational control via weirs—the loss of aquatic habitat associated with the drainage of Lake L01 remains significant throughout the mine's operations phase. This loss accounts for the bulk of the impacts associated with construction. The effects on water quality—including increased turbidity and sediment deposition—as well as the effects on hydrology, such as local variations in water levels and flow rates into Lake L27, are temporarily exacerbated during the work. However, these effects are considered reversible once the structures have been stabilized and the environment restored. Specific monitoring of the diversion channel and the receiving segments, namely Lake L05, Watercourse CE15, and Lake L27, is planned to confirm the effectiveness of the measures implemented and to allow for corrective actions to be taken as needed.

In summary, the degree of disturbance is considered **high**, resulting in an impact of **medium** intensity. The extent of the impact will generally be limited to the **project** area in the immediate vicinity of the work, and the impact will be felt over a **medium** duration, specifically during the construction and operations phases. This results in a residual impact of **moderate** significance. The probability of occurrence of these impacts is **high**, and the reversibility potential is **medium**, as a return to baseline conditions cannot be achieved for all disturbed aquatic habitats.

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

Operations phase

Statement of potential impact

Disturbance to wildlife activities and aquatic habitats due to mine effluent discharge.

Sources of the impact

- Water use and management.
- Transportation and traffic related to ore and supplies.
- Production and management of residual and hazardous materials.

Detailed description of the impact

The operations phase, expected to last between 17 and 20 years, is characterized by the continued partial drainage of 13,5% Lake L01, which represents a continuation of the impact that began during the construction phase—namely, the permanent loss of aquatic habitats in the pit area. During operations, hydrological conditions and water quality in the receiving environments, including the system consisting of Lake L05, Watercourse CE15, and Lake L27, will be regulated through water management and the operation of the diversion channel. Although local variations in flow rates or water levels may occur, these will remain stable over the long term, allowing aquatic ecosystems to adapt and reach a new state of functional equilibrium. Effects on water quality remain possible, although they are limited by the presence of the industrial wastewater treatment plant, the domestic wastewater treatment facility, and the polishing pond.

Dust emissions from mining operations may also contribute to the degradation of fish habitats by settling in them. Lastly, blasting operations can cause vibrations that disrupt the health and activities of fish. The following watercourses and bodies of water could be affected by vibrations generated by blasting activities: CE01, CE05, CE08, L01, L02, L03, L04, L05, and L72.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the “Ambient air,” “Noise and vibration,” “Soil, surface water, and sediment quality,” and “Wildlife and wildlife habitat” sections apply to this VEC. In addition to these, the following specific measures must be taken into account:

- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).
- Develop and implement a monitoring program for the diversion channel to confirm its capacity to handle the water volumes coming from Lake L01 and to ensure there are no signs of erosion along its course (P30).
- Develop and implement a monitoring program to track water flow and erosion along the network of lakes and watercourses from the point where the diversion channel connects to Lake L05 to the mouth of Watercourse CE15 at Lake L27. The areas at risk of erosion identified by the modelling carried out by AtkinsRéalis (2025) must be specifically included in this program (P31).
- Develop and implement a monitoring program to track water flow and erosion along the network of lakes and watercourses receiving mine effluent, particularly at their intersections with transportation routes (P32).
- Make the required adjustments to the blasting pattern to comply with vibration standards for fish habitat in the affected watercourses and water bodies (CE01, CE05, CE08, L01, L02, L03, L04, L05 and L72) (P44).

Assessment of residual impact

The residual impact is considered to be of moderate significance, primarily due to the prolonged nature of the loss of aquatic habitat associated with the drainage of Lake L01. However, the hydrological and water quality impacts are considered to be medium, localized, and stable over time, provided that management and monitoring measures are maintained.

In summary, the degree of disturbance is considered **high**, resulting in an impact of **medium** intensity. The extent of the impact will generally be **local**, extending beyond the immediate work area, and the impact will be felt over a **long** period of time, that is, beyond the closure phase—specifically, until the open pit has been completely refilled with water. This results in a residual impact of **moderate** significance. The probability of occurrence of these impacts is **medium**, and the reversibility potential is **medium**, as a return to baseline conditions cannot be achieved for all disturbed aquatic habitats.

Impact on wildlife and aquatic habitats			
Intensity:	Medium	**Significance:**	Moderate
Extent:	Local		
Duration:	Long		
Probability of occurrence:		Medium	
Reversibility:		Medium	

Closure phase

Statement of potential impact

Gradual restoration of the ecological functions of aquatic environments and improvement of habitat quality.

Sources of the impact

- Final restoration.

- Production and management of residual and hazardous materials.

Detailed description of the impact

At mine closure, the pit will fill naturally and gradually, allowing water to be gradually reintroduced into the aquatic system. The hydraulic structures, including the diversion channel, dikes, and weirs, will be left in place to ensure the hydraulic stability of the site during and after the pit is filled. The closure work will include sustained efforts to restore vegetation in riparian zones and disturbed areas, promoting soil stabilization, reducing erosion, and gradually improving the quality of aquatic and riparian habitats. There may be one-time disruptions in the short term while the work is underway, but these will be temporary and localized.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the "Noise and vibration," "Soil, surface water, and sediment quality," and "Wildlife and wildlife habitat" sections apply to this VEC. In addition to these, the following specific measures must be taken into account:

- Work together with the tallyman of trapline CH39 in carrying out rehabilitation, restoration, and revegetation activities and returning the site to its natural state (P22).
- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).

Assessment of residual impact

In the long term, the aquatic habitats are expected to return to a new state of ecological stability, supported by the cessation of mining activities, the gradual filling of the pit, and restoration efforts. The residual impact is considered low to medium, as most of the effects are reversible, with the exception of the initial loss of habitat resulting from the drainage of Lake L01, which remains partially irreversible but is mitigated by the planned restoration and compensation measures.

In summary, the degree of disturbance is considered **low**, resulting in an impact of **low** intensity. The extent of the impact will generally be at the **project** area level, and the impact will be felt over a **short** period of time, specifically during the closure phase. This results in a residual impact of **minor** significance. The probability of occurrence of these impacts is **medium**, and the reversibility potential is **high**, as a return to baseline conditions cannot be achieved for all disturbed aquatic habitats.

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

8.2.2 Issue 2 – Preservation of soil and groundwater quality

8.2.2.1 Soil quality

Soil quality concerns all surface soils that may be disturbed by construction, operations, and closure activities. It should be noted that, within the scope of the project, while there is some interest in soil quality, it is not a major concern; for this reason, a **low** ecosystem value was assigned to this VEC.

Summary of current conditions

An assessment of natural background levels (NBL) was conducted at the project site. In general, a layer of organic soil was found at the surface, with a thickness ranging from 0.05 m to 0.67 m. This layer was generally followed by two main horizons consisting, respectively, of sand and gravel with traces of gravel, and sand and till with traces of till. These two horizons were used in the site's NBL calculations. The results showed NBLs in the A-B range for silver and arsenic in both soil horizons considered. All the other metals were below the generic criterion A of the MELCCFP. This study also confirmed that the site is unlikely to have been contaminated by human activities other than those associated with mineral exploration.

Construction phase

Statement of potential impact

Alteration of the physical and chemical quality of soils.

Sources of the impact

- Site organization, stripping, and clearing;
- Surface preparation and access layout;
- Transportation and traffic related to materials and supplies;
- Production and management of residual and hazardous materials.

Detailed description of the impact

During the construction phase, the main risks relate to:

- disturbance of existing soil horizons through various construction activities involving excavation and earthwork;
- soil exposure to erosion caused by clearing, stripping, and excavation work;
- compaction caused by repeated passage of vehicles and machinery;
- contamination of surface soil resulting from accidental leaks and spills of petroleum products or other hazardous materials caused by the operation of equipment that uses these products or simply during their handling.

Mitigation measures

The common mitigation measures are presented in Appendix 8-2; those in the "Soil, surface water, and sediment quality" section apply to this VEC. With the implementation of standard mitigation measures, the following specific measure may be applied:

- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).

Assessment of residual impact

During the construction phase, the implementation of the various proposed mitigation measures is expected to result in a **medium** level of disturbance to the soil. Given the low value attached to soil, the intensity of the impact is **low**. This impact will be felt at the **project** area level and only during the construction period (**short** duration), resulting in a residual impact of **minor significance**. The probability of occurrence for this impact is **medium** in terms of contamination and erosion risks, while it is **high** in terms of compaction and disturbance of natural soil horizons. The reversibility potential of this impact is **high**, as measures can be taken to address potential contamination aas well as the compaction and disturbance of natural soil horizons.

Impact on soil quality			
Intensity:	Low	**Significance:**	Minor
Extent:	Project		
Duration:	Short		
Probability of occurrence:		Medium to high	
Reversibility:		High	

Operations phase

Statement of potential impact

Alteration of the physical and chemical quality of soils.

Sources of the impact

- Transportation and traffic related to ore and supplies.
- Production and management of residual and hazardous materials.

Detailed description of the impact

During the operations phase, the main risks relate to:

- The potential for surface soil contamination through accidental leaks or spills of hazardous materials, or through the deposition of metal-rich dust—both of which are generated by vehicle and machinery traffic on site—as well as by the handling of hazardous materials, tailings, and ore.

- The risk of erosion on the various types of soil and tailings accumulated in the various storage areas. Stacking these materials, which will be exposed to the elements, can cause them to slide and carry fine particles into watercourses.
- Transportation and traffic on roads and access routes can cause localized erosion (vibrations caused by vehicle traffic) that leads to sediment entering watercourses.

Mitigation measures

The common mitigation measures are presented in Appendix 8-2; those in the"Soil, surface water, and sediment quality" section apply to this VEC. With the implementation of standard mitigation measures, the following specific measure may be applied:

- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).
- Leave the non-active surfaces of stockpiles covered with snow in winter: for the winter months, the passive surface, final slopes, and inner slopes are considered covered and inactive (P27).

Assessment of residual impact

During the operations phase, the implementation of the various proposed mitigation measures is expected to result in a **low** level of soil disturbance. Given the low value attached to soil, the intensity of the impact is **low**. This impact will be felt at the **project** area level and only during the operations phase, resulting in a residual impact of **minor significance**. The probability of occurrence of this impact is **high**, and the reversibility potential is **high**.

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

Closure phase

Statement of potential impact

Remediation of affected soils.

Sources of the impact

- Transport and traffic during closure operations.
- Final restoration.
- Production and management of residual and hazardous materials.

Detailed description of the impact

As part of the site's closure, most of the activities will have a positive impact on the site, as a large portion of the occupied areas will be freed up and replanted. The various stockpiles will also be profiled to ensure their long-term stability and revegetated after a layer of soil suitable for the roots of the sown and planted vegetation has been laid. Work areas that may have been contaminated by hazardous materials (hazardous materials storage areas, temporary ore storage areas, concentrator installation areas, etc.) will be assessed, and if contaminated soil is detected, it will be excavated and managed in accordance with provincial standards.

However, it is possible that traffic and transportation related to this work could result in the compaction of additional soil surfaces, as well as accidental leaks or spills.

Mitigation measures

The common mitigation measures are presented in Appendix 8-2; those in the"Soil, surface water, and sediment quality" section apply to this VEC. With the implementation of standard mitigation measures, the following specific measure may be applied:

- Cooperate with the tallyman of trapline CH39 in the rehabilitation, restoration, and revegetation activities and returning the site to its natural state (P22).
- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).

Assessment of residual impact

As mentioned above, most of the activities related to the site's closure will have positive impacts on the various environmental components involved, including soil quality; therefore, there will be a **high** degree of improvement, resulting in a positive impact of **high** intensity. This positive impact will be felt in the project area and will continue beyond the closure activities (**long** duration). It will therefore have a **major** significance and a **high** probability of occurrence.

As for any potential negative impacts, they will be promptly addressed and resolved before the work is completed. For this reason, the anticipated level of disturbance is **low**, resulting in a **low** intensity, an extent limited to the project area, and a short duration. The residual impact will of **minor significance** and the reversibility potential is high.

