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Nunavik Nickel Project, by Canadian Royalties Inc.

Analysis of the Request to Amend the Certificate of Authorization for the Underground Mining of the Mesamax Deposit, the Expansion of the Mesamax Waste-rock Stockpile, the Operation of the Expo Quarries 2 and 2b, the Operation of Esker 2b and the Construction of Two Helipads

Dossier No. 3215-14-007

August 2022

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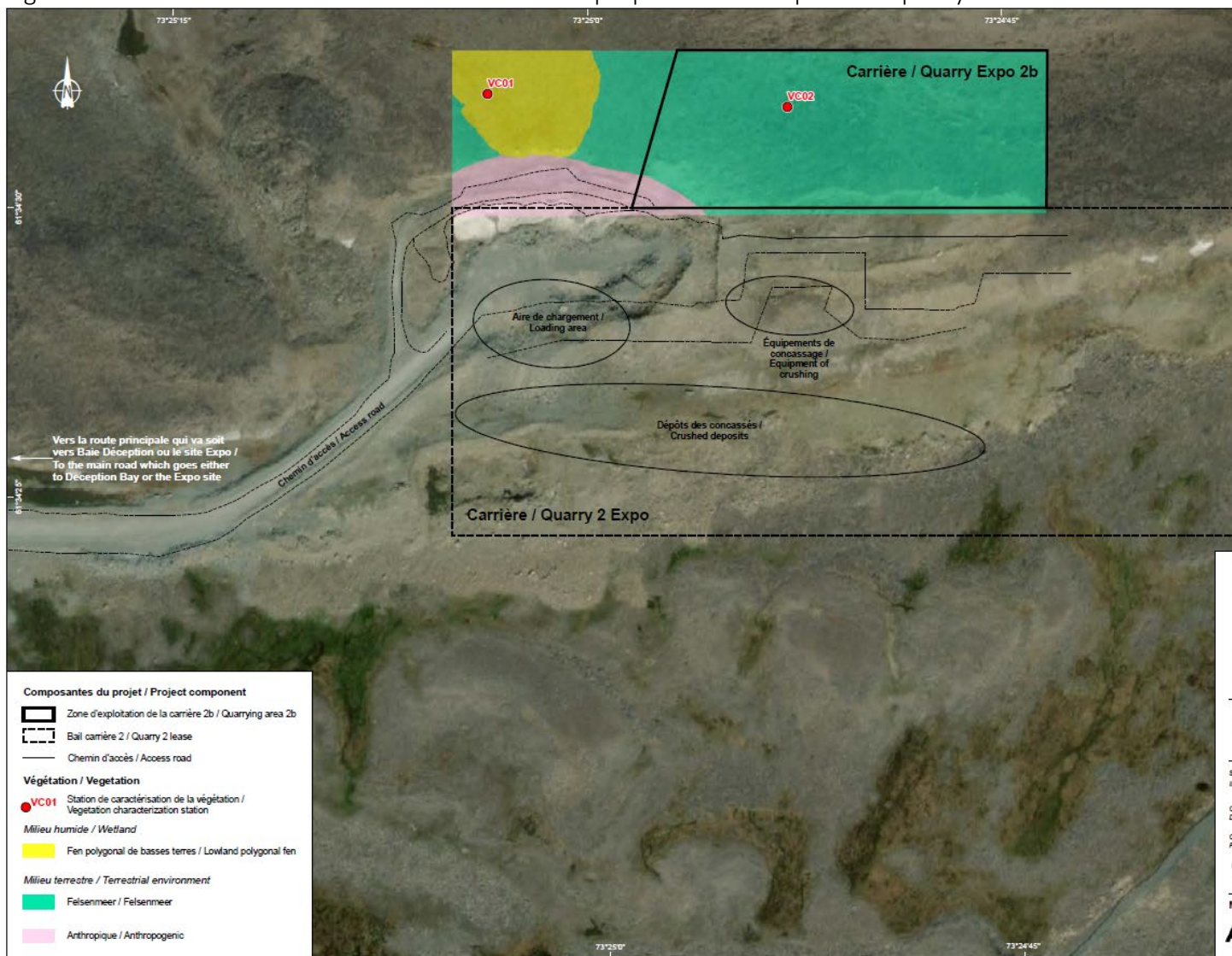
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## INTRODUCTION

The Nunavik Nickel inc. Project (NNiP), by Canadian Royalties Inc. (CRI), adhered to environmental and social impact assessment process, which led to certification of authorization for the entire NNiP mining site on May 20, 2008, pursuant to section 201 of the Environmental Quality Act. Since that time, various amendments to the certification of authorization have been authorized, most recently on June 30, 2022, for works on the electric supply at the Deception Bay camp and the installation of fibre optics.

NNiP now includes six nickel and copper mines: Mesamax, Expo, Méquillon, Ivakkak, Allammaq and Puimajuq. The complex is located approximately 80 km west of Kangiqsujuaq and approximately 140 km southeast of Salluit. The operation of these deposits is planned to take place until 2032.

*Figure 1 Location of the Nunavik Nickel inc. Project*



Source: Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc., AECOM Canada inc, March 2022

This document presents the analysis of Canadian Royalties Inc.'s request to amend the certification of authorization for the underground mining of the Mesamax deposit (Mesamax UG), the expansion of the Mesamax extraction pit, the expansion of the Mesamax waste rock stockpile, the operation of the Expo 2 and 2b quarries, the operation of the 2b esker and the construction of a helicopter landing zone on the road between the Méquillon and Ivakkak sites.

Our analysis of the request is based on the following document:

- Letter from Stéphane Twigg, Canadian Royalties Inc., to Marc Croteau, Provincial Administrator of the James Bay and Northern Quebec Agreement and Deputy Minister of the Environment and Climate Change, dated March 23, 2022, concerning the request to amend the certificate of authorization for the Nunavik Nickel Inc. Project, Canadian Royalties Inc. – Mesamax UG and waste rock stockpile, Expo2 and 2b quarries, esker 2b, helipads, 1 page and 1 appendix:
  - o CANADIAN ROYALTIES INC. *Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc.- Mesamax UG and waste rock stockpile, Expo 2 and 2b quarries, esker 2b, helipads*, by AEROM Canada Ltd., dated March 2022, 364 pages, including 17 appendices.

The environmental and social impact study is based on all the information provided to date by the proponent, as well as on the analysis carried out by the Direction adjointe des projets industriels et miniers, in collaboration with the administrative units concerned at the Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) and certain other departments.

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## I. DESCRIPTION OF THE AMENDMENT TO THE PROJECT

### 1.1 Underground mining of the Mesamax deposit and expansion of the waste rock stockpile

The Mesamax mine is located approximately 15 km east of the Expo industrial complex (Figure 2). It is already in operation and is accessible by the road between the Expo and Mesamax deposits.

The proponent plans to build a portal to be able to mine the underground deposit at this location, called Mesamax UG. It also plans to expand the open mining pit. In addition, it intends to build an underground mine emergency exit and ventilation stacks, rehabilitate water collection ditches, add an ore shed, expand the waste rock stockpile, expand offices, washroom facilities and garage, and construct a concrete slab. The works would involve excavation, blasting and backfilling of the mining area, as well as the extraction of borrow materials.

