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CANADIAN ROYALTIES INC.

NUNAVIKNICKEL

Addendum to the Environmental and Social Impact Assessment

Phase 2a: Mining of the Expo South, Ivakkak UG, Méquillon UG2 and Nanaujaq Deposits

Volume 1 – Main Report

Certificate of Authorization no 3215-14-007 : Nunavik Nickel Mining Project

Project number: 60635966

June 2022

Delivering a better world

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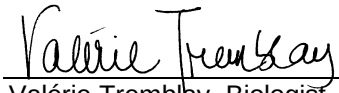
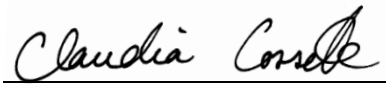
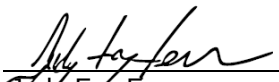
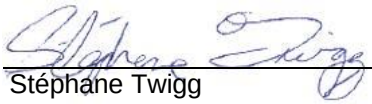
Signatures

Report prepared by:	 Emmanuel Maltais, Biologist. M. Sc. - AECOM	June 20, 2022
	 Cynthia Hébert, B.Sc., M. Ing. - AECOM	June 20, 2022
	 Valérie Tremblay, Biologist. M. Sc. - AECOM	June 20, 2022
Report reviewed by:	 Claudia Cossette, Biologist. M.Sc. Project Director - AECOM	June 20, 2022
	 Stéphane Lemay, Ing. Discipline Manager- Engineering - AECOM	June 20, 2022
	 Judy-Fay Ferron Environmental Coordinator- Canadian Royalties Inc.	June 20, 2022
	 Nicolas Kuzyk, biol, M.Env. Environmental Specialist - Canadian Royalties Inc.	June 20, 2022
Report approved by:	 Stéphane Twigg Environmental Superintendent - Canadian Royalties Inc.	June 20, 2022

Project Team

CANADIAN ROYALTIES INC.

Stéphane Twigg	Environmental Superintendent
Nicolas Kuzyk	Environmental Specialist
Steve Quessy	Chief Engineer
Marie-Eve Ratthé	Environmental Senior Supervisor
Judy-Fay Ferron	Environmental Coordinator

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Claudia Cossette, Biologist, M. Sc.	Project Director
Stéphane Lemay, Eng.	Discipline Manager
Jacques Langlois	Scientific Reviewer
Valérie Tremblay, Biologist, M.Sc.	Analysis and writing
Emmanuel Maltais, Biologist, M.Sc.	Field work, writing
Elisa Mignot, Biologist, B.Sc.	Field work, writing
Sylvain Lacasse, Biologist, M.Sc.	Revisor
Sylvain Daraîche, biologist, Sc.	Analysis and writing
Cynthia Hébert, Biologist, Sc., M. Ing.	Analysis and writing
Patricia Bolduc, Biologist	Writing
Mathieu Lafond, Biologist, M.Sc.	Writing
Cyril Saison, Biologist. M. Sc.	Field work and analysis
Alexandre Joly, wildlife technician	Field work
Félix-Antoine Dumontier-Boislard, wildlife technician	Field work
Dominic Savard, wildlife technician	Field work
Claire Dubé, Anthropologist	Analysis and writing
Julie Mc Neil, Eng.	Environmental Advisor
Jérémy Lagneau, Eng.	Environmental Engineer
Patrick Hébert, Anthropologist	Writing, human environment
Érik Phaneuf, Anthropologist and archaeologist	Analysis and writing
Cherine Akkari, Biologist Sc., M. Geography	Specialist in resilience and adaptation to climate change, writing
Josée Dubois, Biologist M. Sc. ENV.	Cartography and mapping
Chloé Drapeau, Editor	Report editing

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Abbreviations, symbols and acronyms

BQMA	Database on the quality of the aquatic environment (*Banque de données sur la qualité du milieu aquatique*)
CA	Certificate of Authorization
CCME	Canadian Council of Ministers of the Environment
JBNQA	James Bay and Northern Quebec Agreement
DOC	Dissolved Organic Carbon
CRI	Canadian Royalties Inc.
CVAA	Protection criteria for aquatic life against acute effects (*Critère de protection pour la vie aquatique contre les effets aigus*)
CVAC	Protection criteria for aquatic life against chronic effects (*Critère de protection pour la vie aquatique contre les effets chroniques*)
C_{10}-C_{50}	Petroleum Hydrocarbon C_{10}-C_{50}
ESG	Environmental, Social and Governance
ECCC	Environment and Climatic Change Canada
ESIA	Environmental and Social Impact Assessment
EQA	Environment Quality Act
FEL	Frequent Effect Level
GHG	Greenhouse Gas
IAA	Impact Assessment Act
LCP	Lower Collection Pond
LEMN	Northern Landfills
KEQC	Kativik Environmental Quality Commission
KI	Kativik Ilisarniliriniq
MELCC	*Ministère de l'Environnement et de la Lutte contre les changements climatiques*
MERN	*Ministère des ressources naturelles et de l'Énergie*
MCP	Main Collection Pond
NAG	Non Acid Generating
NNiP	Nunavik Nickel Project
NNiPRP	Nunavik Nickel Project Restoration Plan
NNC	Nunavik Nickel Committee
OEL	Occasional effect level
PAG	Potentially Acid Generating
PAH	Polycyclic Aromatic Hydrocarbons
PEL	Probable Effect Level
PEIIC	Program for Environmental Improvement in Inuit Communities
REAFIE	Regulation respecting the supervision of activities based on their environmental impact (*Règlement sur l'encadrement d'activités en fonction de leur impact sur l'environnement*)
REL	Rare Effect Level
TEL	Threshold Effect Level
TSS	Total Suspended Solids
TSM	Towards Sustainable Mining

1 Introduction

Canadian Royalties Inc. (CRI) is a mining company with headquarters located in Montreal. CRI undertook the development of the Nunavik Nickel Project (NNiP), an autonomous mining complex in Nunavik, following the environmental and social impact assessment (ESIA) in 2007 (GENIVAR, 2007) and the issuance of the global authorization certificate n° 3215-14-007 (hereafter named the global CA). The complex is located approximately 80 km west of Kangiqsujuaq and about 140 km south-east of Salluit.

Intensive exploration activities in this area initially brought the discovery of the Mesamax, Expo, Méquillon and Ivakkak deposits, of which the first 3 have been mined at different times since 2012. The mining of the Expo deposit stopped in 2019. Since then, the Allammaq and Puimajuq deposits have been discovered. They were each subject to an impact study and their operation was added to the global CA in 2011 and 2020, respectively.

Several addenda to the global CA have already been presented to the *Ministère de l'Environnement et de la Lutte Contre les Changements Climatiques* (MELCC) in order to increase the NNiP's lifespan, such as those for the underground mining of the Expo, Méquillon and Mesamax deposits[1] (the Expo West, Méquillon UG1, and Mesamax UG projects respectively). Other addenda have been presented for the modification of the operating conditions, such as infrastructure added for mining the Ivakkak open pit deposit (named Ivakkak OP) or the management of mine tailings in the Expo pit.