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

8.2.2.2 Groundwater quality

Groundwater quality refers to the quality of all water found in the different soil horizons that may be disturbed by construction, operations, and closure activities. It should be noted that, within the scope of the project, groundwater is assigned a medium ecosystem value, as it is of interest and its conservation and protection are a concern. It is also assigned a medium socioeconomic value, as it is considered important and can be utilized by a portion of the populations concerned. Since the value to be applied is the higher of the two, a **medium** value will be used to analyze the impacts of this VEC.

Summary of current conditions

Groundwater quality was determined based on samples collected from 23 wells in 2023 and 2024 (Appendix 6-8). These wells include 15 wells installed in the bedrock aquifer and 8 in sandy deposits. Exceedances of drinking water criteria were obtained for dissolved antimony, dissolved arsenic, dissolved manganese, molybdenum, ammonia nitrogen, sulphide, and fluoride. Exceedances were also observed for the criterion regarding the resurgence of copper and sulphides in surface waters. The various results obtained show that the majority of radionuclides were not detected.

Construction phase

Statement of potential impact

Alteration of groundwater quality.

Sources of the impact

- Site organization, stripping, and clearing.
- Surface preparation and access layout.
- Construction of structures and infrastructure.
- Transportation and traffic related to materials and supplies.
- Production and management of residual and hazardous materials.

Detailed description of the impact

Road transportation, traffic and refuelling of mobile equipment and temporary storage or handling of residual and hazardous materials will represent potential sources of accidental spills that could contaminate the soils and reach the water table. Such a spill, if it occurs, will contaminate the soils of the spill site. The impact of a potential spill would depend, among other things, on the volume of contaminants spilled, the one-time occurrence (spill), or the repetition (leak) of the problem.

If the volume spilled is significant, a portion of product not fixed to the soil grains would migrate by surface runoff to the bodies of water and eventually to the water table. Infiltration to the water table would leave a dissolved phase floating in the groundwater. In the case of heavy solvents, the product would infiltrate until it is completely absorbed by the soil particles or until it reaches an impermeable horizon.

The access roads and traffic routes must be maintained to ensure the workers' safety. The use of melting agents (mixture of salt and abrasive), to ensure the safety of the traffic routes in winter, could result in an increase in the salt concentration in the neighbouring soils and affect water quality. Surface water seepage into the sol risks entrainment of a portion of these melting agents to the water table. The salinity of the groundwater could increase under the access roads at the locations where the aquifer is more vulnerable. The salt-abrasive mixture that will be used will be a common type approved by the MTQ or the MELCCFP.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the "Soil, surface water, and sediment quality" section as well as those in the "Hydrology and hydrogeology" section, apply to this VEC. In addition to the common measures, the following specific measure may be applied:

- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).

Assessment of residual impact

During the construction phase, the implementation of the various proposed mitigation measures is expected to result in a **medium** degree of disturbance to groundwater quality. Given the medium value assigned to groundwater, the impact intensity is **medium**. This impact will be felt within the **project** area and only during the construction period (**short** duration), resulting in a residual impact of **minor significance**. The probability of occurrence of this impact is **low** in terms of contamination risks, as it is linked to an accidental event or poor practices. The reversibility potential of this impact is **medium** as measures can be taken to address any potential contamination. However, if action is not taken immediately, it may be difficult to effectively remove contaminants from the water.

Impact on groundwater quality			
Intensity:	Medium	**Significance:**	Minor
Extent:	One-time		
Duration:	Short		
Probability of occurrence:		Low	
Reversibility:		Medium	

Operations phase

Statement of potential impact

Alteration of groundwater quality.

Sources of the impact

- Existence and operation of new infrastructure (water infiltration beneath the infrastructure).
- Water use and management (percolating water, dewatering, etc.).
- Transportation and traffic related to ore and supplies.

- Production and management of residual and hazardous materials.

Detailed description of the impact

Waste rock and tailings storage facilities

The project includes plans for two storage areas for waste rock and tailings. The first will be used to store waste rock that is non-leachable and not potentially acid-generating (Stockpile 01). The second will be used for the storage of materials that are potentially acid-generating (waste rock and tailings). Some of the waste rock and tailings will be stored in the same stockpile, namely Stockpile 02. This stockpile could therefore have an impact depending on the geochemical characteristics of the stored materials. Thus, during operations, runoff water could percolate through the stockpile and leach metals, particularly arsenic (Atkins, 2026).

According to geochemical studies, some of the waste rock and tailings are classified as leachable (for certain metals) under D019. Certain lithologies would also have variable potential for acid generation.

It is unlikely that water containing metals will reach the aquifers, given the design measures that are planned. In fact, the presence of a leak-proof membrane lining the bottom of the stockpile and sealed ditches will minimize the risk of seepage into the soil and thus the potential contamination of groundwater. All runoff will be recovered via a system of perimeter ditches and a lined collection pond, which will prevent water from seeping into the underlying aquifer. Water from the collection ponds will be pumped to a water treatment system and then transferred to the polishing pond before being discharged via the mine effluent (see Section 8.2.1.2, Surface water quality).

Atkins (2026) developed a contaminant transport model to assess the risk of dispersion. The results of the contaminant transport model indicate that Lake L02 is the most at-risk receiving environment due to its proximity to and location downstream of Stockpile 02. However, the measures developed during the design phase and that will be implemented should be effective, since modelling shows that metal concentrations reaching environmental receptors remain below applicable criteria even after 200 years. The sensitivity study conducted shows that the membrane properties are the factor that most strongly influence on the concentrations reaching the receptor, underscoring the importance of proper installation during construction.

Dewatering water

The mine dewatering water could be contaminated with metals and contain traces of nitrites and nitrates. There are few groundwater contamination risks related to dry maintenance activities. Water pumped from underground operations will undergo initial treatment to reduce TSS; the water will then be pumped to a retention pond and treated before being discharged into the natural environment.

Risk of groundwater contamination by the accidental introduction of petroleum hydrocarbons, contaminants or hazardous materials

The description of the impact presented in the construction phase applies for the operations phase.

Throughout the operations period, there will be a risk of accidental spills of petroleum hydrocarbons due to the use of mobile equipment and the storage and handling of hazardous materials (including petroleum hydrocarbons). As in the construction phase, spills may result from the failure of mobile equipment containing a limited quantity of petroleum products, or from the improper storage or handling of hazardous materials. However, since the entire site is surrounded by water management infrastructure, the spread of these substances into the environment will be limited.

Management of residual and hazardous materials

The operations phase will generate residual materials and hazardous products, which will be managed off site. Improper storage that exposes contents to the elements, combined with improper handling, could result in a leak or accidental spill, posing a risk to groundwater quality.

Risk of groundwater contamination by seepage of contaminants from use of melting agents in winter

The description of this impact is the same as the one presented in the construction phase.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the "Soil, surface water, and sediment quality" section as well as those in the "Hydrology and hydrogeology" section, apply to this VEC. In addition to the common measures, the following specific measures may be applied:

- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).
- Develop and implement a monitoring program for dewatering water quality prior to its entry into the polishing pond in order to confirm the absence of contaminants (other than TSS) that could require treatment (P37).

Assessment of residual impact

Given the fact that all the infrastructure at risk will be developed on lined membranes and that the runoff water will be recovered via lined ditches, the degree of disturbance is considered **low**, resulting in a potential impact of **low** intensity. Any mining operation, by its nature, could have a certain impact on groundwater quality. In this case, the extent of the impact will be limited to the **project** area in the event of an accidental spill, but could be **local** if the infiltration is detected late. Similarly, the duration (in the case of accidental spills) will be **long** (if water seeps beneath the stockpiles and ponds) and the probability of occurrence for these elements is **low** since they are linked to poor infrastructure design, improper handling, or accidents. The significance of the residual impact is thus **minor** for the risks of groundwater contamination due to spills, and although unlikely, it may be medium in the case of seepage linked to a failure of the membranes beneath the stockpile. The probability of occurrence is **low** given the planned developments. The reversibility of the impact is considered **medium**, since if an incident occurs, the recovery of contaminants from the groundwater may prove difficult.

Impact on groundwater quality			
Intensity:	Low	**Significance:**	Minor
Extent:	One-time to local		
Duration:	Short to long		
Probability of occurrence:		Low	
Reversibility:		Medium	

Closure phase

Statement of potential impact

Gradual improvement in groundwater quality.

Sources of the impact

- The presence of site remnants (particularly stockpiles).
- Final restoration.
- Production and management of residual and hazardous materials.

Detailed description of the impact

During the restoration phase, the negative impacts related to the risks of groundwater contamination by an accidental spill of petroleum hydrocarbons and hazardous materials and spreading of melting agents in winter are anticipated on the same basis as in the construction period. Furthermore, the impacts are similar to those of the operations phase in terms of contact water infiltration from storage areas, given that the infrastructure (stockpiles) will remain in place despite the site's restoration. Contaminant transport modelling carried out on Stockpile 002 (AtkinsRealis 2026l Appendix 6-12) has shown that the long-term impact is negligible, given the presence of a leak-proof membrane beneath the stockpile. Furthermore, once the site is closed, Stockpile 002 will be covered with a low-permeability layer. The covering will serve to limit or eliminate rainwater runoff into the stored materials, which should result in a reduction in metal leaching and acid generating potential and their percolation into groundwater.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the "Soil, surface water, and sediment quality" section, as well as those in the "Hydrology and hydrogeology" section, apply to this VEC. In addition to the common measures, the following specific measure may be applied:

- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).

Assessment of residual impact

The intensity of the impact on groundwater quality is considered **low**, given the **low** degree of disturbance and the **medium** value attached to the VEC. The extent is considered **local**. Water infiltration through tailings and waste rock, even if minimal, will always be present; the duration is therefore considered **medium**, as for the other risks, since the site will be rehabilitated upon closure. The probability of occurrence is considered **low** given the level of protection provided by the structures (membranes), and the reversibility is considered **medium**. The significance of the residual impact is considered **minor**.

In the closure phase, final restoration provides for revegetation of the tailings storage facility and the waste rock stockpile, dismantling of the mine infrastructure, and rehabilitation of soils if they exceed the criteria established for the restoration work. Removing potential sources of soil contamination thus represents a **high** degree of improvement, resulting in a positive impact of **high** intensity. The extent of this positive impact is **local**, and its duration is **long**, making it of **major** significance. Its probability of occurrence is **high**.

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

8.2.3 Issue 3 – Preservation of wetlands and habitats of interest to terrestrial wildlife and plants

8.2.3.1 Wetlands and water environments

Wetlands and water environments include all types of wetlands (marshes, swamps, peatlands), shorelines (bodies of water and waterways), and banks that may be disturbed by construction, operations, and closure activities. It should be noted that, within the scope of the project, wetlands and water environments are assigned a medium ecosystem value, as they are of significant interest and their conservation and protection are a concern. They are also assigned a medium socioeconomic value, as they are considered important and are used by a proportion of the populations concerned. Since the value to be applied is the higher of the two, a **medium** value will be used to analyze the impacts of this VEC.

Summary of current conditions

In the biophysical LSA (20,661 ha), wetlands cover 2,430 ha, or 11.8% of the area, and consist of eight types of groupings. Among all wetland vegetation groupings, wooded ombrotrophic bogs and open ombrotrophic bogs predominate. In fact, these two types of plant communities account for 63.7% of the wetlands in the biophysical LSA (1,548 ha out of 2,430 ha). Other groupings include open and wooded fens (177 ha and 67 ha), shrub swamps (245 ha), treed swamps (372 ha), ponds and shallow waters (15 ha), and marshes (6 ha).

Only 4% of the characterized wetlands had been disturbed by human activities (roads, partial logging, drainage), while approximately 11% had been disturbed by natural events, such as recent forest fires (10%), or by beaver activity (1%).

Construction phase

Statement of potential impact

Loss of surface area and disruption of the quality of wetlands and water environments.

Sources of the impact

- Site organization, stripping, and clearing.
- Surface preparation and access layout.
- Transportation and traffic related to materials and supplies.
- Production and management of residual and hazardous materials.