### 1.2 Description of the proposed developments and operations

#### 1.2.1 Mining of the Mesamax UG underground deposit

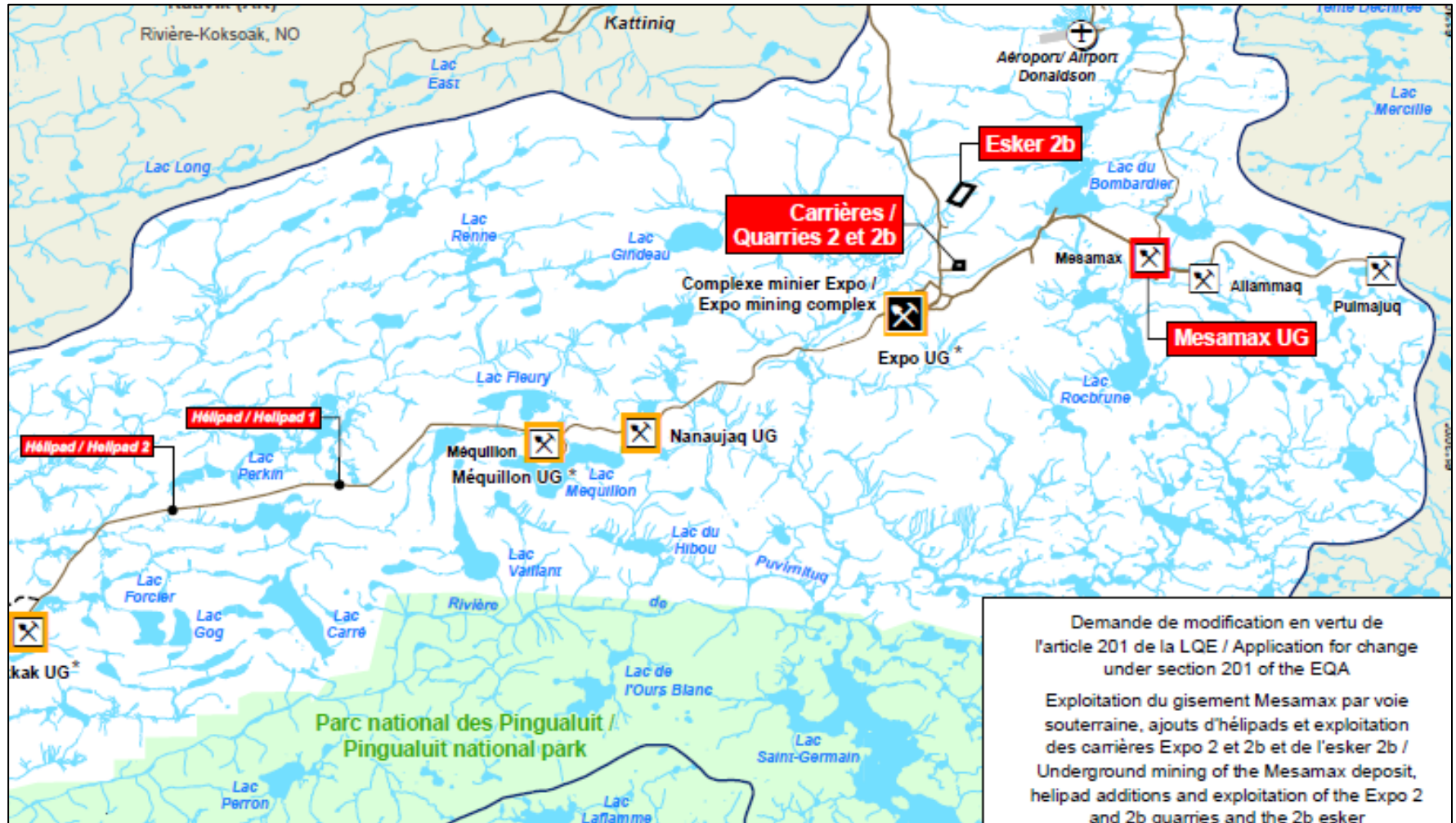
The mining rate of the Mesamax UG deposit is expected to be 750 tonnes per day, for a total of 252,000 tonnes of ore over a 2-year mine life, which includes 1 year of development and 1 year of operation. Annual production will be approximately 270,000 tonnes per year, once maximum production is reached. The waste rock / ore ratio is estimated at 1:2.5. A summary of the estimated quantities of waste rock, ore, concentrate and tailings for the life of the project is presented in Table 1.

*Table 1 Quantity of waste rock, ore, concentrate and tailings produced during the operation of the Mesamax UG deposit in tonnes*

Stériles	Minerai	Concentré	Résidus
174 200	252 268	20 639	237 063

Source: Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc., AECOM Canada inc, March 2022

Figure 2. Location of the planned works.



Source: Adapted from Map 1. Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc., AECOM Canada inc, March 2022



## 1.2.2 Storage

### 1.2.2.1 Projected stockpile

The ore extracted from the Mesamax site is currently transported to the Expo industrial complex, unless road conditions do not allow for safe transportation. The ore is temporarily deposited on a storage area west of the pit.

The proponent intends to build an ore stockpile that will store the equivalent of 7 days of production, or 91,000 tonnes of ore (45,500 m<sup>3</sup>).

### 1.2.2.2 Tailings management facility

All tailings generated by the Mesamax deposit will be accumulated in the tailings facility at the Expo mine complex. Therefore, no mine tailings will be accumulated on the Mesamax site.

### 1.2.2.3 Waste rock stockpile

An expansion of the waste rock stockpile at the Mesamax mine site is required to allow for an additional 1.03 Mt to be stockpiled during mining. The surface area of the authorized waste rock stockpile at Mesamax is 147,000 m<sup>2</sup>, while this request is for a total surface area of 182,000 m<sup>2</sup>. The area planned for the expansion of the waste rock stockpile is characterized by a reworked soil, already used for mining operations.

Waste rock produced during the development phase of the Mesamax UG access ramp and main infrastructure will be temporarily disposed of in the Mesamax pit. It will later be moved underground for safety purposes to backfill certain galleries and the Allammaq underground mine. Excess waste rock will be stored in the Mesamax waste rock stockpile.

Backfilling the pit and underground mine galleries with waste rock is favoured by MELCC, as this method reduces the footprint of the mine site and the risk of surface and groundwater contamination from acid generation and leachate.

*Expert opinion: The proponent must specify what proportion of the waste rock to be generated by the Mesamax operation (pit and underground) will be used for backfill and indicate which areas of the Mesamax mine will be backfilled (pit and underground). It must also evaluate the possibility of backfilling the entire pit, including the northeast pushback, with waste rock without creating a pit lake. The proponent must submit a schedule for the completion of the backfill works.*

*Given the potential for acid generation and leaching of waste rock, the proponent must develop and implement measures to limit the supply of oxygen and to promote permafrost upwelling in the underground backfill, for example, by covering it with an impervious cover, as proposed for the Expo pit. The proponent must submit the details of the measures it has developed.*

The literature mentions that taliks (thawed portion of year-round permafrost) can develop under water bodies deeper than 2 m and where the lower part of the water column does not freeze in winter. In addition, for water bodies larger than 200 m in diameter, taliks may develop in such a way that they cut through the entire permafrost (through taliks).

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The section “4.3.2 Characterization of the extraction pits” of the impact study (Génivar, 2007) mentions that the Mesamax pit would be 200 m wide, 350 m long and 90 m deep. In the event that the pit is flooded by runoff and contact water, the pit’s dimensions would theoretically allow a hydraulic connection to develop between the pit water and the deep aquifer formation found beneath the base of the permafrost. This link is all the more possible considering the operation of underground workings to a depth of 270 m. The formation of a through talik could therefore allow the migration at depth of contaminants initially isolated in the active part of the permafrost (mollisol), which only thaws at the surface in summer.