Since then, the new Nanaujaq, Expo South and Delta deposits were located in the ESIA study area, in addition to underground extensions of the existing Méquillon and Ivakkak deposits. This would make it possible for NNiP to ensure the continued existence of operation mining past 2030. These new projects are all located in the ESIA study area and both the extraction processes and treated daily tonnage are not modified. The request for authorization of these new projects therefore requires an addendum to the initial ESIA.

The present document constitutes the Phase 2a addendum to the ESIA of the NNiP. It includes the Expo South, Méquillon UG2, Nanaujaq, and Ivakkak UG projects, of which the first three require a new mining lease. It also includes a series of related projects required for the proper continuation of operations, including the modification of tailings management in the pit. This document contains all the elements of knowledge and analysis required by the *Direction de l'Évaluation Environnementale des Projets Nordiques et Miniers* (department of environmental assessment of northern and mining projects) to modify the global CA of the NNiP to integrate Phase 2a. It deals with projects for the exploitation of deposits during the useful life of the existing mining complex until its closure and restoration.

It should be noted that the Delta project will be presented in a second addendum, Phase 2b, since it requires more technical components, which are being prepared and of which the impacts are specific to this project.

Chapters 2 and 3 indicate the location, context, project justification and the regulatory framework, in which Phase 2a of the NNiP falls. It also presents the main challenges, CRI's sustainability objectives, and the agreements with the Inuit communities.

Chapter 4 summarizes the consultation process held with local communities, whether through the Nunavik Nickel Committee (NNC) as part of the Impact and Benefit Agreement (IBA), or according to the concerns expressed since 2006.

Chapter 5 describes the different variants possible for Phase 2a in regard to the ore mining method, tailings and waste rock management method, location of the waste rock piles and collection ponds, as well as site closure and restoration. This comparison makes it possible to determine the best alternative in terms of technical and economic feasibility and the magnitude of the impacts on the biophysical and social environment. The chapter then describes the full details of Phase 2a for each deposit of the alternatives selected. This description concerns, among other

[1] Mesamax UG was filed in a previous addendum, currently under analysis by the MELCC.

things, all mining infrastructure and the activities that will take place there, such as the waste rock and water management methods, construction schedule, mining sequence and the cost of work.

Chapter 6 describes the physical, biological and human environments located in the study area selected for the environmental and social impact assessment. This description includes a synthesis of the information collected in the context of the 2007 ESIA (GENIVAR, 2007), including all relevant information added into the various requests for modification to the global CA (Allammaq, Puimajuq, Expo West, Ivakkak OP, Méquillon UG1 and Mesamax UG), in addition to the results of specific inventories completed in the summer of 2021 in the Phase 2a study area for the underground mines currently under study.

Chapter 7 presents the assessment of the impacts of Phase 2a, the applicable mitigation measures and the residual effects for each component. A summary of the significant residual impacts, after mitigation measures, concludes this section.

Chapter 8 presents a climate change resilience study for the Phase 2a project, as well as the greenhouse gas balance produced under Phase 2a.

Chapter 9 presents the environmental surveillance and monitoring programs. The environmental surveillance mostly involves the construction phase. The latter mpust be planned when the preparation phase of the plans and specifications begin. The established environmental monitoring is to assess the effectiveness of the proposed mitigation measures and to verify whether certain negative impacts could arise. If applicable, these must be quantified, while ensuring compliance with standards and the application of measures for environmental protection.

Chapter 10 describes the general procedures for managing the main accidents that could occur during Phase 2a's construction and operation. These procedures are relative to preventing spills of petroleum products and hazardous materials, in addition to fires and explosions.

1.1 Project Initiator and Consultants Involved

The project promoter is Canadian Royalties Inc. - Nunavik Nickel Project. CRI is exclusively owned by the parent company, Jien International Investment Ltd. CRI's headquarters are located in Montreal.

CRI mandated the firm AECOM to complete the impact study in its entirety, in addition to the specific social and environmental studies. AECOM is a firm that specializes in engineering and environmental impact studies who operate in several countries worldwide.

The contact details of the project initiator and the consultant involved in the file are included in Table 1-1.

Table 1-1: Contact Details for the Project Initiator and the Consultant Involved

Project Initiator	
Name:	Canadian Royalties Inc.
Civic address:	800, boul. René-Lévesque O. Locale 410 Montreal (Quebec) H3B 1X9
Phone:	1-877-879-1688
Fax:	1-514-879-1795
Project manager:	Stéphane Twigg
Email of the project manager:	Stephane.Twigg@canadianroyalties.com
Quebec business number (NEQ) from the Registraire des Entreprises du Québec:	1166090366
AECOM	
Name:	AECOM Consultants Inc.
Civic address:	2 rue Fusey, Trois-Rivières, QC, G8T 2T1
Phone:	1-873-387-0306
Fax:	819-373-7573
Project manager:	Claudia Cossette
Email of the project manager:	claudia.cossette@aecom.com
Quebec business number (NEQ) from the Registraire des Entreprises du Québec:	1161553129

2 Project Location

The exploitation of NNiP's deposits will take place in the arctic tundra of Nunavik, located about 80 km west of Kangiqsujuaq and 140 km south-east of Salluit. The land regime established by the James Bay and Northern Quebec Agreement (JBNQA) is divided into three categories: I, II and III category lands. NNiP is located on land of category III where the Inuit of Nunavik have specific rights for that location.

Map 2-1 presents the project's situation; the general location of NNiP in this case. In addition to the project's components and infrastructure (existing and projected), which includes the mining complex in Phase 2a, the following elements are also present:

1) Existing and projected roads

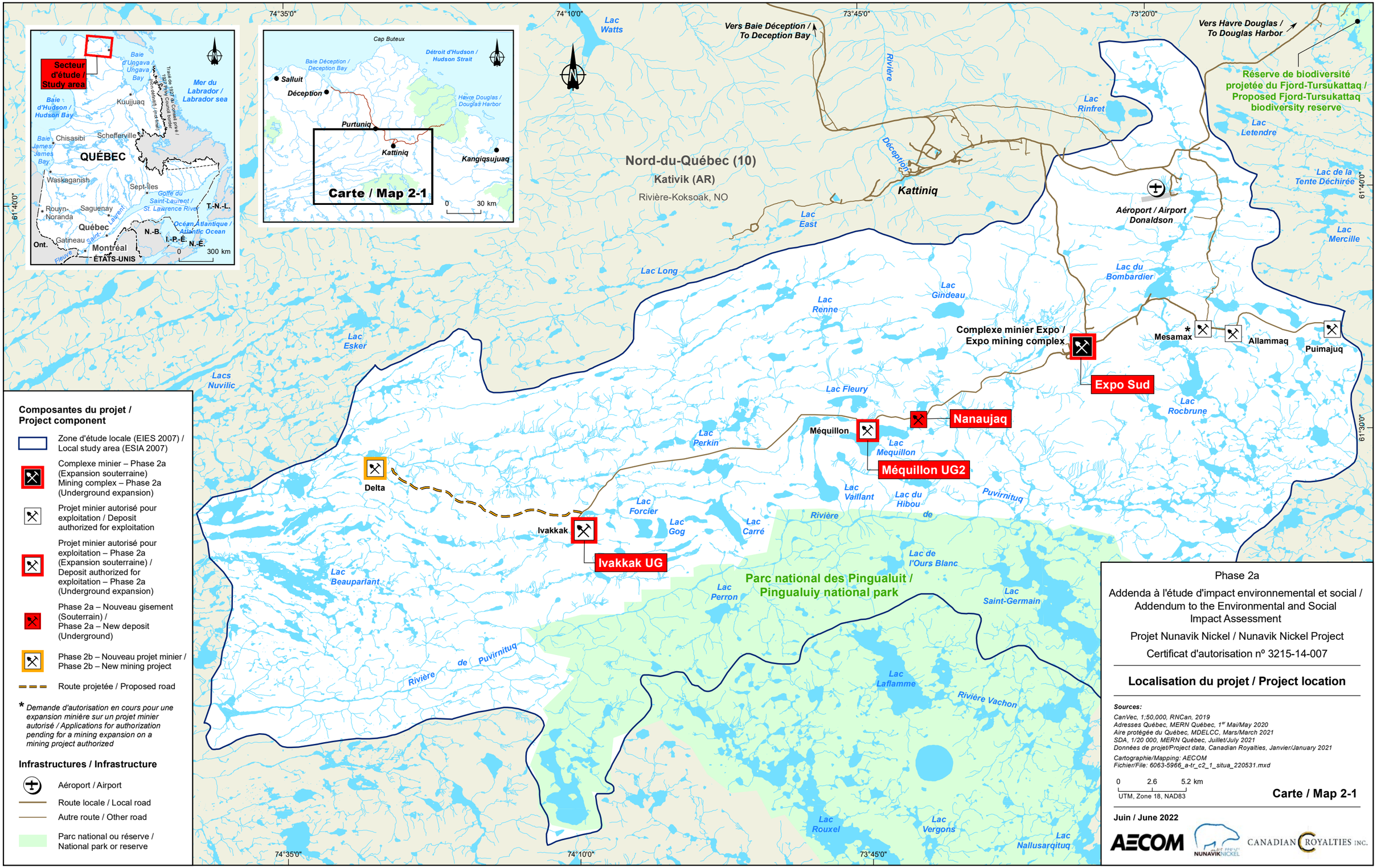
2) Hydrography (lakes and waterways)

3) The Donaldson airport to the north-east

4) Limits of the Pingualuit National Park to the south and the *Réserve de Biodiversité Projetée du Fjord-Tursukattaq* to the north-east

5) Roads toward Deception Bay and Douglas Harbour.

Port infrastructure, including a transshipment dock, are located in Deception Bay at about 110 km from the Expo camp. These infrastructures make it possible to receive the goods and transport the ore. A camp also gives the workers a place to rest. The harbour infrastructure and the Deception Bay camp will be present for the entire duration of the NNiP mining operations and for the time required to restore the sites after their operation.



Composantes du projet / Project component

- Zone d'étude locale (EIES 2007) / Local study area (ESIA 2007)
- Complexe minier – Phase 2a (Expansion souterraine) / Mining complex – Phase 2a (Underground expansion)
- Projet minier autorisé pour exploitation / Deposit authorized for exploitation
- Projet minier autorisé pour exploitation – Phase 2a (Expansion souterraine) / Deposit authorized for exploitation – Phase 2a (Underground expansion)
- Phase 2a – Nouveau gisement (Souterrain) / Phase 2a – New deposit (Underground)
- Phase 2b – Nouveau projet minier / Phase 2b – New mining project
- Route projetée / Proposed road

* *Demande d'autorisation en cours pour une expansion minière sur un projet minier autorisé / Applications for authorization pending for a mining expansion on a mining project authorized*

Infrastructures / Infrastructure

- Aéroport / Airport
- Route locale / Local road
- Autre route / Other road
- Parc national ou réserve / National park or reserve

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Localisation du projet / Project location

Sources:

CanVec, 1;50,000, RNCan, 2019
Adresses Québec, MERN Québec, 1er Mai/May 2020
Aire protégée du Québec, MDELCC, Mars/March 2021
SDA, 1/20 000, MERN Québec, Juillet/July 2021
Données de projet/Project data, Canadian Royalties, Janvier/January 2021

Cartographie/Mapping: AECOM
Fichier/File: 6063-5966_a-tr_c2_1_situa_220531.mxd

0 2.6 5.2 km
UTM, Zone 18, NAD83

Carte / Map 2-1

Juin / June 2022

AECOM · NUNAVIK NICKEL · CANADIAN ROYALTIES INC.

3 Project Context

3.1 Project Justification

CRI began exploration work on the NNiP properties in 2001 and invested a total of 73.6 million dollars in exploration, mineral resource delineation, in addition to technical and economic studies through 2009. Mineral resources reported in 2009 totalled 23.7 million tonnes from six deposits. CRI continued their efforts in the search for new deposits and in the development of known and mined deposits. The investment in exploration and development reached 112 million dollars between 2010 and 2021, including 69.6 million dollars since 2018. Exploration activities led to the discovery of four new deposits and several major mineralized zones during this period. NNiP is the 5th largest nickel mining operation in Canada (Mining Technology, 2022).

This search for ore is based on the growing need for copper and nickel worldwide. Nickel is used in the design of lithium-ion batteries for electric and hybrid vehicles (Gouvernement du Canada, 2022), whereas nearly 35% of copper is used for electrical purposes (distribution, transmission and building electrical systems) (IRIS, 2019). Thus, the global energy transition taking place in electrified transport and the decarbonization of energy and electrical technologies have become priorities that meet international climate objectives and local pollution issues.

In addition to meeting the needs for the transition to greener energies for vehicle motorization, the extension of the NNiP via the four projects presented in the context of this document (Expo South, Ivakkak UG, Méquillon UG2 and Nanaujaq) would make it possible to extend the operations, while ensuring the installation's performance and profitability in relation to the life of the equipment, as well as maintaining jobs in Nunavik. Therefore, the new deposits listed will allow the viability and profitability of mining and ore processing activities for CRI until at least 2032, as indicated in Table 3-1, without the need for an increase in the maximum authorized ore processing rate of 4,500 tonnes per day.

The deposits targeted by Phase 2a of the NNiP are easily accessible due to the presence of roads already built or authorized as part of the global CA. Thus, Phase 2a is considered economical and optimal, specifically due to the pre-existing facilities. Table 3-1 presents the mining schedule for the various NNiP deposits, in addition to the tonnages, for an overall vision of the planned mining sequence. However, this addendum request involves only three underground expansion projects of existing mines (Expo South, Ivakkak UG, Méquillon UG2) and one new underground mining project, the Nanaujaq project, all located within the study area of the initial 2007 ESIS. Table 3-2 presents the maximum tonnage mined per day and per year, for each of the deposits or mines covered by this addendum for Phase 2a.

The new deposits will not be mined simultaneously (see table 3-1). In fact, mining will be spread over time starting in 2023 by overlapping the mining operations with prior authorization. In addition, most deposits have a limited lifespan given their estimated ore reserve.