Detailed description of the impact

The project's impact on wetlands and water environments during the construction phase is closely linked to site preparation (clearing, earthwork) for the installation of the infrastructure, buildings, and equipment required to bring the mine site into operation. More specifically, the impacts are related to the construction of the new power line and associated substations, as well as storage areas, areas designated for buildings and equipment, and the access roads required at the mine site. The access road connecting the mine site to the Trans-Taiga Road is not taken into account because it is already in place.

This work results in a permanent loss of total wetland and water environment area (footprints of work and storage areas, internal routes, transmission line towers, and substations) of 120.2 ha, including 104.7 ha of wetlands and 15.5 ha of water environments (excluding fish habitat surface areas, which are considered in Section 8.2.1.3) (Map 8-3, Table 8-5). This surface area accounts for approximately 5% of the total area of these habitats within the biophysical LSA. In terms of wetlands, the main types affected include, in order of importance, wooded ombrotrophic bogs (30%), open ombrotrophic bogs (27%), treed swamps (25%), and shrub swamps (14%).

It should also be noted that wetlands and water environments can also be impacted by dust stirred up during construction work and settling on surrounding surfaces.

Table 8-5 Summary of estimated losses in wetlands and water environments

Environment	Class	Category	Type	Surface area impacted (ha)		
				Not a fish habitat	Fish habitat	Total
Water	Coastal	Watercourse		-	0.78	0.78
		Body of water		0.03	56.35	56.38
		Wetland below the coastal zone	Shallow water	0.06	-	0.06
			Marshes	-	0.05-	0.05
			Tree swamp	0.05	-	0.05
			Shrub swamp	0.86	-	0.86
			Wooded fen	0.76	-	0.76
			Open fen	2.88	-	2.88
			Wooded ombrotrophic bog	0.02	-	0.02
			Open ombrotrophic bog	0.30	-	0.30
			Subtotal	**4.97**	**57.18**	**62.15**
Water (continued)	Bank 10m	Forest environment	Regenerating	4.59	-	4.59
			Softwood	1.50	-	1.50
		Wetland	Tree swamp	0.46	-	0.46
			Shrub swamp	0.10	-	0.10
			Wooded fen	0.14	-	0.14
			Open fen	0.04	-	0.04
			Wooded ombrotrophic bog	0.86	-	0.86
			Open ombrotrophic bog	2.03	-	2.03
		Non-forest environment	Scrubland	0.59	-	0.59
			Island	0.21	-	0.21
			Lichen tundra	-	-	-
			Bare surface	0.02	-	0.02
			Subtotal	**10.53**	**-**	**10.53**

Environment	Class	Category	Type	Surface area impacted (ha)		
				Not a fish habitat	Fish habitat	Total
Wetland			Shallow water	0.02	-	0.02
			Tree swamp	26.28	-	26.28
			Shrub swamp	14.44	-	14.44
			Wooded fen	3.31	-	3.31
			Open fen	0.14	-	0.14
			Wooded ombrotrophic bog	31.85	-	31.85
			Open ombrotrophic bog	28.64	-	28.64
	Subtotal			**104.68**	**-**	**104.68**
Total				**120.19**	**57.18**	**177.36**

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the "Ambient air," "Soil, surface water, and sediment quality," and "Vegetation and wetlands" sections apply in whole or in part to impacts on wetlands and water environments. In addition to these, the following specific measures must be taken into account:

- Whenever possible, preserve the forest cover along the road of the mine site and revegetate bare areas with native plants after completion of the work (P23).
- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).

Assessment of residual impact

During the construction phase, despite the implementation of the various proposed mitigation measures, the work will result in a permanent net loss of wetlands and water environments, suggesting that these environments will be significantly disturbed. Given the medium value assigned to wetlands and water environments, the impact intensity is **high**. This impact will be felt at the project site throughout the construction and operations phases (**medium** duration), resulting in a residual impact of **moderate significance**. The probability of occurrence of this impact is **high**, and its reversibility potential is **medium**, as it is relatively complex to recreate wetlands and water environments.

Impact on the quality of wetlands and water environments			
Intensity:	Medium	**Significance:**	Moderate
Extent:	Project		
Duration:	Medium		
Probability of occurrence:		High	
Reversibility:		Medium	

Operations phase

Statement of potential impact

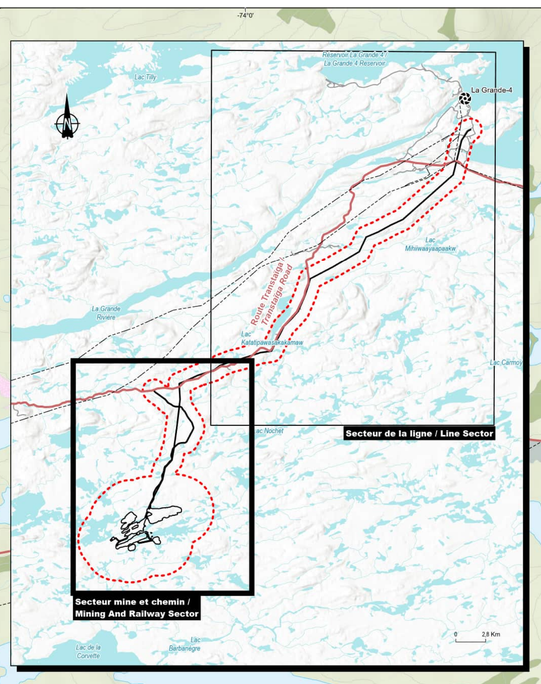
Disruption of the quality of wetlands and water environments.

Sources of the impact

- Water use and management.
- Transportation and traffic related to ore and supplies.
- Production and management of residual and hazardous materials.

Detailed description of the impact

During the operations phase, the impact on wetlands is primarily associated with the generation of dust that can settle in these environments as a result of various traffic and material-handling activities at the mine site. Some of these environments may also be indirectly affected by the drawdown of the water table (dewatering of the pit and the underground mine), which could slightly reduce the levels of resurgence. For water environments, which include shorelines and riverbanks, in addition to the problems caused by dust deposition, issues related to slope instability and the onset of erosion may arise, particularly due to changes in flow rates in certain watercourses (contribution from mine effluent and the diversion channel) and at intersections with traffic routes (vibrations caused by vehicles).



Empiètement du projet / *Project Encroachment*

Zone d'empiètement du projet / *Project encroachment area*

Infrastructures / *Infrastructure*

Centrale / *Power plant*

Ligne de transport d'énergie / *Electric power transmission line*

Réseau routier / *Road Network*

Route d'accès aux ressources / *Resource access route*

Composantes de l'écosystème / *Ecosystem Components*

Milieux humides et hydriques / *Wetlands and Hydrous Environments*

- Marécage arborescent / *Treed swamp*
- Marécage arbustif / *Shrubby swamp*
- Tourbière minérotrophe boisée / *Treed fen*
- Tourbière minérotrophe ouverte / *Open fen*
- Tourbière ombrotrophe boisée / *Treed bog*
- Tourbière ombrotrophe ouverte / *Open bog*
- Marais / *Marsh*
- Eau peu profonde / *Shallow water*
- Plan d'eau / *Waterbody*
- Rive de 10 m / *10 m shore*

Cours d'eau / *Watercourses*

- Intermittent / *Intermittent*
- Permanent / *Permanent*

Milieux terrestres / *Terrestrial Environments*

- Feuillu / *Deciduous*
- Mixte / *Mixed-wood*
- Résineux / *Softwood*
- Arbustaie / *Scrubland*
- Lande à lichens / *Lichen tundra*
- Régénération / *Regeneration*

Autres milieux / *Other Environments*

- Anthropique / *Anthropogenic*
- Champ de blocs / *Boulder field*
- Île / *Island*
- Surface dénudée / *Dry barren*

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Étude d'impact sur l'environnement / Environmental Impact Assessment

Carte 8-4a / *Map 8-4a*

Empiètement du projet en milieu humide et hydrique - Secteur de la mine et du chemin/ *Project Encroachment in Wetland and Hydrous Environments - Mining And Road Sector*

Sources / Sources

AOrléneux+, réseau routier, MERN, 2016
BDGA, 1M, MERN, 2014
CanVec, 250k,RNCan, 2017
MRNF, Végétation du Nord québécois, 2013
WSP, Photo interprétation et validation terrain, 2024-2025 / BBA, Photo interprétation, 2023.
GRHQ, Réseau hydrique, 2024

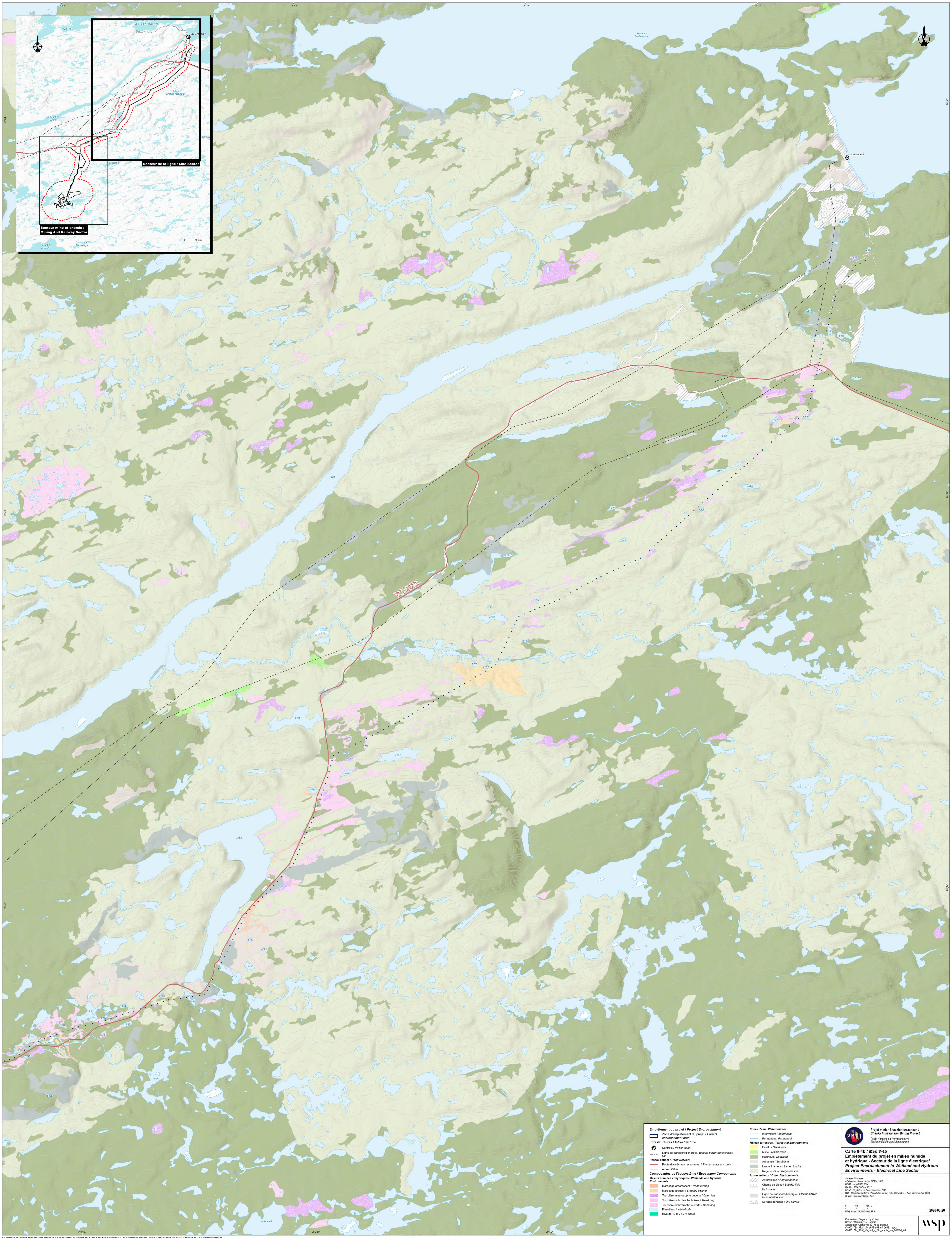
0 190 380 m
UTM, fuseau 18, NAD83 (CSRS)

2026-03-20

Préparation / Prepared by V. Roy
Dessin / Drawn by M. Dupraz
Approbation / Approved by M.-H. Brisson
CA0001724_3318_ele_c02B_c03_04_260311.aprx
CA0001724_3318_ele_c08_4_121_empiet_mh_260320_A0

wsp

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.