*Expert opinion: The proponent must assess the risk of groundwater contamination due to the presence of underground workings in a context where there is a potential for talik formation. Considering the potentially acid-generating and leachable nature of the mine waste rock that will be placed in the Mesamax underground work sites, as well as the depth targeted for the operation of these sites (level 270 m), the proponent must validate certain elements in the field, and;*

- *Justify whether the Mesamax site may recharge the deep aquifer via a through (open) talik, generated by the combined effects of the pit and underground workings;*
- *Define and justify what is the residual thickness of the permafrost layer below 270 m at the end of the Mesamax underground workings;*
- *Verify whether the base of the permafrost was intersected during exploratory drilling and specify the methodologies used, particularly to validate the 400 m permafrost thickness at the Mesamax site;*
- *Specify its approach to prevent the initiation of sulfide oxidation (DMA) and leaching reactions depending on the layout of the mine waste rock in the underground workings;*
- *Specify and justify the impermeability measures that will be put in place to prevent oxygen intake and promote permafrost upswelling;*
- *Provide thermal modelling to simulate the combined impact of underground workings and the pit on permafrost distribution in a changing climate.*

*Expert opinion: The proponent mentions that it will excavate borrow materials in the area where the Mesamax deposit is mined. The proponent must locate this source of borrowed materials on a map and specify its intended use.*

*Expert opinion: In section 3.1 of its request to amend the certificate of authorization, the proponent refers to an expansion of the Mesamax pushback, also shown on Map 2. However, this pushback is not presented in more detail in the request. The proponent must indicate whether it has all the required authorizations to carry out this expansion or, if not, provide all the documentation required to assess the impacts in this request to amend the certification of authorization.*

### **1.2.3 Water management**

Prior to discharge to the receiving stream, drainage from the mine site is directed by gravity to the Mesamax site catch basin via ditches and berms. The water from the basin is then directed to the mobile wastewater treatment plant at the Mesamax site, which is already in operation, and then it is discharged to the receiving environment via the existing mine effluent. No changes to the water treatment system currently in place at the site are planned for this request to amend the

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certificate of authorization. However, the water treatment system was covered with a dome in order to extend the treatment season and thus increase the volume of water treated. The proponent plans to construct new drainage ditches around the periphery of the proposed infrastructure.

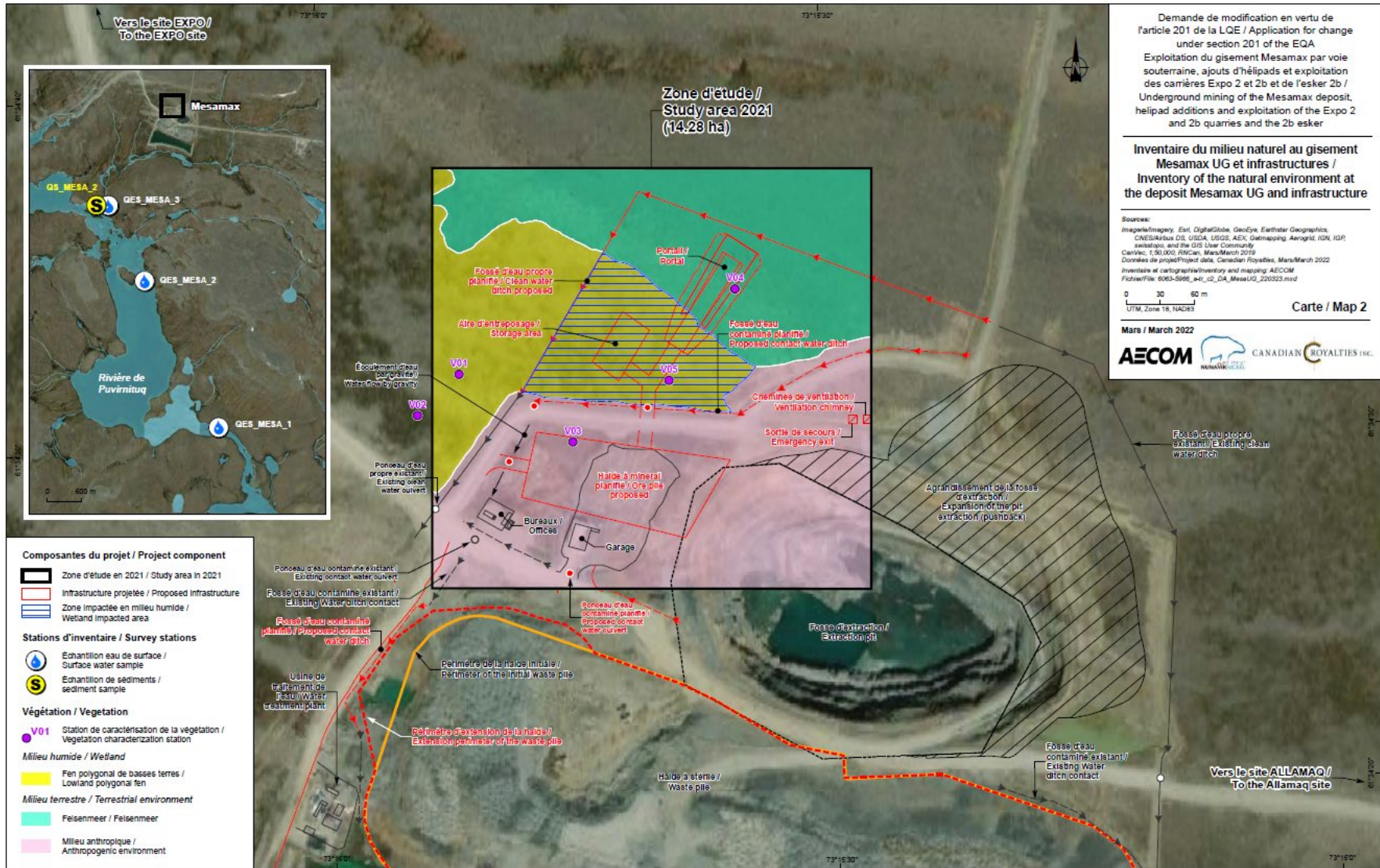
*Expert opinion: The proponent must specify the additional volume of water that it expects to treat with the proposed modifications to the mine site and specify whether the existing equipment is sufficient. If it is not, the proponent must show how it will modify its facilities to handle the additional volume of water and indicate the flow rate of the treated effluent.*

*In view of developing new surfaces on the Mesamax mine site, the proponent must present the drainage plan for water in contact with mining infrastructures and clean water, and present on a map the different ditches and their drainage directions. The map should include the topographic levels.*

*Expert opinion: The proponent must revise maps 2 and 3 of the request to amend the certificate of authorization to include the entire area occupied by the Mesamax deposit as well as its facilities, including the waste rock stockpile, the water management equipment and the location of the mining effluent. Maps should include a complete and detailed legend.*

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Figure 3. Current and proposed layout of the Mesamax site.



Source: Map 2, Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc., AECOM Canada inc, March 2022

### **1.3 Natural environment**

Additional surface water, sediment, special status species, and wetland inventories were conducted in 2021 in areas impacted by the proposed developments. The closest water environment to the Mesamax mine is the Puvirnitug River.

#### **1.3.1 Surface water quality**

The results of the surface water characterization sampled in 2021 downstream of Mesamax show an increase in pH that remains in the range of 6.5 to 9.0 for the protection of aquatic life of the MELCC and for the prevention of contamination (water and aquatic organisms) (Canadian Council of Ministers for the Environment, CCME). However, exceedances of the MELCC's aquatic life protection criteria for chronic effects and for CCME's long-term effects are observed for total phosphorus, copper, nickel, selenium and zinc. An in-depth evaluation will be conducted during the analysis of the 2021 annual report, which should contain more information on the results achieved.