Table 3-1: Mining Calendar for the NNiP Deposits

Mine	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Expo															
Allammaq															
Méquillon															
Mesamax															
Mesamax UG															
Expo West															
Expo South															
Puimajuq															
Ivakkak															
Ivakkak UG															
Méquillon UG1															
Méquillon UG2															
Nanaujaq															
Delta OP															
Delta UG															
Expo marginal ore															
Total annual tonnage (kt)	1491	1356	1188.4	825	1637.2	1131	1371	1391	1641	1641	1366	1491	1016	891	240
Maximum daily tonnage (kt)	4085	3715	3256	2260	4485	3099	3756	3811	4496	4496	3742	4085	2784	2441	0.658

	Mining authorized under the global CA 3215-14-007
	Mining of Phase 2a targeted by the present request
	Mining of Phase 2b targeted by a future request
	Mining targeted by another request for modification of global CA 3215-14-007 and currently under analysis.

Table 3-2: Maximum Daily and Annual Tonnage to be Exploited by the Phase 2a Deposits

Mine/Deposit	Tonnes/day	Tonnes of concentrated ore/year	Lifetime
Méquillon UG2	2,400	104,355.00	2 years
Expo South	1,500	49,100.00	2 years
Nanaujaq	1 750	98,857.00	3 years
Ivakkak UG	1,500	29,623.00	1 year

Map 3-1 details the mining titles and lease (claims and leases) held by CRI, including rental leases in the public land sector, exclusive and non-exclusive leases.

3.1.1 Objectives and Benefits of Phase 2a

The expansion of the underground mining for the NNiP Phase 2a is to meet CRI's priority operational objectives while continuing to bring significant benefits to the Nunavik communities.

CRI's operational objectives are as follows:

- Continue the underground mining operations until at least 2032 by using most of the infrastructure already in place as to minimize the environmental footprint: the Expo complex including, among others, a concentrator, tailings and water management facilities, a power station and a camp; port facilities at Deception Bay including an ore concentrate warehouse, a wharf and a camp; road network, etc.
- Maintain the concentrator feed at 4,500 tonnes of ore per day for the production of nickel and copper concentrates.

Completion of Phase 2a will allow for the following benefits:

- Maintain existing jobs;
- Create jobs during the construction phase;
- Create economic benefits at the local and regional levels for Inuit communities;
- Create economic partnership opportunities with Inuit partners;
- Create economic benefits within Quebec and across Canada;
- Provide stimulating jobs for residents of regional Inuit communities and elsewhere in Quebec;
- Assist in the training of local workers to ensure the smooth operation of NNiP mining activities.

Thus, given the operational objectives and benefits resulting from Phase 2a of the project, its completion is not only a priority for CRI, but it also provides positive economic and social benefits for Nunavik and its residents, as well as for Quebec.

3.2 Legal and Regulatory Framework

Within the provincial framework, projects located in Nunavik territory are governed by Chapter 23 of the *James Bay and Northern Quebec Agreement* (JBNQA) and Chapter II of the *Environment Quality Act* (EQA) for the environmental assessment regime. Thereafter, CRI produced and filed a complete environmental and social impact study in 2007, which led to obtaining the global certificate of authorization (n° 3215-14-007, hereafter named the global CA) issued by the Government of Quebec.

The four projects described in this addendum and the resulting activities are in the PNNi study area. In this context, the Expo South, Ivakkak UG, Méquillon UG2, Nanaujaq, and related projects are designated as Phase 2a at the PNNi and will not undergo a new impact study. The four projects are nevertheless applicable projects and lead to the production and filing of an addendum by request for modification to the global CA. Specific environmental assessment procedures are provided for projects located on the territory governed by the James Bay and Northern Quebec Agreement (JBNQA). North of the 55th parallel, the Kativik Environmental Quality Commission (KEQC) is responsible for defining the nature and scope of the impact study to be carried out. This addendum to the NNiP's ESIA contains all the knowledge and analysis elements required for the KEQC analysis, with the goal of modifying the global CA of the NNiP.

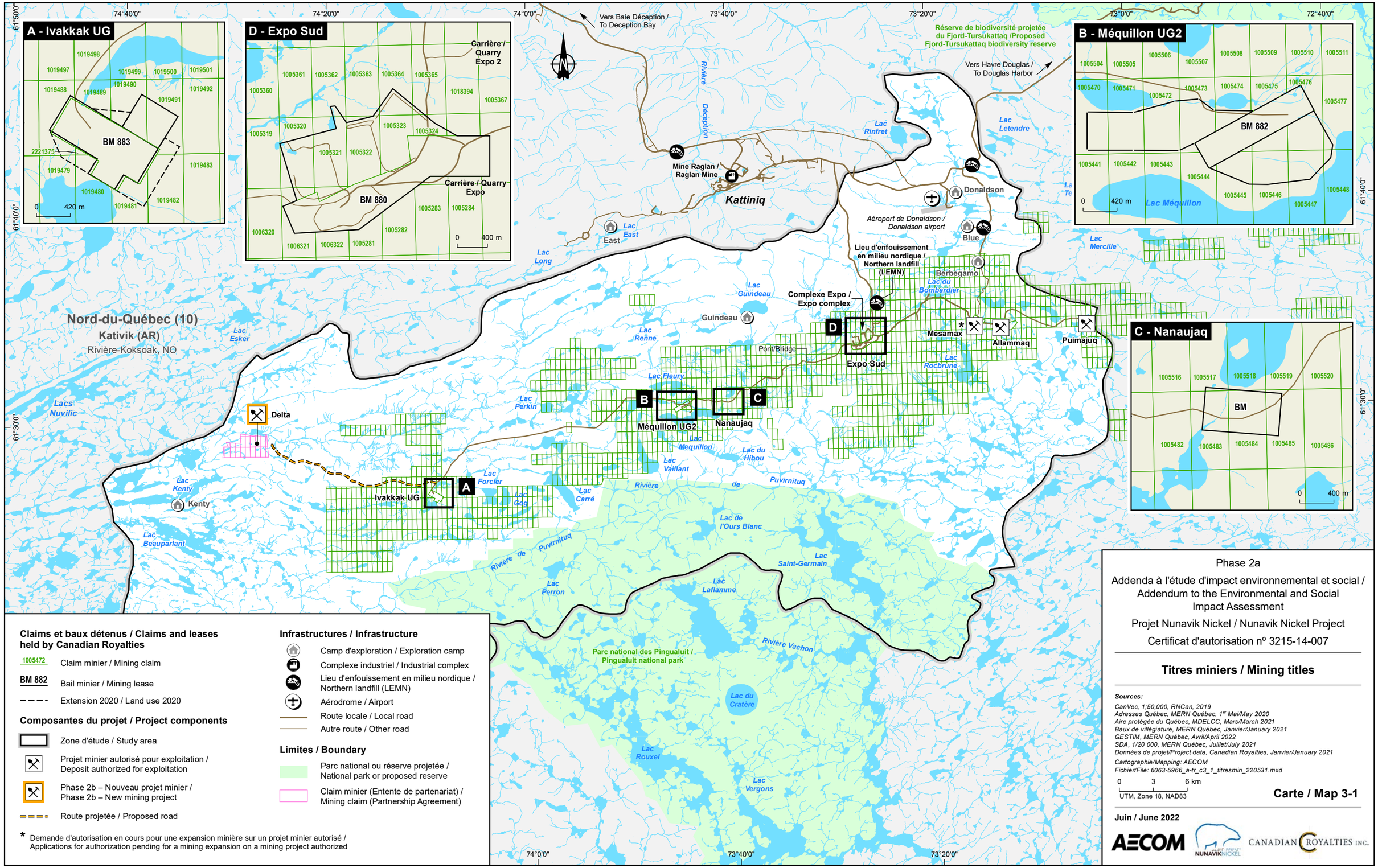
At the federal level, according to the *Physical Activities Regulations* (s. 18c; 19cd; SOR/2019-285[2]) arising from the *Impact Assessment Act* (IAA), the completion of these four projects (Expo South, Ivakkak UG, Méquillon UG2 and Nanaujaq) is not subject to the federal impact assessment procedure. The production capacity of the metal mine is still below 5,000 tonnes/day and the expansion is being done without increasing the mining area by 50% or more. A project notice has also been filed for review with the Impact Assessment Agency of Canada (the Agency) to ensure that the project is not subject to the IAA. The Agency's response indicates that the project is indeed not subject to this law (Appendix A).