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.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the "Ambient air," "Soil, surface water, and sediment quality," and "Vegetation and wetlands" sections apply in whole or in part to the impacts on the quality of wetlands and water environments. In addition to these, the following specific measures must be taken into account:

- Gradually restore Stockpiles 1 and 2 to reduce the areas susceptible to wind erosion and erosion from runoff (P01).
- Whenever possible, preserve the forest cover along the road of the mine site and revegetate bare areas with native plants after completion of the work (P23).
- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).
- Spray water on the non-active areas of the stockpiles using a water truck when necessary (P28).
- Apply dust suppressants on the slopes and top surfaces (exterior) of the stockpiles (P29).
- Develop and implement a monitoring program for the diversion channel to confirm its capacity to handle the water volumes coming from Lake L01 and to ensure there are no signs of erosion along its course (P30).
- Develop and implement a monitoring program to track water flow and erosion along the network of lakes and watercourses from the point where the diversion channel connects to Lake L05 to the mouth of Watercourse CE15 at Lake L27. The areas at risk of erosion identified by the modelling carried out by AtkinsRéalis (2025) must be specifically included in this program (P31).
- Develop and implement a monitoring program to track water flow and erosion along the network of lakes and watercourses receiving mine effluent, particularly at their intersections with transportation routes (P32).

Assessment of residual impact

During the operations phase, the implementation of the various proposed mitigation measures is expected to result in a **low** degree of disturbance to wetlands and water environments. Given the medium value attached to wetlands and water environments, the intensity of the impact is **low**. This impact will be felt at the local level (dust emissions) and throughout the entire operations phase (medium duration), resulting in a residual impact of **minor significance**. The probability of occurrence of this impact is **high**, and the reversibility potential of this impact is **medium**.

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

Closure phase

Statement of potential impact

Restoration of wetlands and water environments.

Sources of the impact

- Final restoration.
- Production and management of residual and hazardous materials.

Detailed description of the impact

During the closure phase, the impact is primarily positive due to the freeing up of most of the space occupied by mining facilities and its restoration (soil and slope rehabilitation, revegetation).

Nevertheless, restoration work can lead to impacts related to dust generation and the onset of localized erosion.

Mitigation measures

Common mitigation measures are presented in Appendix 8-2; in particular, those in the "Ambient air," "Soil, surface water, and sediment quality," and "Vegetation and wetlands" sections apply in whole or in part to the impacts on the quality of wetlands and water environments. In addition to these, the following specific measures must be taken into account:

- Gradually restore Stockpiles 1 and 2 to reduce the areas susceptible to wind erosion and erosion from runoff (P01).
- Work together with the tallyman of trapline CH39 in carrying out rehabilitation, restoration, and revegetation activities and returning the site to its natural state (P22).
- Whenever possible, preserve the forest cover along the road of the mine site and revegetate bare areas with native plants after completion of the work (P23).
- An environmental supervisor will conduct regular inspections of work areas, ensure that all parties strictly comply with the various commitments, obligations, measures, and other requirements, assess the quality and effectiveness of the measures implemented, and document any non-compliance observed (P24).

Assessment of residual impact

During the closure phase, the implementation of the various proposed mitigation measures is expected to result in a **low** degree of disturbance and a **high** level of improvement to wetlands and water environments. Given the medium value assigned to wetlands and water environments, the intensity of the negative impact is considered **low**, whereas the intensity of the positive impact is considered **high**. The negative impact will be felt within the area of the project's footprint and only during the closure phase (short duration), resulting in a residual impact of **minor significance.** As for the positive impact, it will also be felt primarily within the area of the project's footprint, but over the long term, resulting in an improvement of **major** significance. The probability of occurrence of these impacts is **high**, and the reversibility potential of the negative impact is **medium**.

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

8.2.3.2 *Wildlife species of special status*

Wildlife species of special status refers to all wildlife species that have been granted provincial protection status (likely to be designated, vulnerable or threatened) or federal protection status (special concern, threatened, endangered, or extinct) and that may be disturbed by construction, operations, and closure activities. It should be noted that, within the framework of the project, wildlife species of special status are assigned **high** ecosystem and socioeconomic value, as there is a consensus on their conservation and protection, and they are subject to legal and regulatory protection.

Summary of current conditions

Inventories and literature reviews on wildlife have identified 21 wildlife species of special status, 17 of which have been confirmed to be present in the biophysical LSA and one of which is uncertain, including 11 bird species (among them the red crossbill, for which the presence of the subspecies of special status, *percna*, remains uncertain), caribou (*Rangifer tarandus caribou*, forest ecotypes), 5 bat species, and the southern bog lemming.

For the woodland caribou, the scarcity of mature forest stands and the prevalence of young, regenerating environments could explain its very low use of the biophysical LSA, a finding supported by the lack of telemetry data for this ecotype in this area.

Among the bird species, six have nesting potential: the short-eared owl (*Asio flammeus*), the lesser yellowlegs (*Tringa flavipes*), the common nighthawk (*Antrostomus vociferus*), the bank swallow (*Riparia riparia*), the olive-sided flycatcher (*Contopus cooperi*), and the rusty blackbird (*Euphagus carolinus*).

It should be noted that, in addition to the five bat species of special status, the big brown bat—which does not have any special status—was also recorded at the site during the inventories. Since this is the only bat species without a special status to be observed at the project site and its ecological characteristics are similar to those of other species, the potential impacts on this species are also discussed in this section.

Construction phase

Statement of potential impact

Disturbance of activities and loss of habitat of wildlife species of special status.

Sources of the impact

- Site organization, stripping, and clearing.
- Surface preparation and access layout.

- Construction of structures and infrastructure.
- Transportation and traffic related to materials and supplies.
- Production and management of residual and hazardous materials.

Detailed description of the impact

Large wildlife and other mammals

During the construction phase, the main risks involve the loss and fragmentation of breeding and feeding habitats, as well as disturbance caused by noise and other nuisances.

Loss and fragmentation of breeding and feeding habitats due to site preparation, stripping and clearing activities

The southern bog lemming typically inhabits wetlands rich in vegetation and covered with a thick layer of organic soil, such as peatlands, marshes, and nearby moist mixedwood forests, as well as fields, grasslands, and clear-cut areas (Desrosiers et al., 2002; Rose and Linzey, 2021). The project's impact on wetlands and water environments could result in habitat loss for the southern bog lemming, which feeds primarily on sedges (Carex sp.) (Gouvernement du Québec, 2026), a group of plants that grow mainly in these environments.

The direct impacts of mining and electrical infrastructure construction on woodland caribou are manifested primarily through habitat loss and fragmentation, the creation of physical barriers, and the degradation of food resource quality (Saint-Laurent *et al.*, 2012; Saint-Laurent *et al.*, 2014; Dickie *et al.*, 2023; Lessard *et al.*, 2026). The fragmentation caused by the construction of a new power transmission line (PTL) can reduce connectivity between high-quality habitat patches and limit the movements necessary for foraging, reproduction, and dispersal (Polfus *et al.*, 2011; Leblond *et al.*, 2012). According to Lesmerises *et al.* (2013), woodland caribou rarely cross PTLs and exhibit a significant increase in movement speed when crossing them, suggesting a negative perception of the right-of-ways.

These anthropogenic infrastructures also result in a functional loss of habitat well beyond the physical footprint of the developments (Saint-Laurent *et al.*, 2014; Dickie *et al.*, 2023; Lessard *et al.*, 2026), meaning that patches of habitat become inaccessible or underutilized, even if they offer conditions suitable for caribou (Polfus *et al.*, 2011; Leblond *et al.*, 2012). The areas of influence around infrastructure can thus extend for several kilometres (Weir *et al.*, 2007), restricting the use of large portions of the habitat (Weir *et al.*, 2007; Saint-Laurent *et al.*, 2014). For example, Weir *et al.* (2007) showed that caribou density was significantly reduced within a 4-kilometre radius of an active mine site. Avoiding optimal habitats located near human-made infrastructure may cause caribou to make greater use of suboptimal habitats to reduce the risk of predation (Polfus *et al.*, 2011; Rudolph *et al.*, 2012).

Taking into account the planned mining and electrical infrastructure, the rate of disturbance to the woodland caribou habitat within the biophysical LSA was estimated relative to the baseline condition. Three methods were used to estimate the rate of habitat disturbance for woodland caribou in the biophysical LSA. The first method is based on those recommended by the Government of Quebec, with the addition of a 500-meter buffer zone around all anthropogenic disturbances, with the exception of the mine site, for which a 4-kilometre buffer zone was added, while excluding the surface water network from the total area (Weir *et al.*, 2007; MFFP, 2021). The second method is the one recommended by the Government of Canada, which involves adding a 500-metre buffer zone around all anthropogenic disturbances and taking into account the total area, including the surface water network within that total area (EC, 2011; ECCC, 2020a; ECCC, 2024). The third method is the one proposed by the Cree Nation Government, which involves establishing a 750-metre buffer zone around the proposed mining infrastructure and the PTL, while excluding the surface water system from the total area. For more details on the methods used, see the sectoral report on caribou in Appendix 6-21.

According to the Quebec government's methodology, the overall habitat disturbance rate for woodland caribou is estimated at 49.0% (Table 8-6), an increase of 0.8% compared with the baseline estimate. According to the Government of Canada's methodology, the overall disturbance rate is estimated at 42.6% (Table 8-7), an increase of 0.1% compared with the baseline estimate. Lastly, according to the Cree Nation Government's method, the overall disturbance rate is estimated at 49.4% (Table 8-8), which represents a difference of 6.8% compared with the Government of Canada's method. The project's encroachment on the potential habitat of the woodland caribou is shown in Map 8-5.

An analysis of the project's impacts on potential forest caribou habitat was also conducted. Taking into account the addition of a 750-m buffer zone around the proposed mining infrastructure, the proportion of potential forest caribou habitat (i.e., coniferous stands >40 years old, lichen woodlands, and wetland and aquatic environments) affected was also estimated at 0.1% of the terrestrial area of the biophysical LSA, corresponding to an area of approximately 6.5 km². Within this buffer zone, which covers a terrestrial area of 24.7 km², habitat areas exhibiting permanent and temporary disturbances under baseline conditions were estimated at 6.1 km² and 10.0 km², respectively, covering the majority of the buffer zone's terrestrial area (i.e., 24.5% and 40.3%). These temporary disturbances consisted of forest fires that occurred between 2001 and 2010 (Appendix 6-21, Map 6). These habitats therefore comprised vegetation communities aged 16 to 25 years under baseline conditions, which are potentially favourable to moose due to the availability of food resources (Courtois et al., 2007; Leblond et al., 2013; Raymond-Bourret, 2017). However, these habitats could become potential forest caribou habitat in the medium to long term. Several small- to medium-sized wetlands are also intersected by the infrastructure and its 750-m buffer zone. As a result, the construction of the mining infrastructure leads to a permanent loss of habitat for forest caribou, which may also tend to avoid the area over several kilometres, as suggested by the 4-km buffer zone illustrated in Map 8-5 (Weir et al., 2007).

Taking into account the addition of a 750-m buffer zone around the transmission line (TL), the proportion of potential forest caribou habitat affected by the construction of the TL was estimated at 0.1% of the terrestrial area of the biophysical LSA, corresponding to an area of approximately 7.2 km². Within this buffer zone, which covers a terrestrial area of 73.7 km², habitat areas exhibiting permanent and temporary disturbances under baseline conditions were estimated at 32.6 km² and 32.5 km², respectively, covering the majority of the buffer zone's terrestrial area (i.e., 44.2% and 44.0%).