#### **1.3.2 Sediment**

The results of the sediment sample taken in August 2021 show exceedances of the rare effect concentration (REC) criteria of the guide *Criteria for the Assessment of Sediment Quality in Quebec and Application Frameworks: Prevention, Dredging and Remediation* (Environment Canada and MELCC, 2020) for chromium and nickel and the limit values of Appendix II of the Land Protection and Rehabilitation Regulation for sodium. However, according to the proponent, this situation has been reported since the baseline in 2006 and can be attributed to naturally high levels in soils and sediments in the study area.

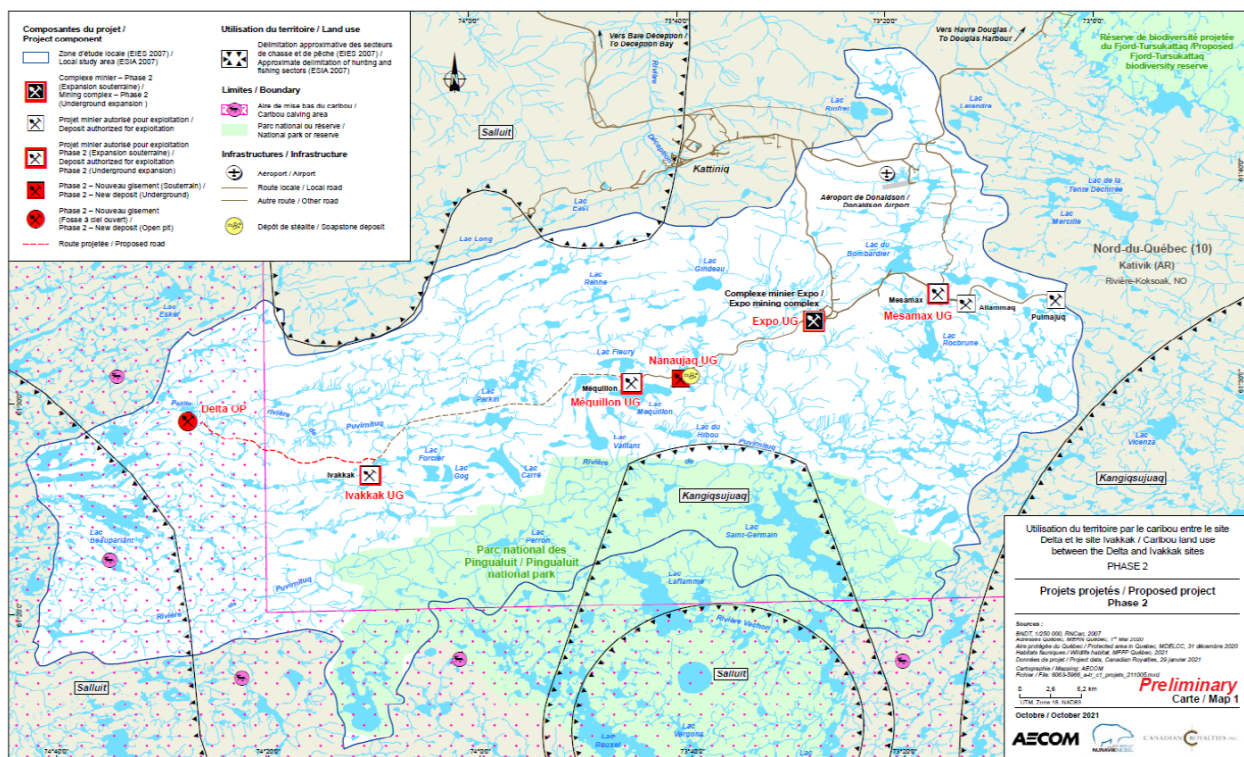
#### **1.3.3 At-risk species**

Directed research was conducted in 2021 to document the presence of species with at-risk status. After 7.4 km of inventory on the Mesamax site, no at-risk species of fauna or flora were reported.

Note that 11 caribou (including 2 calves) were observed throughout the field season, mainly in the sector's flat wetlands. However, the study area is not located in the caribou calving ground north of the 52nd parallel, in compliance with the Wildlife Habitat Regulations (see Figure 4).

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Figure 4. Caribou calving ground.



Source: Appendix C, presentation to the Nunavik Nickle Committee, Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc., AECOM Canada inc, March 2022

*Expert opinion: With regard to the protection of fauna and flora, the proponent refers to Appendix J of its document concerning mitigation measures for caribou. Appendix J refers to a wildlife protection plan, which is being developed and is required to assess the anticipated impacts of the proposed activities on wildlife. The proponent must contact the Ministère des Forêts, de la Faune et des Parcs (MFFP) to learn the expected content of this plan. The plan shall include, but not be limited to, a nuisance-animal management plan, wildlife mitigation measures, protection measures, identification of roles, etc. This plan must be filed with the Administrator.*

### 1.3.4 Geochemical characterization

All ore and tailings samples analyzed from the Mesamax, Expo and Ivakkak deposits are classified as leachable and acidogenic (Golder, 2010). CRI considers that the results obtained apply to the Mesamax UG underground deposit.

*Expert opinion: The proponent indicates that the results of the geochemical characterization of the ore and mine waste rock generated by the open pit mining of the Mesamax deposit are representative of the future underground mine. In order to better understand the environmental risks associated with the management of these materials, including the anticipated effectiveness of the water treatment system used at the Mesamax site, and to assess the reactivity of the rock that will be mined in the underground mine, the proponent must provide evidence of its affirmation. In particular, the baseline geochemical characteristics of the newly mined areas must be compared with the results of previous characterization programs. For example, a comparative analysis of the*

*chemical and mineralogical composition of the ore and mine waste rock extracted from the pit and underground mine must be presented.*

## **1.4 Social environment**

The closest Inuit villages to the study area are Kangiqsujuaq and Salluit, located approximately 69 km and 143 km, respectively, from the Mesamax site. The area is sometimes used by Inuit for hunting, fishing and trapping. The proponent specifies that accessibility to waterways and hunting grounds will be maintained for local users.

The NNiP has a specific agreement, the *Nunavik Nickel Agreement*, with the Inuit, regarding impacts and benefits. A monitoring committee is in place and the project amendment has been presented to the committee.

## **1.5 Potential impacts on the environment**

### **1.5.1 Physical environment**

The assessment of the impacts of this request to amend the certificate of authorization on the physical environment is primarily related to the additional encroachment of infrastructure on the ground, the addition of a ditch to collect clean water, and the potential for unintended spills. No water environment is directly affected. Moreover, since the dewatering and runoff water will be collected and treated before discharge, the proponent does not anticipate any significant modification of water and sediment quality.

### **1.5.2 Natural environment**

The natural environment characterization identified a wetland, a polygonal lowland fen, of which 1.59 ha would be disturbed by the work. Since this wetland is located at a short distance from a tributary of the Puvirnituuq River located to the south of the infrastructure, the proponent indicates that sediments or deposits caused by NNiP activities may reach the wetlands and waterways during the construction of the infrastructure.

The proponent nevertheless foresees no additional impact on the natural environment, other than that already identified in the initial impact study (Genivar, 2007<sup>1</sup>), since the expansion will take place mainly in an already disturbed environment.

## **1.6 Mitigation measures**

All of the mitigation measures outlined in the impact study (Genivar, 2007) will be applied in the context of this amendment to the certificate of authorization. In addition, the proponent suggests compensating the loss of wetlands through the Inuit Community Environmental Enhancement Project (ICEEP), some initiatives of which are planned or underway.