The new *Règlement sur l'encadrement d'activités en fonction de leur impact sur l'environnement* (Q-2, r. 17.1; REAFIE[3]), is to specify the supervision of activities subject to ministerial authorization, under section 22 and those subject to a modification of such an authorization under section 30 of the EQA, will also apply for certain activities. Chapter III of this regulation deals exclusively with mining activities (art. 78 to 80).

Even if Phase 2a does not require a new impact study, all of the project's effects have been documented as to comply with the guidelines of the *Directive pour la réalisation d'une étude d'impact sur l'environnement d'un projet minier* (MDDELCC, 2016), in accordance with the *Regulation respecting the environmental and social impact assessment and review procedure applicable to the territory of James Bay and Northern Québec,* the document *Les changements climatiques et l'évaluation environnementale : Guide à l'intention de l'initiateur de projet* (MELCC, 2021)[4] and chapter 23 of Appendix 3 of the JBNQA. Appendix I "*Autres renseignements requis pour un projet minier*"[5] was also consulted since it records the specific information necessary when carrying out an impact study for mining projects subject to the assessment and review of environmental impacts.

Mining projects may be subject to several other laws and regulations, in addition to the laws and regulations governing environmental assessment processes. Among those applicable to some of the NNiP activities are:

[2] The Canada Gazette, Part II, Volume 153, Number. 17: Physical Activities Regulations
[3] Regulation respecting the supervision of activities based on their environmental impact: dynamic administrative version. Document is only available in French (gouv.qc.ca)
[4] Climate change and environmental assessment : Guide for the project initiator. Document is only available in French.
[5] APPENDIX I - OTHER INFORMATION REQUIRED FOR A MINING PROJECT (MINE OR ORE TREATMENT PLANT), available only in French (gouv.qc.ca)



Claims et baux détenus / Claims and leases held by Canadian Royalties

- 1005472 — Claim minier / Mining claim
- BM 882 — Bail minier / Mining lease
- Extension 2020 / Land use 2020

Composantes du projet / Project components

- Zone d'étude / Study area
- Projet minier autorisé pour exploitation / Deposit authorized for exploitation
- Phase 2b – Nouveau projet minier / Phase 2b – New mining project
- Route projetée / Proposed road

Infrastructures / Infrastructure

- Camp d'exploration / Exploration camp
- Complexe industriel / Industrial complex
- Lieu d'enfouissement en milieu nordique / Northern landfill (LEMN)
- Aérodrome / Airport
- Route locale / Local road
- Autre route / Other road

Limites / Boundary

- Parc national ou réserve projetée / National park or proposed reserve
- Claim minier (Entente de partenariat) / Mining claim (Partnership Agreement)

* Demande d'autorisation en cours pour une expansion minière sur un projet minier autorisé / Applications for authorization pending for a mining expansion on a mining project authorized

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Titres miniers / Mining titles

Sources:

CanVec, 1:50,000, RNCan, 2019
Adresses Québec, MERN Québec, 1er Mai/May 2020
Aire protégée du Québec, MDELCC, Mars/March 2021
Baux de villégiature, MERN Québec, Janvier/January 2021
GESTIM, MERN Québec, Avril/April 2022
SDA, 1/20 000, MERN Québec, Juillet/July 2021
Données de projet/Project data, Canadian Royalties, Janvier/January 2021

Cartographie/Mapping: AECOM
Fichier/File: 6063-5966_a-tr_c3_1_titresmin_220531.mxd

0 3 6 km
UTM, Zone 18, NAD83

Carte / Map 3-1

Juin / June 2022

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At the Provincial level

- Regulation respecting hazardous materials (RLRQ, chapter Q-2, r. 32)
- Land Protection and Rehabilitation Regulation (RLRQ, chapter Q-2, r. 37)
- Soil Protection and Contaminated Sites Rehabilitation Policy
- *Politique de protection des rives, du littoral et des plaines inondables* (only in French) (ch. Q-2, r. 35)
- Regulation respecting industrial depollution attestations (RLRQ, chapter Q-2, r. 5)
- Regulation respecting sand pits and quarries (RLRQ, chapter Q-2, r. 7)
- Water Withdrawal and Protection Regulation (RLRQ, chapter Q-2, r. 35,2)
- Regulation respecting the quality of drinking water (RLRQ, chapter Q-2, r. 40)
- Regulation respecting the landfilling and incineration of residual materials (RLRQ, chapter Q-2, r. 19)
- Clean Air Regulation (RLRQ, chapter Q-2, r. 4,1)
- Regulation respecting a cap-and-trade system for greenhouse gas emission allowances (RLRQ, chapter Q2, r. 46.1)
- Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere (RLRQ, chapter Q2, r. 15)
- Mining Act (chapter M-13.1)
- Act respecting the conservation of wetlands and bodies of water (2017, chapter 14) and the Regulation respecting compensation for adverse effects on wetlands and bodies of water
- Act respecting the lands in the domain of the State (RLRQ, chapter T-8.1)
- Act respecting threatened or vulnerable species (RLRQ, chapter E-12.01)
- Act respecting the conservation and development of wildlife (RLRQ, chapter C-61.1)
- Regulation respecting wildlife habitats (RLRQ, chapter C-61.1, r. 18)
- Regulation respecting hazardous materials (RLRQ, chapter Q-2, r. 32)
- Transportation of Dangerous Substances Regulation (RLRQ, chapter C-24.2, r. 43) of the Highway Safety Code
- Petroleum Products Regulation (RLRQ, chapter P-30.01) and its rules of application (R.R.Q., C. P-30.01, r. 1)
- Act Respecting Explosives (RLRQ, chapter E-22) and its rules of application

At the Federal level

- Fisheries Act (R.S.C., 1985, c. F-14)
- Canadian Environmental Protection Act, 1999 (S.C. 1999, c. 33)
- Environmental Emergency Regulations, 2019 (SOR/2003-307)
- Metal and Diamond Mining Effluent Regulations (SOR/2002-222)
- Species at Risk Act (S.C. 2002, c. 29)
- Explosives Act (R.S.C., 1985, c. E-17)