Relative to areas that were already disturbed under baseline conditions, the creation of new disturbances associated with the new TL particularly affects the segment located approximately between 30 and 50 km from the mine's zone of influence. As illustrated in Map 8-5, the 750-m buffer zone surrounding this TL segment is dominated by forest fires. This sector is more specifically affected by fires that occurred between 2001 and 2010, and to a lesser extent by fires that occurred between 1987 and 1990 (Appendix 6-21, Map 6). These habitats therefore comprised vegetation communities aged 16 to 39 years under baseline conditions, which are potentially favourable to moose due to the availability of food resources (Courtois et al., 2007; Leblond et al., 2013; Raymond-Bourret, 2017). However, these habitats could become potential forest caribou habitat in the medium to long term. Several small- to medium-sized wetlands are also intersected by this TL segment and its 750-m buffer zone.

Furthermore, habitats enclosed by the existing TL and the segment of the new TL located approximately between 30 and 50 km from the mine's zone of influence consist of forest fires and potential forest caribou habitat. These habitats could, however, become functionally inaccessible to forest caribou due to the addition of a TL. Nevertheless, the direct loss of potential forest caribou habitat appears negligible along the TL segment located between the mine site and approximately 30 km, as its construction is planned along existing roads whose baseline footprint largely encompasses that of the new TL.

Forest clearing associated with the construction of infrastructure may promote increased densities of moose (*Alces alces*), which in turn support higher populations of gray wolf (*Canis lupus*) and indirectly increase predation pressure on caribou, a phenomenon known as 'apparent competition' (Courtois et *al*., 2007; Leblond et *al*., 2013; Raymond-Bourret, 2017). Although predators may use the infrastructure as early as the construction phase, this phenomenon is more likely to be observed during the operational phase. This aspect is also addressed in greater detail in the section covering impacts during the operations phase.

Composante du projet / *Project Component*

- Projet minier Shaakichiuwaanann / *Shaakichiuwaanann Mining Project*

Zones d'étude / *Study Areas*

- Projet / *Project*
- Local - Régionale / *Local - Biophysical*
- Zone d'influence de la mine / *Mine's area of influence*

Habitat potentiel / *Potential habitat*

- Jeunes peuplements résineux matures (40-80 ans) / *Mature young softwood stands (40-80 years)*
- Vieux peuplements résineux matures (> 80 ans) / *Mature old softwood stands (> 80 years old)*
- Lande à lichens / *Lichen tundra*
- Milieux humides et hydriques / *Wetlands and hydrous environments*

Perturbations / *Disturbances*

Conditions actuelles / *Currents Conditions*

- Anthropique et naturelle / *Anthropogenic and natural*

Conditions futures / *Futures Conditions*

- Anthropique - Permanente (Zone tampon 500 m) / *Anthropogenic - Permanent (Buffer 500 m)*
- Anthropique - Permanent (Zone tampon 750 m) / *Anthropogenic - Permanent (Buffer 750m)*
- Anthropique - Permanent (Zone tampon 4 km) / *Anthropogenic - Permanent (Buffer 4 km)*

Infrastructures / *Infrastructure*

- Prélèvement d'eau potable / *Drinking water withdrawal*
- Aérodrome / *Aerodrome*
- Hydroaérodrome / *Hydroaerodrome*
- 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*

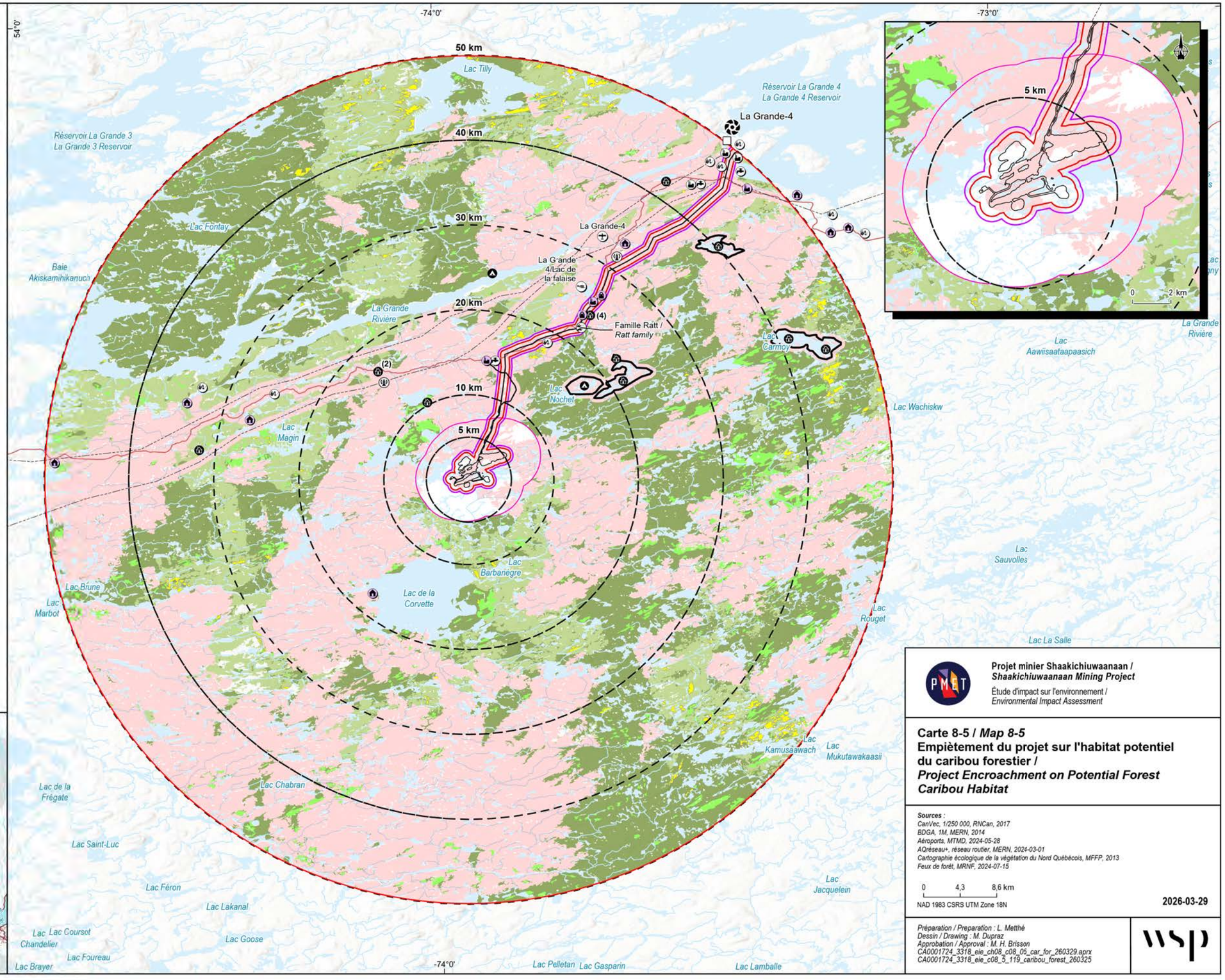
- Route collectrice municipale / *Municipal collector road*
- Locale / *Local road*

Utilisation du territoire / *Land Use*

Baux / *Leases*

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





Projet minier Shaakichiuwaanann / *Shaakichiuwaanann Mining Project*

Étude d'impact sur l'environnement / *Environmental Impact Assessment*

Carte 8-5 / *Map 8-5*

Empiètement du projet sur l'habitat potentiel du caribou forestier / *Project Encroachment on Potential Forest Caribou Habitat*

Sources :

CanVec, 1/250 000, RNCan, 2017
BDGA, 1M, MERN, 2014
Aéroports, MTMD, 2024-05-28
AQréseau+, réseau routier, MERN, 2024-03-01
Cartographie écologique de la végétation du Nord Québécois, MFFP, 2013
Feux de forêt, MRNF, 2024-07-15

0 4,3 8,6 km

NAD 1983 CSRS UTM Zone 18N

2026-03-29

Préparation / Preparation : L. Metthé
Dessin / Drawing : M. Dupraz
Approbation / Approval : M. H. Brisson
CA0001724_3318_eie_ch08_c08_05_car_for_260329.aprx
CA0001724_3318_eie_c08_5_119_caribou_forest_260325

Zones d'étude / *Study Areas*

- Projet / *Project*
- Local - Régionale / *Local - Biophysical*
- Zone d'influence de la mine / *Mine's area of influence*

Habitat potentiel / *Potential habitat*

- Jeunes peuplements résineux matures (40-80 ans) / *Mature young softwood stands (40-80 years)*
- Vieux peuplements résineux matures (> 80 ans) / *Mature old softwood stands (> 80 years old)*
- Lande à lichens / *Lichen tundra*
- Milieux humides et hydriques / *Wetlands and hydrous environments*

Perturbations / *Disturbances*

Conditions actuelles / *Currents Conditions*

- Anthropique et naturelle / *Anthropogenic and natural*

Conditions futures / *Futures Conditions*

- Anthropique - Permanente (Zone tampon 500 m) / *Anthropogenic - Permanent (Buffer 500 m)*
- Anthropique - Permanent (Zone tampon 750 m) / *Anthropogenic - Permanent (Buffer 750m)*

Infrastructures / *Infrastructure*

- Prélèvement d'eau potable / *Drinking water withdrawal*
- Aérodrome / *Aerodrome*
- Site d'extraction ouvert / *Open extraction site*
- Bâtiment industriel / *Industrial building*
- Tour de télécommunication / *Telecommunication tour*
- Ligne de transport d'énergie / *Electric power transmission line*