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<sup>1</sup> Genivar, 2007. *Projet nickélique Raglan Sud. Étude d'impact sur l'environnement et le milieu social présentée au ministère du Développement durable, de l'Environnement et des Parcs et à la Commission de la qualité de l'environnement Kativik, Rapport principal – avril 2007*. 649 pages and annexes

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The work will be carried out under the supervision of the proponent's environmental team, which will be tasked with ensuring that the planned mitigation measures are implemented and compliance with laws and regulations. The proponent has also adopted a procedure for monitoring mining facilities and managing tailings, waste rock and water that is carried out on a daily, weekly, quarterly and annual basis during the operating phase.

The environmental monitoring programs of the Mesamax site will be applied (*Programme de suivi environnemental version 5 – Suivi 26 (2019)*). The Quarry 2b, Esker 2b and Heliport projects will not be subject to specific environmental monitoring.

*Expert opinion: The proponent refers to the Inuit Community Environmental Enhancement Project (ICEEP) regarding compensation for wetland losses. The proponent must identify current and planned projects, provide a description of these projects and the framework in which they were developed. The proponent must specify how the communities were involved in the development and implementation of these projects and how the ICEEP fits into the request to amend the certificate of authorization.*

## 1.7 Schedule

Table 2. Project schedule.

Activités	Dates
Construction des routes d'accès au site	Déjà construites
Construction des bâtiments et infrastructures de surface	Non-requis
Construction / installation des infrastructures électriques, de transport et de soutien	Non-requis
Construction / modification des infrastructures de gestion des eaux	2022 – Q3
Construction des infrastructures minières et préparation du terrain (extension de la halde)	Avril 2023
Période d'exploitation	2023-2024
Période post-exploitation	2025-2026
Période de restauration	2026-2028
Période de post-restauration	2029-2039

Source: Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc., AECOM Canada inc.



## 2. Operation of Expo quarries 2 and 2b

The Expo quarries 2 and 2b are located approximately 5 km northeast of the Expo mine complex. The extension of the authorization for the Expo 2 quarry will allow the full capacity of the quarry to be operated and will allow access to Expo quarry 2b. The Expo quarry 2 could be used for material storage and the installation of crushing and screening equipment.

The Expo quarry 2b will provide material for the various infrastructures and for the restoration of the Expo site. The volume of material available is approximately 520,900 m<sup>3</sup> and the mining rate would be 200,000–300,000 tonnes per year between 2022 and 2032. Restoration of the Expo quarry 2b is scheduled to begin in 2032.

The proponent states that the additional area required for the Expo quarry 2b operation is 17,641 m<sup>2</sup>. The current authorized area of Quarry 2 is 74,373 m<sup>2</sup>.

According to the configuration of the Expo quarry 2b presented on Map 4, it appears that the MERN has not issued any mining lease at the location where the proponent plans to operate this quarry, contrary to what is mentioned in the request. An exclusive surface mineral lease was issued for the site south of the proposed Expo quarry 2b. The proponent should contact MERN and ensure it has the appropriate permit, located in the right place.

### 2.1 Natural environment

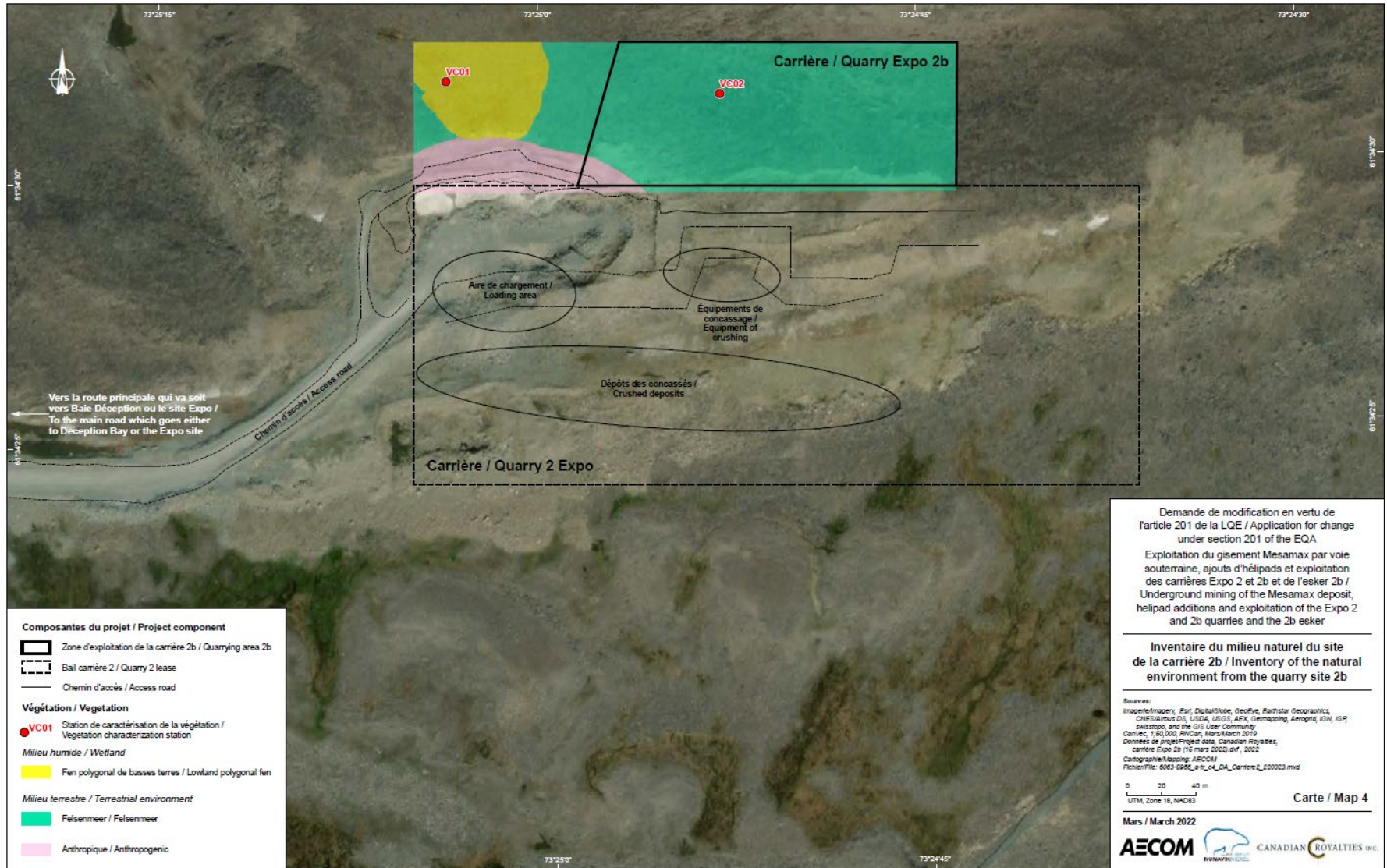
An inventory of the natural environment of the Expo 2b quarry was conducted on August 9 and 10, 2021. No species of precarious status were observed. The closest record of occurrence, according to the Centre de données sur le patrimoine naturel du Québec (CDPNQ), is the subcapitate dredge (*Draba subcapitata*) at 2.8 km from the Expo quarry 2b.

Caribou were observed throughout the field observation, mainly in the sector's flat wetlands. Indeed, during the vegetation inventory on the Expo quarry 2b site, 6 caribou, including 2 calves, were observed about 50 m from VC01 station on the plateau.

The Expo quarry 2b is mostly located in a Felsenmeer-type land environment. The proponent states that no wetlands or water bodies will be destroyed with the quarry expansion.

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Figure 5. Location of the proposed Expo quarry 2b.