Table 3-3 presents the modifications to the global CA obtained to date by CRI within the NNiP framework. For informational purposes, guidelines have also been issued since 2004, particularly for the *Southern Raglan Mine* mining project (2006-08-29), as to oversee pre-project activities. Certificates of exemption were also received for the operation of a domestic waste landfill site (2006-07-11), the improvement of a basic mining road (2005-05-12), a mining road leading to the Mesamax and Expo deposits (2004-09-24), and from the waste pit to the Expo geological camp (2004-07-12; #3215-16-30). The NNiP project is also known to federal authorities, under the JBNQA projects, which establishes an environmental and social protection regime for both James Bay and Nunavik. The president of the Agency acts as the Federal Administrator of the JBNQA for federal projects and is responsible for authorizing or not authorizing projects, according to the assessment recommendations and review committees. The port infrastructure project and sediment management in Deception Bay are among the projects completed under this federal approach.[6]

Table 3-3: Modifications to the *Nunavik Nickel Mining Project's* Certificate of Authorization Since 2008

Title	Date
Environmental and Social Impact Assessment – Nunavik Nickel Mining Project	
Issuance of a certificate of authorization	2008-05-20
Decision by the KEQC relative to the project	May, 2008
Environmental and Social Impact Assessment – Nunavik Nickel Mining Project– Requests for modifications to the CA	
Underground mining of the Méquillon UG1 deposit and addition of mining infrastructure to the Ivakkak mining site	2022-04-22
Tailings management at the Expo mine	2022-01-06
Adjustment of the loss of fish habitat required for the Tr-5 crossing and addition of the Ivakkak quarry	2021-04-29
Exploitation of an underground mine at Expo West site	2020-11-04
Development of port infrastructure in Deception Bay	2014-07-11
Modification to the Environmental Monitoring Program	2013-10-31
Development of port facilities and the management of dredged sediment in Deception Bay	2013-07-05
Project to increase permanent accommodation capacity in Deception Bay	2013-03-05
Widening of the road section between Ivakkak and Allammaq	2013-01-15
Relocation of the collection basin and discharge point of the Méquillon satellite mine	2012-11-06
Mining a sand pit at km 34 near Lac François-Malherbe	2012-07-24
Second stage of the modification of terms and conditions and approval of the follow-up program	2012-06-22
Nunavik Nickel Mining – Expo No. 4 Quarry mining project	2012-01-27
Nunavik Nickel Mining – Expo No. 2 Quarry mining project	2012-01-27
Project to increase temporary accommodation capacity at Expo and Deception Bay	2011-11-28
Changes to Terms and Conditions	2011-06-06
Mining of a quarry at Lac du Bombardier	2011-02-16
Allammaq deposit mining and increase to the concentrator's processing capacity	2011-01-25
Waste management of the Chrysler mining exploration camp	2010-08-23
Pre-Project (Exploration for NNiP)	
Construction of a mining exploration road leading to the Expo deposit – addition of a quarry	2008-01-25
Construction of a mining exploration road leading to the Expo deposit	2007-04-12

[6] https://www.canada.ca/en/impact-assessment-agency/corporate/james-bay-northern-quebec-agreement/deception-bay-wharf-sediment-management.html

3.3 Main Issues

The stakes of a project are related to the risks that it can bring to the study area, by causing a modification, alteration, gain or loss of certain components to which concerns are attributed and whose analysis could influence the decision on the authorization of said project. Issues in establishing a mining project generally relate to the following elements:

- The conservation and protection of water resources (protection of surface water and groundwater), which also includes wetlands
- The conservation of atmospheric quality
- A reduction in greenhouse gas (GHG) emissions
- The adoption and implementation of sustainable and inclusive mining development (relating to climate changes and Inuit communities)

In addition to these main issues for mining projects, there are site-specific issues such as constraints related to deadlines, social acceptability, mining project location and technical constraints.

Since the project is located in arctic tundra and in the permafrost zone, the natural environment is rich in wetlands and bodies of water. Much of the local wildlife is partially dependent on these environments. First and foremost, the installation of mining project infrastructure avoids wetlands as much as possible to reduce the technical complexity during construction and to reduce the project's impact on these environments. The integration of mining activities within the migratory activities of caribou and birds is also an important issue when carrying out the various mining projects.

In addition, the NNiP Phase 2a location is on the Nunavik territory, whose population is mainly composed of Inuit, which is small in numbers and spread over a vast territory. The continuation of Phase 2a represents a major challenge from a socio-economic perspective, since mining expansion makes it possible to maintain jobs, hire new resources and perfect the training process for Inuit employees at CRI.

Social acceptability of its activities in Nunavik is an aspect in which CRI has attributed great importance since the project began. Consequently, an impact and benefit agreement, named the Nunavik Nickel Agreement, was developed and signed with the Inuit partners following the global CA. CRI has ensured compliance with the clauses of this agreement since 2008 and ensured the satisfaction of the Inuit partners via the Nunavik Nickel Committee, created under this agreement. This committee makes it possible to communicate the changes to come and the information extracted from the environmental monitoring done by CRI to the Inuit communities involved. It also makes it possible to collect the communities' concerns, maintain a dialogue and thus promote the social acceptability of CRI mining projects. The Nunavik Nickel agreement is therefore a fundamental component of the social acceptability of Phase 2a. The Nunavik Nickel Agreement is described in more detail in section 3.5.

The members of the committee met three times in 2021 to outline the development vision until 2034, in addition to the planned consultation process. Keep in mind that the four new projects that are part of this addendum are located in an area already exploited and that the NNiP is relatively far from the nearest Inuit village, Kangiqsujuaq, located nearly 80 km east of the industrial complex.

CRI is subject to a major scheduling challenge for several reasons: 1) the deposits are generally small in size and the maximum daily tonnage is limited to 4,500 tonnes, which requires an almost un-interrupted ore supply. 2) The weather conditions limit when construction is possible. This tight schedule indicates that a delay in ministerial authorizations may lead to layoffs (socio-economic losses).

Climate change is an issue for any project. It has been considered according to the mining project’s specific situation, while considering the receiving environment in which the NNiP is inserted. They have thus been integrated and assessed as to reduce the sources of (direct, indirect) greenhouse gas (GHG) emissions (section 6.4.3) according to the directives of the document on *Climate change and environmental assessment: Guide for the project initiator* (MELCC, 2021), while adapting the content to the northern territory, which will experience even greater

projected effects compared to more southern areas. To this intent, the *Greenhouse gas emissions: quantification guidance* (MELCC, 2019), which details the calculation methodologies for quantifying GHG emissions, was also consulted. Measures to prevent and reduce GHG emissions will be implemented, depending on the different project phases.

A climate change resilience and adaptation study has been completed (Appendix B) in terms of climate change adaptation. It includes the identification of the hazards likely to have repercussions on the project, although mining at the site has already taken place for several years. As part of the climate change adaptation process, climate variables important to the project are identified and project-specific adaptation measures are developed if necessary.

By committing to minimizing the negative effects on the natural and social environment as part of its activities according to the various established mitigation measures, CRI thus contributes to respecting the project's challenges and to implementing responsible mining development. The measures will therefore evolve over time, depending on the operations within the framework of NNiP's Phase 2a, according to the deposits and the phases (construction, operation, post-operation and restoration, post-restoration).