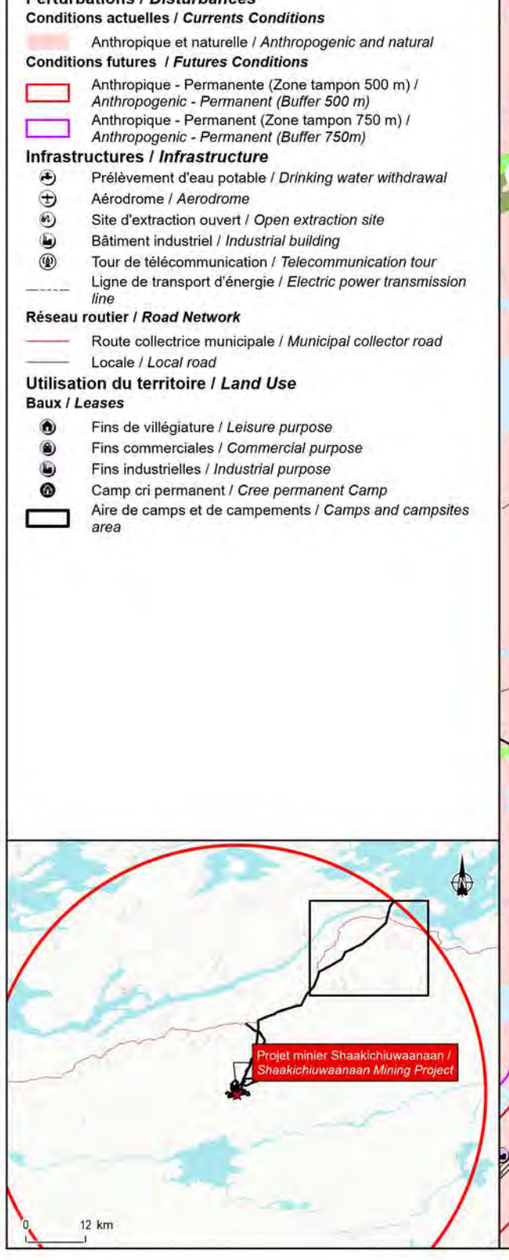
Réseau routier / *Road Network*

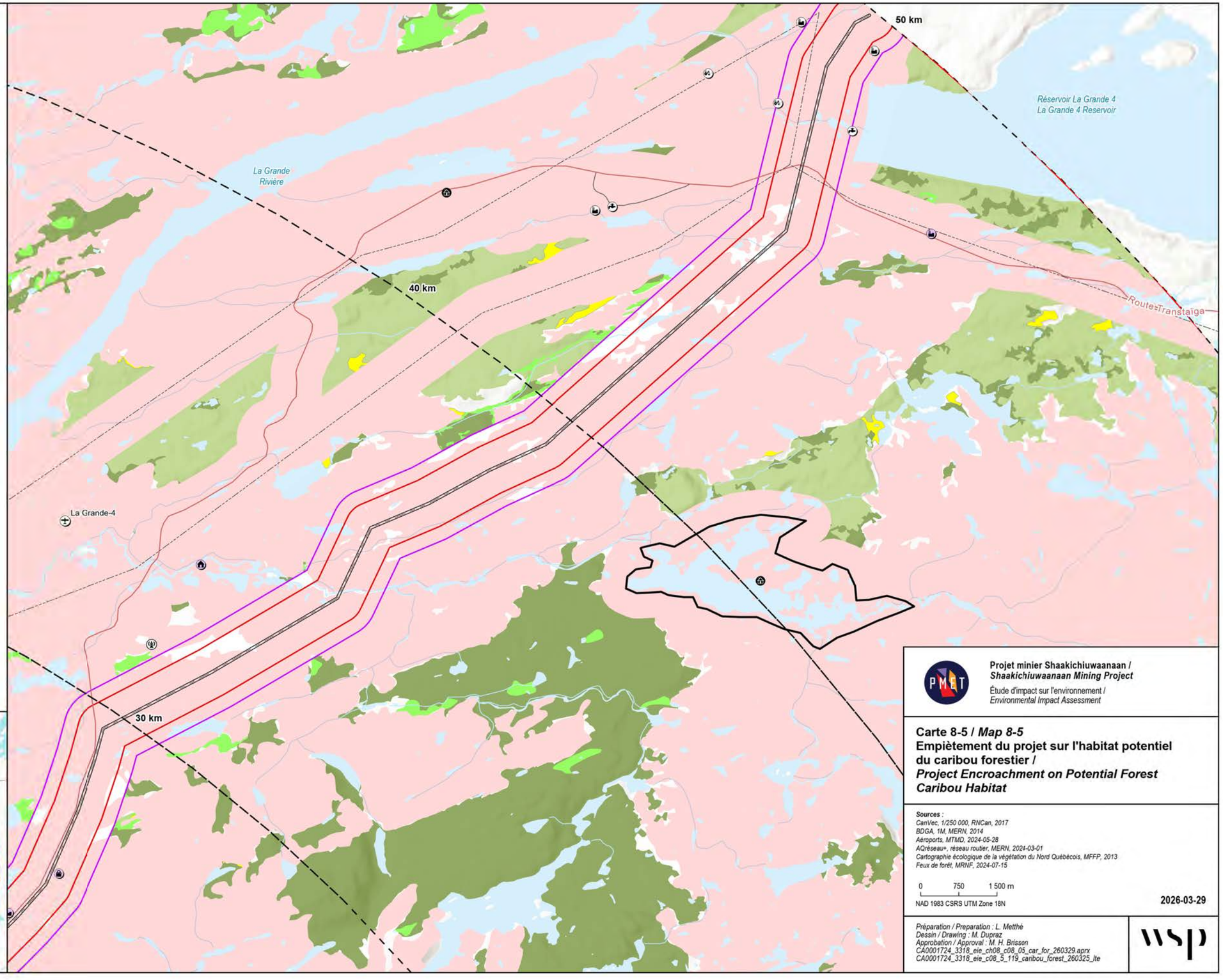
- Route collectrice municipale / *Municipal collector road*
- Locale / *Local road*

Utilisation du territoire / *Land Use*

Baux / *Leases*

- Fins de villégiature / *Leisure purpose*
- Fins commerciales / *Commercial purpose*
- Fins industrielles / *Industrial purpose*
- Camp cri permanent / *Cree permanent Camp*
- Aire de camps et de campements / *Camps and campsites area*





Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Étude d'impact sur l'environnement / *Environmental Impact Assessment*

Carte 8-5 / *Map 8-5*
Empiètement du projet sur l'habitat potentiel du caribou forestier / *Project Encroachment on Potential Forest Caribou Habitat*

Sources :
CanVec, 1/250 000, RNCan, 2017
BDGA, 1M, MERN, 2014
Aéroports, MTMD, 2024-05-28
AQréseau+, réseau routier, MERN, 2024-03-01
Cartographie écologique de la végétation du Nord Québécois, MFFP, 2013
Feux de forêt, MRNF, 2024-07-15

0 750 1 500 m
NAD 1983 CSRS UTM Zone 18N

2026-03-29

Préparation / Preparation : L. Metthé
Dessin / Drawing : M. Dupraz
Approbation / Approval : M. H. Brisson
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Table 8-6 Rate of disturbance to woodland caribou habitat in the biophysical LSA according to the approach of the Quebec government

Mine's area of influence (km)	Type of disturbance	Area (km²)					Proportion of disturbed surfaces (%)
		Permanent	Temporary	Subtotal	Without disturbance	Total[1]	
0–5	Anthropogenic	61.8	0.0	61.8	0.6 (1.0%)	62.4	99.0
	Natural	N/A	0.0				0.0
5–10	Anthropogenic	49.2	0.1	114.9	77.5 (40.3%)	192.4	25.6
	Natural	N/A	65.6				34.1
10–20	Anthropogenic	87.1	0.1	469.1	280.3 (37.4%)	749.4	11.6
	Natural	N/A	382.0				51.0
20–30	Anthropogenic	90.9	0.0	559.8	763.1 (57.7%)	1,322.8	6.9
	Natural	N/A	468.8				35.4
30–40	Anthropogenic	84.5	0.0	891.0	995.6 (52.8%)	1,886.7	4.5
	Natural	N/A	806.6				42.8
40–50	Anthropogenic	107.7	0.0	1,105.2	1,220.0 (52.5%)	2,325.2	4.6
	Natural	N/A	997.5				42.9
0–50	**Anthropogenic**	**481.1**	**0.2**	**3,201.7**	**3,337.1 (51.0%)**	**6,538.9**	**7.4**
	Natural	**N/A**	**2,720.4**				**41.6**

Notes: 1 Excluding the surface water network.
N/A not applicable.

Table 8-7 Rate of disturbance to woodland caribou habitat in the biophysical LSA according to the Government of Canada's methodological approach

Mine's area of influence (km)	Type of disturbance	Area (km²)					Proportion of disturbed areas (%)
		Permanent	Temporary	Subtotal	Without disturbance	Total	
0–5	Anthropogenic	23.3	0.0	39.3	39.2 (50.0%)	78.5	29.7
	Natural	N/A	16.0				20.4
5–10	Anthropogenic	7.3	0.2	105.9	129.5 (55.0%)	235.5	3.1
	Natural	N/A	98.6				41.9
10–20	Anthropogenic	98.1	0.1	484.4	457.4 (48.6%)	941.8	10.4
	Natural	N/A	386.2				41.0
20–30	Anthropogenic	104.2	0.0	585.5	984.2 (62.7%)	1,569.7	6.6
	Natural	N/A	481.3				30.7
30–40	Anthropogenic	91.5	0.0	946.3	1,251.3 (56.9%)	2,197.5	4.2
	Natural	N/A	854.8				38.9
40–50	Anthropogenic	128.8	0.0	1,184.6	1,638.7 (58.0%)	2,823.3	4.6
	Natural	N/A	1,055.8				37.4
0–50	**Anthropogenic**	**453.3**	**0.3**	**3,345.9**	**4,500.3 (57.4%)**	**7,846.2**	**5.8**
	Natural	**N/A**	**2,892.6**				**36.9**

Note: N/A not applicable.

Table 8-8 Rate of disturbance to woodland caribou habitat in the biophysical LSA according to the Cree Nation Government's methodological approach

Mine's area of influence (km)	Type of disturbance	Area (km²)					Proportion of disturbed areas (%)
		Permanent	Temporary	Subtotal	Without disturbance	Total[1]	
0–5	Anthropogenic	24.1	0.0	37.3	25.1 (40.2%)	62.4	38.6
	Natural	N/A	13.2				21.2
5–10	Anthropogenic	9.1	0.0	103.4	89.0 (46.3%)	192.4	4.7
	Natural	N/A	94.3				49.0
10–20	Anthropogenic	90.8	0.0	471.0	278.4 (37.2%)	749.4	12.1
	Natural	N/A	380.2				50.7
20–30	Anthropogenic	94.1	0.0	560.5	762.3 (57.6%)	1,322.8	7.1
	Natural	N/A	466.4				35.3
30–40	Anthropogenic	89.5	0.0	891.7	995.0 (52.7%)	1,886.7	4.7
	Natural	N/A	802.1				42.5
40–50	Anthropogenic	110.5	0.0	1163.8	1,638.2 (70.5%)	2325.2	4.8
	Natural	N/A	1,053.3				45.3
0–50	**Anthropogenic**	**418.1**	**0.0**	3227.7	**3,788.0 (57.9%)**	**6538.9**	**6.4**
	Natural	**N/A**	**2,809.6**				**43.0**

Notes: 1 Excluding the surface water network.
N/A not applicable.

Disturbances caused by vibrations, noise, light, and dust from infrastructure construction and equipment installation, as well as the risk of collisions associated with transport and heavy vehicle and equipment traffic, which can lead to mortality.

Mining projects have direct impacts through noise and dust pollution, as well as contamination of food sources, particularly lichens (Best et al., 2025; Lessard et al., 2026). Dust generated by mining infrastructure can reduce lichen cover over several kilometres around mine sites and lead to the accumulation of heavy metals in caribou tissues, with potential effects on health and reproduction (Lessard et al., 2026). Chen *et al*. (2017) found, in particular, that dust generated by mining transport can raise soil pH and significantly reduce lichen cover, thereby decreasing the availability of lichen to caribou within a radius of about 1 km around major roads.

Although roads are normally avoided by caribou, roads in the summer can also become an attractive food source for some caribou due to the deciduous vegetation and herbaceous plants growing along their edges (Post and Klein, 1999). However, proximity to roads increases the risk of collisions with vehicles (Fahrig and Rytwinski, 2009) and the likelihood of encounters between caribou and their predators (Whittington et al., 2011).

Chiropterans

During the construction phase, the main risks include the loss and fragmentation of breeding and feeding habitats, disturbance caused by noise, and a decline in habitat quality.

Loss and fragmentation of breeding and feeding habitats due to site preparation, stripping, and clearing activities

According to the *Recovery Strategy for the Little Brown Myotis, the Northern Myotis, and the Tri-coloured Bat* (ECCC, 2018), habitat loss is one of the greatest threats to these species after white-nose syndrome (WNS). Most of the bat species found in the project area are arboreal (Tremblay and Jutras, 2010): the red, hoary, and silver-haired bats primarily use arboreal shelters, while bats of the genus *Myotis* use a combination of arboreal structures, buildings, and rocky structures(Tremblay and Jutras, 2010). The big brown bat uses buildings or rocky structures (Tremblay and Jutras, 2010), but also mature trees with cavities (woodpecker holes, crevices, etc.) (Willis et al., 2006). Therefore, clearing and other work associated with the construction of the work and storage areas will cause a direct loss of roost sites for chiropterans and will contribute to changes in the microclimate of the immediate environment, which could also result in the loss of roost sites or decrease their quality.

The loss of wetlands and water environments will result in the loss of feeding sites for chiropterans. These environments are indeed key habitats to meet the feeding needs of chiropterans since they usually support large quantities of prey (Grindal et al., 1999). For bats using these areas, the loss of these sites could imply increased displacement to alternate foraging sites.

Disturbances caused by vibrations, noise, light, and dust from infrastructure construction and equipment installation, as well as the risk of collisions associated with transport and heavy vehicle and equipment traffic, which can lead to mortality.

Activities that generate noise, vibration, and dust, such as earth-moving, construction, excavation, transportation, and traffic activities could cause disturbance to chiropteran populations.