Source: Map 4, Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc., AECOM Canada inc, March 2022

## 2.2 Social environment

The closest Inuit communities are Kangiqsujaq and Salluit, approximately 77 km from Expo quarry 2b. According to the proponent, no concerns have been communicated to date via the Nunavik Nickel Committee regarding the expansion of Expo quarry 2b.

*Expert opinion: The proponent mentions that no concerns have been communicated to date by the communities via the Nunavik Nickel Committee (NNC) regarding the expansion of Expo quarry 2b. The proponent must specify who the members of the NCC are and which groups they represent. It must also present the consultation processes it has put in place to obtain the community's comments and concerns, including the dates of the meetings, the topics discussed and the comments obtained. If necessary, the proponent must present the mitigation measures it intends to implement to answer the community's concerns.*

## 2.3 Potential impacts on the environment

According to the proponent, all the impacts of Expo quarries 2 and 2b were addressed in the initial impact study (Génivar, 2007). Only an increase in dust emissions and noise during the work is likely.

During the operation phase, air quality could be locally altered, especially in dry weather, and an increase in noise could occur around the quarries. In addition, the use and refueling of machinery are likely to slightly increase the risks of soil contamination by hydrocarbons in the event of accidental spills. However, the proponent maintains that these impacts are of minor significance.

## 2.4 Mitigation measures

In order to mitigate the impacts, the proponent plans to use dust suppressants, to mark out the perimeter of the operation site, to avoid leaving machinery running unnecessarily, to carry out regular inspections of the machinery and to intervene quickly and efficiently in case of accidental spills.

## 2.5 Operation of esker 2b

CRI intends to mine 19.76 ha of Esker 2b to recover granular material for use in the restoration of tailings and waste rock areas. This includes work to close the tailings facility, including cells 1 and 2, the Expo waste rock stockpile, the Expo pit and for other potential needs near the Expo site. Esker 2b is located immediately northeast of Esker 2, and less than 5 km north of the Expo mine complex. It is accessible via eskers 1 and 2.

The proponent plans to extract 1,723,665 m<sup>3</sup> (3,447,310 tonnes) of material from Esker 2b to a depth of up to 13 m, at a rate of 300,000–350,000 tonnes per year, from 2022 to 2032. The restoration period for Esker 2b would begin in 2032.

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## 2.6 Natural environment

The physical environment of Esker 2b concerns only the soils that will be reworked and removed from the site. No additional characterization was conducted on these components since the proponent indicates that they were characterized in the initial impact study.

Two watercourses (CE1 and CE2) were identified in the study area, but the potential for fish habitat was deemed null by the proponent. The Esker 2b operation area avoids hydric environments and a 30 m protective strip of wetlands will be retained, as shown in Figure 6. A culvert will have to be installed in the CE1 stream at the northeast end of Esker 2, where the access road for Esker 2b will be built.

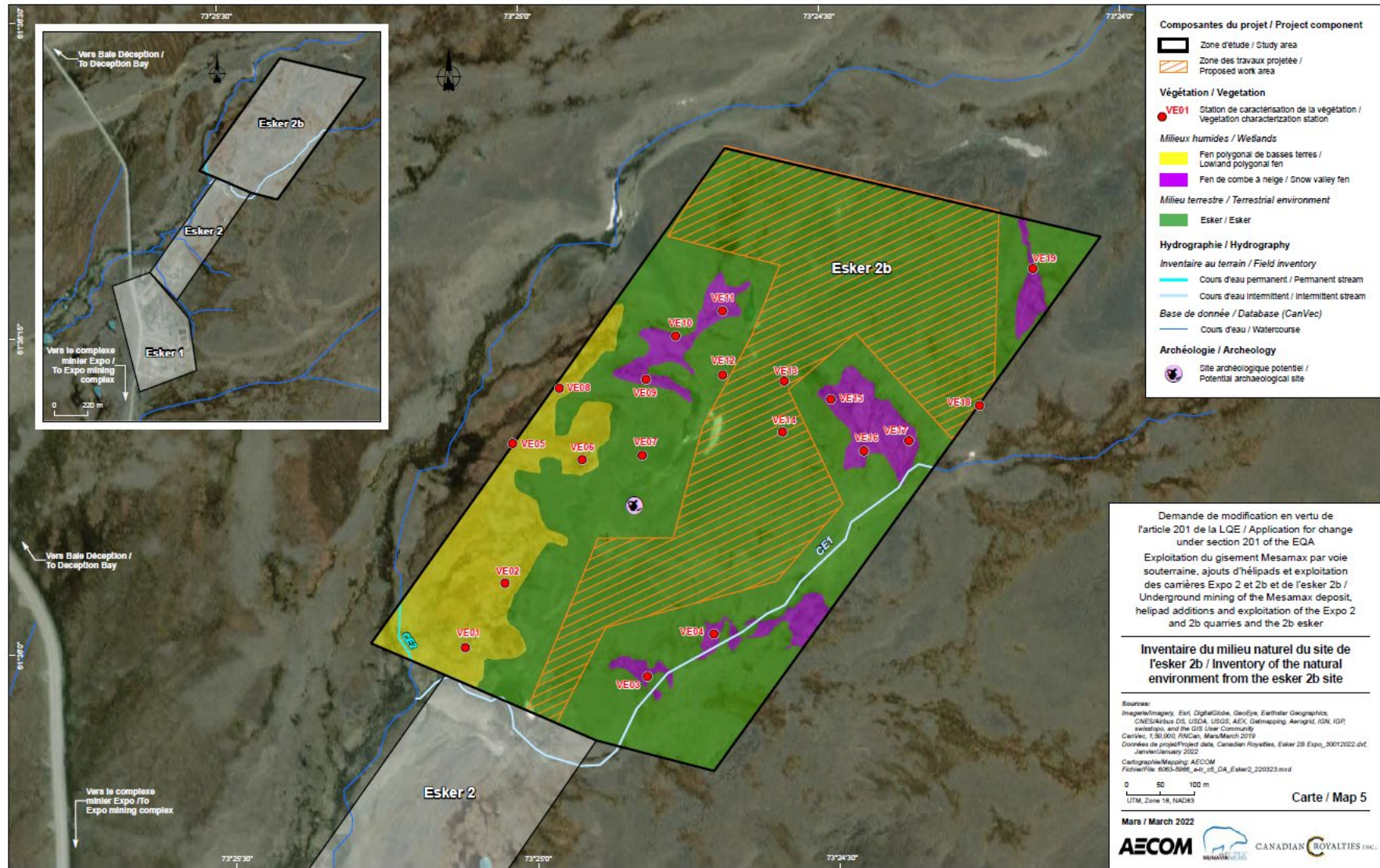
Wildlife inventories conducted on the Esker 2b site indicate that this environment is used by land and avian fauna. Two snow plectrophanes (*Plectrophenax nivalis*) were seen northeast of the site on snow-comb fens. Canada geese (*Branta canadensis*) are also present (several scats were seen on the ground). Caribou tracks, feces and browse were also observed at the Esker 2b site, as well as lemming feces and an Arctic fox skull.

*Expert opinion: Two watercourses (CE1 and CE2) are located in the Esker 2b area and a culvert will be required to allow for machinery traffic in the CE1 intermittent waterbody area. This stream, although intermittent and shallow, can have considerably increased flow during periods of flooding. Although details will be provided at the time of the Ministerial Authorization under Section 22 of the EQA, the proponent must specify the type of culvert it plans to install. In addition, it is mentioned that the slopes of this stream are steep and prone to erosion. The proponent must specify whether stabilization work, particularly via riprap, will be necessary to prevent suspended matter from being introduced into the watercourse. In such a case, while the addition of a culvert may potentially be exempted, rockfill stabilization may also require approval. For CE1, the culvert must be installed in the absence of flow or at a very low flow.*

*Expert opinion: Judging from Figure 6, it would appear that natural environment characterization is low in the area of operation. The characterization aims to define the environment that will be operated. The development area is poorly shown as only two inventories were conducted within the development area, with the majority being outside the development area. The proponent must confirm the absence of wetlands in the development area and indicate whether it will avoid wetlands, if any.*

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Figure 6. Esker 2b operating area and natural environment inventory.