It is important to mention that the process for determining the issues could evolve during the modifications made to the project and the environmental and social issues will therefore be adjusted, if required, according to the evolution of the activities in the framework of the NNiP.

After the exploitation phase, the restoration of the NNiP deposits and the post-restoration phase will take place. During these phases no issues will persist except for the projected effects of climate change on the northern environment that will follow thereafter.

3.4 Sustainability and Corporate Social Responsibility

3.4.1 Integration of the Sustainable Development Principles

Like the integration of climate change into the project planning and design process, sustainable development remains at the center of CRI's priorities. In fact, CRI is a metal mining company committed to environmental protection, as well as occupational health and safety.

The principles of the MELCC's *Sustainable Development Act* are found throughout the design and will be implemented during Phase 2a of the NNiP. On one hand, all NNiP activities, including Phase 2a, are anchored in the Environment, Health and Safety policy (presented in the following section), the Nunavik Nickel Agreement on the impacts and benefits (presented further in section 3.5 and in chapter 4) and the project's mitigation measures. Table 3-4 illustrates how sustainability principles are intrinsic to the NNiP, without, however, being exhaustive as to the ramifications of applying the principles.

On the other hand, the reader will be able to note the integration of principles such as those of precaution, biodiversity preservation and respect for the ecosystems support capacity in the chapter regarding the project description (chapter 5). These principles are upheld by minimizing the environmental footprint of infrastructure and operating methods and by maximizing economic efficiency by extending the life of existing infrastructure.

Phase 2a thus allows the mining of new resources and the creation of new wealth by using infrastructure already in place and with the lowest possible impacts. Added to this is a mechanism for redistributing the wealth created through the Nunavik Nickel Agreement for Inuit communities. Ultimately, Phase 2a moves in the direction of the balance sought between the three objectives of sustainable development which are social equity, environmental integrity and economic efficiency.

Table 3-4: NNiP Sustainability Principles

Principles of the *Sustainable Development Act*	NNiP elements
Health and quality of life Environmental protection Prevention Precaution Responsible production and consumption Cost internalization	EHS policy (environment, health, safety)
Equity and social solidarity Attendance and commitment Access to knowledge Subsidiarity Partnership and intergovernmental cooperation Cultural heritage protection	Nunavik Nickel Agreement and mitigation measures
Biodiversity preservation Respect for ecosystem support capacity	Mitigation measures

3.4.2 Environment, Health and Safety Policy

To implement its commitments, CRI has adopted an environmental policy, approved by senior management, in order to minimize the dangers, risks and impacts on the natural and human environment and thus improve its performance on a continuous basis. The CRI's EHS is presented in diagram 3-1 and in diagram 3-2 in Inuktitut.

Furthermore, when mining and mine-related activities cease on the territory occupied by the NNiP, CRI is committed to respect the *Guidelines for preparing mine closure plans in Québec*[7] with respect to the restoration of mining sites in northern environments, all while respecting the surrounding environment.

[7] https://mern.gouv.qc.ca/english/mines/reclamation/documents/guidelines-mine-closure.pdf

CANADIAN ROYALTIES INC.

Environment, Health and Safety Policy

Canadian Royalties Inc. is a metal mining company committed to occupational health & safety and environmental protection. Canadian Royalties Inc. will act in a manner that minimizes dangers, risks and impacts and will continually seek to improve its performance. Canadian Royalties Inc. will engage the commitment and involvement of all of its employees and contractors to ensure that environmental, health and safety performance objectives are met.

Canadian Royalties Inc. is committed to:

- Evaluating the dangers, risks and impacts for the natural, human and social environments with a focus on the goals of prevention and protection.
- Implementing prevention and response programs in order to minimize and mitigate impacts and adverse events.
- Complying with current laws and regulations wherever the company is engaged in mining or mining-related activities.
- Ensuring responsible use of energy, water and consumable goods.
- Informing employees, subcontractors and suppliers of the company's policies and programs and their required involvement to ensure successful implementation.
- Conducting monitoring programs and periodic audits in order to identify opportunities for improvement and implementing corrective actions where required to improve environmental and organizational health and safety performance.
- Identifying stakeholders and undertaking dialog with the inclusion of governmental authorities and the public in order to improve Canadian Royalties Inc.'s practices and performance.
- Reclaiming the impacted environment to a condition as near to its original state as is reasonably possible, upon the termination of mining and mining-related activities.
- Ensuring that sufficient human, material and financial resources are available to implement this policy.

James Xiang
President/Chief Operating Officer
Canadian Royalties Inc.

May 30, 2022

Diagram 3-1 : CRI's Environment, Health and Safety Policy

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3.4.3 Environmental, Social and Governance Initiatives

CRI integrates the general principles of sustainable development into its business management strategies.

3.4.3.1 Past and Present Initiatives

Technological breakthrough for the recirculation of mine water

CRI reduced the withdrawal of fresh water from Lac du Bombardier by more than 50% in 2019 and 2020. More specifically, while the amount of water withdrawn was 764,629 m^3 in 2018, it was reduced to 314,831 m^3 and 338,292 m^3 in 2019 and 2020.

This decrease in consumption was largely attributable to the acquisition and start-up of a nanofiltration water treatment unit, which makes it possible to reuse a greater portion of the process water and thus limit the withdrawal of fresh water from the lake. This has also had the benefit of reducing the contaminated water generated that must be stored at the tailings disposal facility. To this intent, the water from the tailings disposal facility was returned to the concentrator and filtered by the nanofiltration units, allowing it to be used once again in the ore concentration process.

Great logistical efforts have been made for its installation and optimization, including employee training, considering that the transformation process of ore, in addition to copper and nickel, is very sensitive to variations in water quality.

CRI has thus respected one of the commitments of the global CA regarding the mine water recirculation and will continue these efforts in the years to come, in addition to those for sound water use management from a global perspective.

Energy efficiency and reduction of fossil fuel consumption

As the NNiP is located outside the Hydro-Québec network, the energy required for all of its activities is based on diesel, which is transported by sea to the port facilities in Deception Bay.

For the sake of responsible consumption of this non-renewable resource, CRI has carried out rigorous monitoring of diesel consumption over the past few years, specifically with regards to the use of power generators. In fact, the latter represents the largest proportion of diesel consumption, mainly used to produce electricity. Efforts to reduce consumption can be summarized in two parts.

On one hand, the generator consumption trends study of the satellite sites made it possible to combine the consumption of certain sites with fewer generators, specifically via electrical cables. Since 2017, it's been estimated that 4,339,000 L, or 13.5% of the annual consumption, was saved.

On the other hand, CRI commissioned the firm BBA in 2019 to optimize the central group of generators, which supplies the ore concentrate plant and a section of the Expo camp. This made it possible to maintain diesel consumption at a relatively stable level, despite more sustained occupation of the camp.

Through its projects to reduce its carbon footprint, CRI confirms its commitment to be a constructive partner in the fight against climate change.