In fact, since chiropterans use echolocation to navigate and to locate and capture their prey, the presence of anthropogenic noise could interfere with these activities. For “acoustic” predators such as bats, noise pollution is therefore likely to decrease hunting efficiency (Senzaki et al., 2016; Finch et al., 2020). The impact of this type of disturbance varies according to the species of chiropteran, each of which uses its own range of ultrasound frequencies (Bunkley et al., 2015). Therefore, the frequency of noise generated by road traffic, which varies between 0 kHz and 50 kHz, but mostly between 1 kHz and 20 kHz (Schaub et al., 2008), will probably cause more disturbance to species using low frequencies, but will also affect other species, since their minimum frequencies are generally between 35 kHz and 45 kHz. Among the species potentially present in the project area, those using low frequencies are the silver-haired, hoary, and big brown bats. At their roosts, the presence of noise could also affect chiropterans by disturbing their sleep. As a result, a decrease or disappearance of the quality of daytime roosts available for local chiropteran populations could be observed in the area surrounding the project site.

Similarly, vibrations generated by some activities near certain habitats, such as maternity colonies, could result in a reduction in reproductive success and cause bats to abandon some sites to find others (ECCC, 2018; McCracken, 2011). It should be noted, however, that the inventories carried out did not confirm the presence of a bat maternity roost on the project site, although the presence of such a habitat within the biophysical LSA remains a possibility. This area has numerous snags, and several species of bats regularly change their summer roosts using a network of sites in the same area (ECCC, 2018; ERCSQ, 2019). It is therefore possible that the sites inspected were used by chiropterans at another time, or that areas containing several snags that are less suitable were used preferentially.

Moreover, as chiropterans are mainly nocturnal, they are especially likely to be disturbed by light pollution (Stone et al., 2015). It would appear that the presence of artificial light would disrupt the movements of certain species of chiropterans (Stone et al., 2009) and may direct them to suboptimal alternate flight paths. These alternate flight paths may require greater energy expenditures and may pose greater predation risks (Stone et al, 2015). However, it is difficult to assess the actual effect as a result of the project, since the impact of a flight path change varies depending on the available habitats in the surrounding environment. In addition, some chiropteran species, including the big brown, hoary, and red bats and species of the genus *Myotis*, use artificial light sources for feeding under certain conditions as they tend to concentrate many flying insects (Rydell, 1992; Stone et al., 2015 (Rydell and Racey 1995; Hickey et al. 1996).

Although there is little research on the subject, dust stirred up during construction work can also affect bats, particularly because of its likely negative impact on the insect populations on which they depend for food.

In summary, certain disturbances caused by construction activities (noise, vibration, and light pollution) can have various impacts on bats using the biophysical local study area. These can result in behavioural disturbances in individual bats, particularly in relation to their movements and feeding, or in a decline in the quality or even a loss of certain habitats, such as daytime shelters, maternity roosts, and feeding grounds. However, positive impacts can result from certain sources of disturbance such as the creation of linear landscape elements during deforestation or the attractive effect of lights on insects.

Road traffic can also pose a risk to chiropterans by causing direct mortality due to collisions with mobile equipment (ECCC, 2018). The season, surrounding environment, and traffic density influence the number of collisions and deaths caused by mobile equipment. Low-flying species, such as the northern long-eared bat and tri-coloured bat, appear to be more vulnerable to the risk of mortality due to collision (Fensome and Mathews, 2016). This risk is also higher in juveniles than in adults, likely because young bats are less experienced and less skilled in flight (Fensome and Mathews, 2016). The height of the roadside tree canopy may also affect the risk of mortality due to collision.

For example, little brown bats were observed to cross roads at canopy height and when the canopy was low (<6 m), they crossed at a lower height and thus closer to mobile equipment (Russel et al., 2009).

Deterioration of the quality of the environment due to accidental leaks and spills of petroleum products or other hazardous materials into surface water and soil caused by the operation of equipment that uses these products or simply during their handling

Accidental spills of hazardous materials, particularly from equipment maintenance activities or from traffic and breakdowns of mobile equipment, could, in some cases, have an indirect impact on chiropterans. In fact, the possible contamination of a watercourse, water body, or wetland could alter the survival or reproduction of the insects that chiropterans feed on. Certain contaminants could also accumulate in the tissues of insects and thus cause contamination in chiropterans. Moreover, insofar as bats use this type of environment for drinking, direct contamination of individuals is also possible (Clarke-Wood et al., 2016; Korine et al., 2015; Pilosof et al., 2014).

Avian fauna

Loss and fragmentation of nesting and feeding habitats due to various construction projects involving clearing, soil stripping, earthwork, and drainage

Among the six bird species of special status likely to nest within the local study area, all will experience some loss of potential habitat due to the planned project footprint (Table 8-9, Maps 8-6 to 8-8). For the Common Nighthawk, the total area affected is estimated at 601.2 ha, representing 5.6% of its potential habitat within the LSA. In the case of the Bank Swallow, the planned activities will result in a loss of 10.8 ha, corresponding to 13.0% of its potential habitat within the LSA. For the Olive-sided Flycatcher, the projected footprint will cover an area of 277.3 ha, equivalent to 6.1% of its potential habitat within the LSA. With respect to the Lesser Yellowlegs and the Rusty Blackbird, which share the same habitat type, a total of 85.3 ha will be removed from their potential habitat, representing 7.3% of that habitat within the LSA. Finally, 4.8 ha of potential Short-eared Owl habitat will be affected, corresponding to 2.3% of its potential habitat within the LSA. A summary of the criteria used to delineate potential habitat for each species is presented in Table 8-10.

Table 8-9 Areas and Project Footprint of Potential Habitats for Bird Species of Special Status

Species	Surface area (ha)								Percentage of Encroachment within the Biophysical LSA
	Project Footprint within the Project Area						Biophysical LSA		
	Access road	Electrical line	Proposed component	Total	Access road	Ligne électrique	Proposed component	Total	
Common Nighthawk	62.3	151.9	387.1	**601.2**	1,397.1	5,200.7	4,066.9	**10,664.7**	5.6
Short-eared Owl	0.0	4.8	0.0	**4.8**	0.0	112.6	98.9	**211.5**	2.3
Bank Swallow	2.9	2.4	5.5	**10.8**	21.5	48.7	12.9	**83.0**	13.0
Olive-sided Flycatcher	23.6	69.5	184.1	**277.3**	587.5	2,209.4	1,781.1	**4,578.1**	6.1
Rusty Blackbird and Lesser Yellowlegs	3.7	20.7	60.8	**85.2**	117.7	604.8	448.1	**1,170.5**	7.2

Table 8-10 Summary of Criteria Used to Identify Potential Habitats for Target Species of Special Status

Species	Summary of selection criteria
Common Nighthawk	Outcrops, beaches, gravel pits, industrial sites, plantations older than 10 years, burns aged 0 to 20 years, dry barren areas, power transmission line rights-of-way, cutblocks 10 years old or less, open peatlands, lichen woodlands, shrublands, and regenerating stands.
Short-eared Owl	Open habitats (open peatlands, swamps, marshes) covering 50 ha or more.
Bank Swallow	Sand or silt banks with slopes ranging from 70 to 105°, or anthropogenic sites including aggregate quarries (sand and gravel pits), soil stockpiles, or road cut trenches.
Olive-sided Flycatcher	Open habitats of 10 ha or more, located within coniferous or mixed forests that are relatively open (Class D) and within 100 m of a water body. Also includes burns, edges of forest cutblocks, clearings or peatlands, wooded shorelines of streams and beaver ponds, and lichen woodlands.
Rusty Blackbird Lesser Yellowlegs	Open wetlands (open peatlands, swamps, marshes), shallow ponds, or alder swamps.

Disturbances caused by vibrations, noise, light, and dust, as well as the risk of collisions associated with transport and heavy vehicle and equipment traffic, which can lead to mortality

Indirect impacts caused by increased disturbances—such as vibrations, noise, light, and dust emissions—are to be expected during the construction phase due to infrastructure work and equipment installation.

The effect of noise has been shown in the literature to have a potential negative effect on avian wildlife (Ortega, 2012; McClure et al., 2013; Kunc and Schmidt, 2019; Senzaki et al., 202). The threshold at which impacts could be felt is 40 dBA (Reijnen et al., 1997; Shannon et al., 2015). In fact, noise from infrastructure construction, site traffic, and refuelling and maintenance of mobile equipment could result in avoidance of certain noisy areas, changes in the reproductive success of certain species, and changes in interspecific communication. Human presence would also result in the avoidance of areas used by certain bird species. However, the noise generated by the project on the outskirts of the mine site is not expected to exceed this threshold by a significant margin, since the prescribed noise limits are 40 dBA at night and 45 dBA during the day (hourly average).

Few studies have been done on the impact of vibration on birds. However, Ferguson-Lee and Christie (2005) suggest that the upper limit is 10 kHz to 20 kHz and the lower limit is 50 kHz to 300 Hz. In some species of birds of prey, it would be between 1 kHz and 6 kHz (Yamazaki et al., 2004). The main source of vibration during the construction phase of the project will be surface blasting activities. It should be noted, however, that these activities will be carried out on a sporadic basis and will be concentrated in specific areas, such as for the construction of roads and ponds.

In the case of light disturbance, nighttime lighting could have an effect on migrating birds, attracting groups of birds to operations and diverting them from their migratory route. This may occur particularly under foggy conditions, resulting in a risk of mortality from collisions (Ogden, 1996).

Heavy vehicles and equipment traffic also pose a risk to birds of special status. In Canada, it is estimated that 3,462 birds per 100 km are struck by vehicles each year during the breeding season (Bishop and Borgan, 2013). Owls are particularly vulnerable to this threat, as is the case with the short-eared owl (COSEWIC, 2021). Speed limits at various construction sites and during mining operations help mitigate this danger. The access road, where speeds are higher, is the area most prone to collisions.

Deterioration of the quality of the environment due to accidental leaks and spills of petroleum products or other hazardous materials into surface water and soil caused by the operation of equipment that uses these products or simply during their handling

Accidental spills of hazardous materials—particularly those related to equipment maintenance, traffic, or breakdowns of mobile equipment—could, in some cases, have direct and indirect impacts on birdlife. Contamination of soil or surface water can expose birds to various hydrocarbons. This exposure can cause the feathers to become fouled, compromising their waterproofing and thermal insulation properties, as well as causing toxic effects resulting from the ingestion or inhalation of contaminants. Some products may also have an impact on embryonic development and thus affect reproduction (King et al., 2021). Such exposures can alter behaviour, reduce survival rates, and compromise the reproductive success of birds. Similarly, heavy metals such as lead and mercury are known to affect the nervous, endocrine, and reproductive systems (ECCC, 2020b).

Contamination of surface water and soil can also have indirect effects by degrading habitats or affecting the survival and reproduction of food sources, such as plants, insects, and small mammals. Some contaminants can accumulate in the tissues of these prey animals, leading to secondary contamination in the birds that feed on them.