Source: Map 5, Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc., AECOM Canada inc, March 2022

## 2.7 Social environment

The Inuit villages located closest to the study area are Kangiqsujuaq and Salluit, both located approximately 134 km from Esker 2b. This area is occasionally used by Inuit for fishing, hunting and trapping. No concerns were communicated by the Nunavik Nickel Committee to the proponent regarding the operation of Esker 2b.

Potential archaeological sites have been observed in the Esker 2b study area, but have not yet been assessed by an archaeologist. Their archaeological character is therefore not yet verified. In order to avoid the destruction or disturbance of these sites, the proponent has established a 30 m or 50 m protection perimeter around them.

*Expert opinion: Given the presence of remains with archaeological potential in the Esker 2b sector, the proponent must evaluate the archaeological potential before starting the works. The proponent must also specify the mitigation measures that it will apply to prevent the destruction of archaeological sites, and specify and justify the established protection perimeter.*

## 2.8 Other impacts

Air quality will be a component modified by the works, given the emission of dust during the works. The use of machinery on soils always presents some risk of hydrocarbon contamination.

## 2.9 Restoration

*Expert opinion: The proponent plans to strip an area of 19.76 ha to mine the granular material in Esker 2b between 2022 and 2032. The proponent must specify the methods that will be used to restore the site during the planned restoration period beginning in 2032 and its schedule for reclamation.*

## 2.10 Mitigation measures

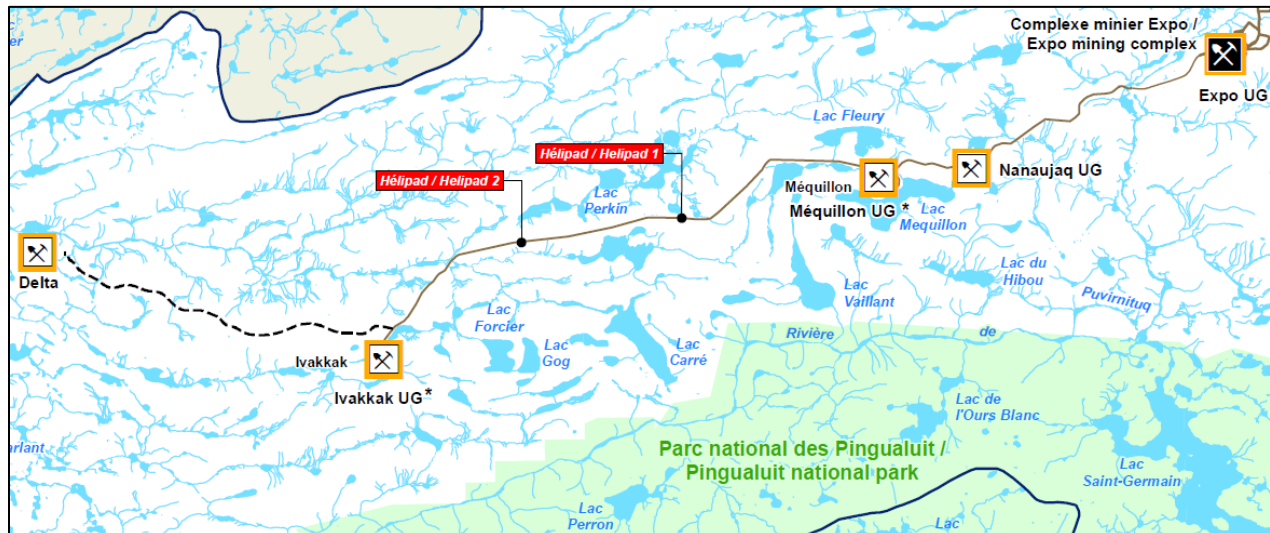
In addition to the mitigation measures listed in section 2.4, the proponent plans to install sediment barriers around the works in the vicinity of stream CE1 and the access road, to prevent runoff and sediment transport into this stream.

## 3. Construction of two helicopter landing zones

The proponent wishes to build two helipads along the Ivakkak-Méquillon road. The construction work includes stripping, backfilling and grading the soil over an area of 30 x 30 m (900 m<sup>2</sup>) each. The work will be carried out in the summer of 2022 using material taken from authorized quarries. The helipads would be used from 2022 to 2032, before being restored. The proponent estimates that these heliports would reduce refueling distances and fuel consumption by about 60 barrels.

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Figure 7. Location of the planned helipads.



Source: Adapted from Map 1. Request to amend certificate of authorization 321-014-007 under section 201 of the EQA - Nunavik Nickel Inc. mining project by Canadian Royalties Inc., AECOM Canada inc, March 2022

### 3.1 Natural environment

Two sites located in land environments were selected for the construction of the heliports: one in a polygonal tundra ostiola soil and the other in a boulder field.

Inventories were conducted along the entire future route of the Ivakkak-Méquillon road from July 30 to August 4, 2020. A search for at-risk species will be conducted in summer 2022. The works will not destroy wetlands since they will take place entirely on land.

*Expert opinion: The proponent must indicate the results of the inventories carried out in summer 2022 and confirm the absence of at-risk plant species on the site planned for the construction of the two helipads.*

### 3.2 Social environment

No impact is anticipated on the social environment.

### 3.3 Impacts

The use of machinery to build the helipads and to refuel the aircraft during the operation phase may result in hydrocarbon leaks on the ground and on vegetation. In addition, the use of machinery during helipad development and helicopter landings during the operation phase may cause disturbance to land and avian wildlife. The proponent states that these impacts are of minor significance.

### 3.4 Mitigation measures

In addition to the mitigation measures listed in section 2.4 and 3.4, machinery will be inspected before the helipad stripping operations begin, to ensure that exhaust systems are in good condition and therefore noise impacts on wildlife are reduced.

## II. CONCLUSION AND RECOMMENDATION

Canadian Royalties Inc. has submitted a request to amend the May 20, 2008, certificate of authorization to authorize the underground mining of the Mesamax deposit, the expansion of the Mesamax waste-rock stockpile, the operation of the Expo quarries 2 and 2b, the operation of the esker 2b and the construction of two helipads.

The analysis showed that some elements are missing from this request and that clarifications are required before the acceptability of the modifications can be determined.

For this reason, it is recommended that the KEQC forward the following questions and comments to the proponent.

### QUESTIONS

#### Community consultation

- QC - 1. The proponent mentions that the communities have expressed no concerns via the Nunavik Nickel Committee (NNC) regarding the expansion of Expo quarry 2b. The proponent must specify who the members of the NCC are and which groups they represent. It must also present the consultation processes it has put in place to obtain the whole community's comments and concerns, including the dates of the meetings, the topics discussed and the comments obtained. If necessary, the proponent must present the mitigation measures it intends to implement to answer the community's concerns.
- QC - 2. The proponent refers to the Inuit Community Environmental Enhancement Project (ICEEP) for the compensation of wetland losses. The proponent must identify current and planned projects, provide descriptions and indicate the framework in which they were developed. The proponent must specify how the communities were involved in the development and implementation of these projects and how the ICEEP fits into the request to amend the certificate of authorization.