-74°0'

-73°54'

53°36'

53°30'

-74°0'

Carte 8-6b

Carte 8-6a

Lac Tilly

Réservoir La Grande 4 / La Grande 4 Reservoir

Route Transtaïga / Transtaiga Road

Lac Mihiwasiyalupaskw

Lac Katalopaskw Tamimiga

La Grande Rivière

Lac Carmoy

Lac Nochet

0 2,8 km

Route Transtaïga / Transtaiga Road

Zones d'étude / *Study Areas*

- Projet / *Project*
- Locale - Biophysique / *Local - Biophysical*

Faune aviaire à statut particulier / *Special-Status Avian Species*

Observation / *Observation*

- Hirondelle de rivage / *Bank swallow*
- Moucherolle à côtés olive / *Olive-sided Flycatcher*

Habitat potentiel / *Potential Habitat*

- Hirondelle de rivage / *Bank swallow*
- Moucherolle à côtés olives / *Olive-sided Flycatcher*

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*

Composantes de l'écosystème / *Ecosystem Components*

Milieux humides et hydriques / *Wetlands and Hydrous Environments*

- Marécage arborescent / *Treed swamp*
- Marécage arbustif / *Shrubby swamp*
- Tourbière minérotrophe boisée / *Treed fen*
- Tourbière minérotrophe ouverte / *Open fen*
- Tourbière ombrotrophe boisée / *Treed bog*
- Tourbière ombrotrophe ouverte / *Open bog*
- Marais / *Marsh*
- Eau peu profonde / *Shallow water*
- Plan d'eau / *Waterbody*

Cours d'eau / *Watercourses*

- Intermittent / *Intermittent*
- Permanent / *Permanent*

Milieux terrestres / *Terrestrial Environments*

- Feuillu / *Deciduous*
- Mixte / *Mixed-wood*
- Résineux / *Softwood*
- Arbustaie / *Scrubland*
- Lande à lichens / *Lichen tundra*
- Régénération / *Regeneration*

Autres milieux / *Other Environments*

- Anthropique / *Anthropogenic*
- Champ de blocs / *Boulder field*
- Île / *Island*
- Surface dénudée / *Dry barren*

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Étude d'impact sur l'environnement / Environmental Impact Assessment

Carte 8-6a / *Map 8-6a*

Empiètement du projet sur l'habitat potentiel des oiseaux terrestres / *Project Encroachment on Potential Habitat for Terrestrial Birds*

Sources / Sources

ADirection, réseau routier, MERN, 2016
BDGA, 1M, MERN, 2014
CanVec, 250k,RNCan, 2017
MRNF, Végétation du Nord québécois, 2013
WSP, Photo interprétation et validation terrain, 2024-2025 / BBA, Photo interprétation, 2023
GRHQ, Réseau hydrique, 2024

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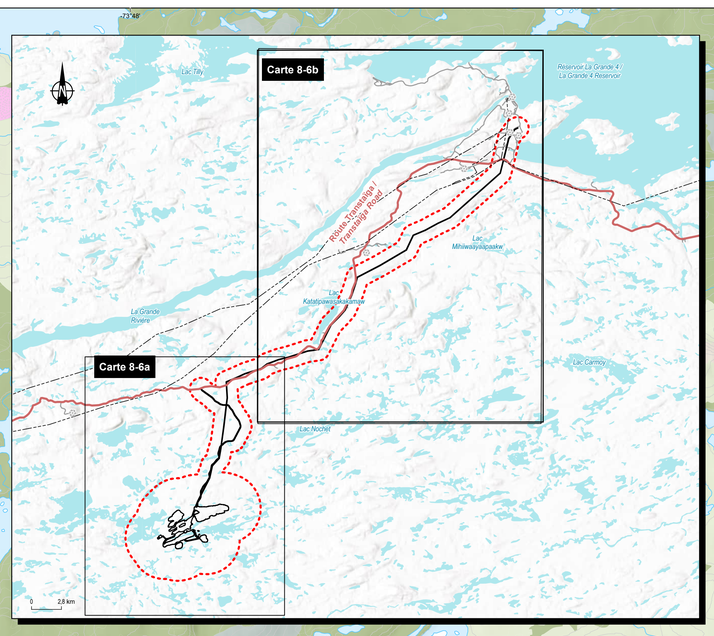
UTM, fuseau 18, NAD83 (CSRS)

2026-03-25

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CA0001724_3318_ele_c08_6_130_pis_terrest_260325_A0

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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*
- Locale - Biophysique / *Local - Biophysical*

Habitat potentiel / *Potential Habitat*
- Hirondelle de rivage / *Bank swallow*
- Moucherolle à côtés olives / *Olive-sided Flycatcher*

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*
- Locale

Composantes de l'écosystème / *Ecosystem Components*

Milieux humides et hydriques / *Wetlands and Hydrous Environments*
- Marécage arborescent / *Treed swamp*
- Marécage arbustif / *Shrubby swamp*
- Tourbière minérotrophe boisée / *Treed fen*
- Tourbière minérotrophe ouverte / *Open fen*
- Tourbière ombrotrophe boisée / *Treed bog*
- Tourbière ombrotrophe ouverte / *Open bog*
- Marais / *Marsh*
- Eau peu profonde / *Shallow water*
- Plan d'eau / *Waterbody*

Cours d'eau / *Watercourses*
- Intermittent / *Intermitent*
- Permanent / *Permanent*

Milieux terrestres / *Terrestrial Environments*
- Mixte / *Mixed-wood*
- Résineux / *Softwood*
- Arbustaie / *Scrubland*
- Lande à lichens / *Lichen tundra*
- Régénération / *Regeneration*

Autres milieux / *Other Environments*
- Anthropique / *Anthropogenic*
- Champ de blocs / *Boulder field*
- Île / *Island*
- Ligne de transport d'énergie / *Electric power transmission line*
- Surface dénudée / *Dry barren*

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Étude d'impact sur l'environnement / Environmental Impact Assessment

Carte 8-6b / *Map 8-6b*
Empiètement du projet sur l'habitat potentiel des oiseaux terrestres / *Project Encroachment on Potential Habitat for Terrestrial Birds*

Sources / Sources

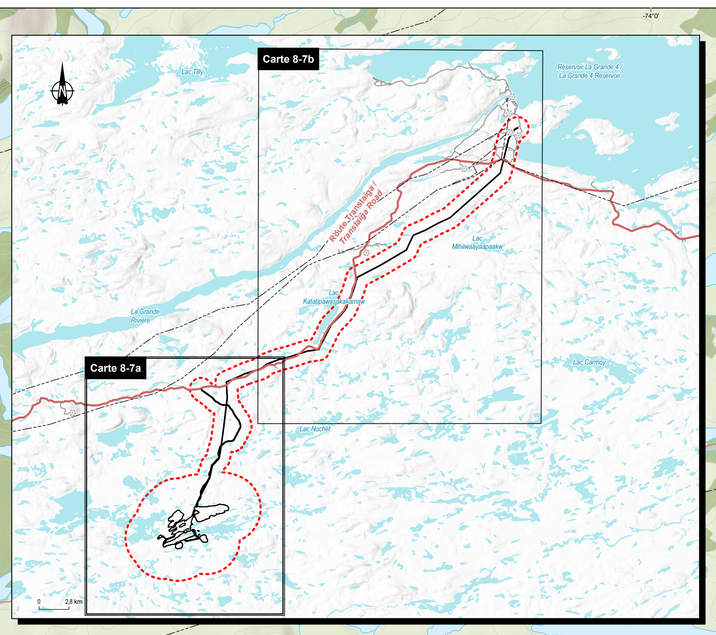
ADIIslatur, Réseau routier, MERN, 2016
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WSP, Photo interprétation et validation terrain, 2024-2025 / BBA, Photo interprétation, 2023
GRHQ, Réseau hydrique, 2024

0 310 620 m
UTM, fuseau 18, NAD83 (CSRS)

2026-03-25

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Zones d'étude / *Study Areas*

Projet / *Project*

Locale - Biophysique / *Local - Biophysical*

Faune aviaire à statut particulier / *Special-Status Avian Species*

Observation / *Observation*

Petit chevalier / *Lesser Yellowlegs*

Quiscale rouilleux / *Rusty blackbird*

Habitat potentiel / *Potential Habitat*

Quiscale Rouilleux et Petit chevalier / *Rusty blackbird and Lesser Yellowlegs*

Infrastructures / *Infrastructure*

Centrale hydroélectrique / *Hydroelectric generating station*

Ligne de transport d'énergie / *Electric power transmission line*

Réseau routier / *Road Network*

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Tourbière minérotrophe ouverte / *Open fen*

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Tourbière ombrotrophe ouverte / *Open bog*

Marais / *Marsh*

Eau peu profonde / *Shallow water*

Plan d'eau / *Waterbody*

Cours d'eau / *Watercourses*

Intermittent / *Intermittent*

Permanent / *Permanent*

Milieux terrestres / *Terrestrial Environments*

Feuillu / *Deciduous*

Mixte / *Mixed-wood*

Résineux / *Softwood*

Arbustaie / *Scrubland*

Lande à lichens / *Lichen tundra*

Régénération / *Regeneration*

Autres milieux / *Other Environments*

Anthropique / *Anthropogenic*

Champ de blocs / *Boulder field*

Île / *Island*

Surface dénudée / *Dry barren*

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Étude d'impact sur l'environnement / *Environmental Impact Assessment*

Carte 8-7a / *Map 8-7a*
Empiètement du projet sur l'habitat potentiel des oiseaux associés aux milieux humides / *Project Encroachment on Potential Habitat for Wetland-Associated Birds*

Sources / Sources

ADIrésolu+, réseau routier, MERN, 2016
BDGA, YM, MERN, 2014
Carrières, 250k,RNCan, 2017
MRNF, Végétation du Nord québécois, 2013
WSP, Photo interprétation et validation terrain, 2024-2025 / BBA, Photo interprétation, 2023
GRHQ, Réseau hydrique, 2024

0 210 420 m

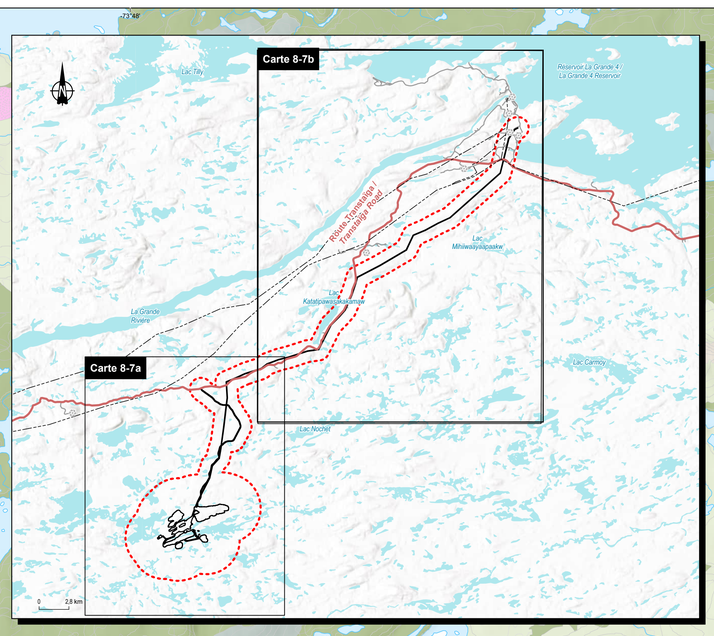
UTM, fuseau 18, NAD83 (CSRS)

2026-03-25

Préparation / Prepared by : C. Villeneuve
Dessin / Drawn by : M. Dupraz
Approbation / Approved by : E. D'Astous
CA0001724_3318_eie_ch08_t05_07_260309.aprx
CA0001724_3318_eie_c08_7_131_ois_mh_260325_A0

wsp

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.



-73°48'
-73°42'
-73°36'
-73°30'
53°54'
53°48'
53°42'

Réservoir La Grande 4

Route Transtaïga / Transtaiga Road

Lac Nochet

Zones d'étude / *Study Areas*
- Projet / *Project*
- Locale - Biophysique / *Local - Biophysical*

Habitat potentiel / *Potential Habitat*
- Quiscale Rouilleux et Petit chevalier / *Rusty blackbird and Lesser Yellowlegs*

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*
- Locale

Composantes de l'écosystème / *Ecosystem Components*

Milieux humides et hydriques / *Wetlands and Hydrous Environments*
- Marécage arborescent / *Treed swamp*
- Marécage arbustif / *Shrubby swamp*
- Tourbière minérotrophe boisée / *Treed fen*
- Tourbière minérotrophe ouverte / *Open fen*
- Tourbière ombrotrophe boisée / *Treed bog*
- Tourbière ombrotrophe ouverte / *Open bog*
- Marais / *Marsh*
- Eau peu profonde / *Shallow water*
- Plan d'eau / *Waterbody*

Cours d'eau / *Watercourses*
- Intermittent / *Intermitent*
- Permanent / *Permanent*

Milieux terrestres / *Terrestrial Environments*
- Mixte / *Mixed-wood*
- Résineux / *Softwood*
- Arbustaie / *Scrubland*
- Lande à lichens / *Lichen tundra*
- Régénération / *Regeneration*

Autres milieux / *Other Environments*
- Anthropique / *Anthropogenic*
- Champ de blocs / *Boulder field*
- Île / *Island*
- Ligne de transport d'énergie / *Electric power transmission line*
- Surface dénudée / *Dry barren*

PMBT

Projet minier Shaakichiuwaanaan / *Shaakichiuwaanaan Mining Project*

Étude d'impact sur l'environnement / Environmental Impact Assessment

Carte 8-7b / *Map 8-7b*
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0 310 620 m
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