#### Mesamax

- QC - 3. The proponent plans on using part of the waste rock generated by the operations of the Mesamax mine to backfill the pit and underground mine galleries, a method that is favoured by MELCC as it reduces the footprint of the mine site and the risk of surface and groundwater contamination from acid generation and leachate.

The proponent must specify what proportion of the waste rock to be generated by operations at the Mesamax deposit (pit and underground) will be used for backfill and

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indicate which areas of the Mesamax mine will be backfilled (pit and underground). The proponent must also evaluate the possibility of backfilling the entire pit, including the northeast pushback, with waste rock in order to avoid creating a pit lake. The proponent must submit a schedule for the completion of the backfill works.

Given the potential for acid generation and leaching of waste rock, the proponent must develop and implement measures to limit the supply of oxygen and to promote permafrost upwelling in the underground backfill, for example, by covering it with an impervious cover, as proposed for the Expo pit. The proponent must submit the details of the measures it has developed.

**QC - 4.** The literature mentions that taliks can develop under water bodies deeper than 2 m and where the lower part of the water column does not freeze in winter. In addition, for water bodies larger than 200 m in diameter, taliks may develop in such a way that they cut through the entire permafrost (through taliks).

The section “4.3.2 Characterization of the extraction pits” of the impact study (Génivar, 2007) mentions that the Mesamax pit would be 200 m wide, 350 m long and 90 m deep. In the event that the pit is flooded by runoff and contact water, the pit’s dimensions would theoretically allow a hydraulic connection to develop between the pit water and the deep aquifer formation found beneath the base of the permafrost. This link is all the more possible considering the operation of underground workings to a depth of 270 m. The formation of a through talik could therefore allow the migration at depth of contaminants initially isolated in the active part of the permafrost (mollisol), which only thaws at the surface in summer.

Considering the potentially acid-generating and leachable nature of the mine waste rock that will be placed in the Mesamax underground work sites, as well as the depth targeted for the operation of these sites (level 270 m), the proponent must validate certain elements in the field, and;

- a. Justify whether the Mesamax site may recharge the deep aquifer via a through (open) talik, generated by the combined effects of the pit and underground workings;
  - b. Define and justify what is the residual thickness of the permafrost layer below from 270 m at the end of the Mesamax underground workings;
  - c. Verify whether the base of the permafrost was intersected during exploratory drilling and specify the methodologies used, particularly to validate the 400 m permafrost thickness at the Mesamax site;
  - d. Specify its approach to prevent the initiation of sulfide oxidation (DMA) and leaching reactions depending on the layout of the mine waste rock in the underground workings;
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- e. Specify and justify the impermeability measures that will be put in place to prevent oxygen intake and promote permafrost upswelling;
- f. Provide thermal modelling to simulate the combined impact of underground workings and the pit on permafrost distribution in a changing climate.

**QC - 5.** The proponent mentions that it will excavate borrow materials in the area where the Mesamax deposit is mined. The proponent must locate this source of borrowed materials on a map and specify its intended use.

**QC - 6.** In section 3.1 of its request to amend the certificate of authorization, the proponent refers to an expansion of the Mesamax pushback, also shown on Map 2. However, this pushback is not presented in more detail in the request. The proponent must indicate whether it has all the required authorizations to carry out this expansion or, if not, provide all the documentation required to assess the impacts in this request to amend the certification of authorization.

**QC - 7.** The proponent must specify the additional volume of water that it expects to treat with the proposed modifications to the mine site and specify whether the existing equipment is sufficient. If it is not, the proponent must show how it will modify its facilities to handle the additional volume of water, present a plan of the foreseen installations and indicate the flow rate of the treated effluent. The proponent must present the contaminants likely to be emitted from a new effluent and assess whether Environmental Discharge Objectives (EDOs) can be met.

In view of developing new surfaces on the Mesamax mine site, the proponent must present the drainage plan for water in contact with mining infrastructures and clean water, and present on a map the different ditches and their drainage directions. The map should include the topographic curves.

**QC - 8.** The proponent must revise maps 2 and 3 of the request to amend the certificate of authorization to include the entire area occupied by the Mesamax deposit as well as its facilities, including the waste rock stockpile, the water management equipment and the location of the mining effluent. Maps should include a complete and detailed legend.

**QC - 9.** With regard to the protection of fauna and flora, the proponent refers to Appendix J of its document concerning mitigation measures for caribou. Appendix J refers to a wildlife protection plan, which is being developed and is required to assess the anticipated impacts of the proposed activities on wildlife. The proponent must contact the Ministère des Forêts, de la Faune et des Parcs (MFFP) to learn the expected content of this plan. The plan shall include, but not be limited to, nuisance-animal

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management plan, wildlife mitigation measures, protection measures, identification of roles, etc. This plan must be filed for information purposes.

- QC - 10.** The proponent indicates that the results of the geochemical characterization of the ore and mine waste rock generated by the open pit mining of the Mesamax deposit are representative of the future underground mine. In order to better understand the environmental risks associated with the management of these materials, including the anticipated effectiveness of the water treatment system used at the Mesamax site, and to assess the reactivity of the rock that will be mined in the underground mine, the proponent must provide evidence of its affirmation. In particular, the baseline geochemical characteristics of the newly mined areas must be compared with the results of previous characterization programs. For example, a comparative analysis of the chemical and mineralogical composition of the ore and mine waste rock extracted from the pit and underground mine must be presented.

### **Esker 2b**

- QC - 11.** Two streams (CE1 and CE2) are located in the Esker 2b area. A culvert will have to be installed to allow the circulation of machinery in the intermittent watercourse CE1 sector. This stream, although intermittent and shallow, can have considerably increased flow during periods of flooding. Although details will be provided at the time of the Ministerial Authorization under Section 22 of the EQA, the proponent must specify the type of culvert it plans to install. In addition, it is mentioned that the slopes of this stream are steep and prone to erosion. The proponent must specify whether stabilization work, particularly via riprap, will be necessary to prevent suspended matter from being introduced into the watercourse. In such a case, while the addition of a culvert may potentially be exempted, rockfill stabilization may also require approval. For CE1, the culvert must be installed in the absence of flow or at a very low flow.
- QC - 12.** Judging from Map 5, it would appear that natural environment characterization is low in the area of operation. The characterization aims to define the environment that will be operated. The development area is barely shown as only two inventories were conducted within the development area, with the majority being outside the development area. The proponent must confirm the absence of wetlands in the development area and indicate whether it will avoid wetlands, if any.
- QC - 13.** The proponent plans to strip an area of 19.76 ha to mine the granular material in Esker 2b between 2022 and 2032. The proponent must specify the methods that will be used to restore the site during the planned restoration period beginning in 2032 and its schedule for reclamation.
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- QC - 14.** Given the presence of remains with archaeological potential in the Esker 2b sector, the proponent must evaluate the archaeological potential before starting the works. The proponent must also specify the mitigation measures that it will apply to prevent the destruction of archaeological sites, and justify the established protection perimeter.

### Helipads

- QC - 15.** The proponent must indicate the results of the inventories carried out in summer 2022 and confirm the absence of at-risk plant species on the site planned for the construction of the two helipads.

### **COMMENTS**

- QC - 16.** The proponent states in its document that “The Mesamax open pit pushback, as presented in Appendix K, was already approved at the time of the MELCC,s visit in 2020” and that “The area of the authorized waste rock stockpile at Mesamax is 147,000 m<sup>2</sup>. The surface area currently used is 160,000 m<sup>2</sup>.”

The proponent must take note that any modification to the operating capacity, to the facilities and to the surface areas in operation or any addition of infrastructure to the mine site must be authorized by the MELCC, following a decision by the KEQC. It must also obtain any other authorization or right required.

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