Participation in the "Towards Sustainable Mining" initiative

CRI has been a member of the Towards Sustainable Mining (TSM) initiative of the Mining Association of Canada since 2017. CRI is committed to respecting the guiding principles of the program, as well as their implementation by integrating the seven performance protocols of the program into its activities and management systems. CRI is also committed to ensuring that its actions are consistent with each of the protocols' strategic frameworks.

This world-renowned program enables CRI to better identify and manage its primary environmental and social risks. CRI aims to demonstrate leadership through its community commitments, the health and safety of employees and communities, in addition to energy efficiency.

PEIIC - giving back to communities

The program for environmental improvement in Inuit communities (PEIIC), created by CRI, consists of the implementation of projects completed as a replacement for compensation plans, relative to the loss of wetlands and bodies of water established for projects in southern Quebec. Although this does result from obligation, this innovative program remains an excellent example of the partnership between CRI, the regional government (the Kativik Regional Government - KRG), and the local communities that are members of the Nunavik Nickel Agreement. This partnership allows the KRG and the communities to suggest environmental improvement projects, which will benefit the inhabitants of the Inuit villages. These projects will be primarily financed by CRI. Through its involvement in the PEIIC, CRI demonstrates that its development in Nunavik can harmoniously contribute to the sustainable development of Inuit communities.

3.4.3.2 Future Initiatives

Wind turbines project

CRI, in partnership with TUGLIQ Energy, is taking steps to create a small wind farm near the Expo industrial complex. This wind farm will be equipped with two wind turbines that are 80 m high (120 m when the blade is vertical) and with a capacity of 3 MW. The wind turbines will make it possible to prevent the consumption of 5 million liters of diesel or 14,000 tonnes of CO_{2eq} of greenhouse gases (GHG) per year, for the next 10 years. This would represent a decrease of almost 12% in annual GHG emissions for CRI operations in Nunavik. This project requires a new environmental and social impact study, which will constitute Phase 2c of the NNiP.

Complete carbon footprint

CRI understands the importance of considering GHG emissions throughout its value chain and product portfolio as to comprehensively manage GHG risks and opportunities. To this intent, the company plans to begin voluntary reporting its indirect GHG emissions other than those related to energy (*scope 3*) starting in 2022. The *scope 3* emissions include, among others, upstream and downstream emissions from administration, materials, and travel. This comprehensive exercise will enable CRI to better assess the carbon footprint of its products, nickel and copper concentrates and to identify new opportunities for reducing its GHG emissions, to involve its partners in the GHG management, in addition to improving stakeholder information and corporate reputation through public reporting.

Environmental, social and governance (ESG) management strategy

CRI is working to refine its sustainability strategy by implementing goals and practices to demonstrate progress and accountability on the issues that matter most to stakeholders, which will better help CRI to understand and manage its social and environmental risks and opportunities.

Specifically, CRI intends to produce a consistent ESG report according to recognized international standards, as to increase transparency and accountability in terms of material issues by the end of 2023.

CRI intends to produce a life cycle analysis of the products from its activities, in addition to further addressing the risks of climate change through the declaration of scope 3 emissions. This study will solidify our ability to properly manage risks, better define our sustainable development objectives and meet the highest international environmental standards.

3.5 Agreements With Aboriginal Communities

The basis of the collaboration between CRI and the Inuit people is an impact and benefit agreement called the Nunavik Nickel Agreement ("the Agreement"). The Agreement was established in 2008 between CRI, the land corporations of Salluit and Kangiqsujuaq, the municipality of Puvirnituq and the Makivik Corporation. It states the foundations of CRI's commitment to work fairly with its Inuit partners in writing. The Agreement is intended to:

- Facilitate equitable and meaningful participation of Inuit beneficiaries regarding the NNiP
- Promote the development and operation of the NNiP in an efficient and environmentally friendly manner
- Ensure that the Inuit people benefit from direct and indirect socioeconomic benefits during the development and operation phases of the NNiP
- Integrate the anticipated impacts, mitigation measures and monitoring programs as presented in the environmental and social impact study
- Ensure that the monitoring of environmental impacts is implemented and that unanticipated impacts, in addition to those whose scope or significance is greater than what was anticipated, are addressed appropriately
- Ensure the support of Makivik Corporation for the development and operation of the NNiP
- Allow a dynamic, continuous, and effective relationship between the Parties. Prior to the development phase, during subsequent phases of the development and operation phases of the NNiP.

The Agreement provides the means to achieve these objectives. Specifically:

1) Environmental Component

In Annex 7, the Agreement includes the anticipated impacts and mitigation measures identified during the ESIA 2007. It specifies that the environmental monitoring described in the impact study must be carried out in such a way, as to validate the effectiveness of the mitigation measures and assess the level of residual impacts after mitigation. These monitoring results must be sent to the Nunavik Nickel Committee (see below). If unanticipated impacts are identified, additional mitigation measures must be implemented to reduce them to a level deemed acceptable by the Inuit parties. Compensatory measures will be negotiated if the level of residual impact is not deemed acceptable.

The Agreement also recognizes that it is possible that CRI may wish to develop deposits other than those included in the Agreement, in the years following the Agreement’s signing. It is then expected that a consultation process and an impact study will be carried out. The apprehended impacts, mitigation measures and planned environmental monitoring must be presented to the Inuit parties. Compensatory measures will be negotiated if the mitigation of impacts is not satisfactory to the Inuit parties.

This clause of the Agreement was applied by CRI during the development of the new Puimajuq deposit and the presentation of this addendum to the initial ESIA.

2) Social and Economic Component

CRI is committed to creating jobs for Inuit peoples and to implementing special training programs in various professions during the Agreement. CRI's objective is to offer and grant as many jobs as possible to qualified Inuit peoples for available positions, throughout the mine’s lifespan.

CRI has implemented an apprenticeship vocational training program, working in partnership with the Kativik Regional Government (KRG) and the Kativik Ilisarniliriniq School Board (KI), in addition to provincial employment and training organizations. Additional development phases are scheduled in the program. In addition, various

strategies are used (pairing with other employees, learning through virtual glasses, etc.) to arouse the interest of the Inuit peoples in occupying different positions as part of NNiP.

The Agreement provides for prioritizing the hiring of Inuit workers, in addition to the payment by CRI of free transportation from the northern villages to the NNiP site.

CRI has also created the position of "*Inuit Hiring and Training Advisors*" as to be more attentive to the concerns of Inuit employees and respond to the needs expressed when required.

As planned in the Agreement, an Inuit employability support system has been implemented. This system includes the promotion of respect for Inuit culture, by and among CRI employees, in addition to specific training for management personnel. Other measures have also been implemented, including flexible working hours, adaptations for the language spoken at work and a kitchen dedicated to Inuit employees.

CRI is committed to using Inuit companies when certain subcontracted work is required, with the perspective of generating positive benefits for the Inuit parties as much as possible. A list of goods and services, in addition to designated companies, have been specified in the Agreement.

Lastly, the Agreement defines the terms of payments and royalties to the Inuit parties. Since NNiP began operations, CRI has made annual transfers of several million dollars and will continue do so throughout the life of the project.

3) Inuit Liaison Officer

The Agreement provides for the hiring, by CRI, of an Inuit liaison officer, who will ensure compliance with the Agreement and who will report directly to the VP of Operations. This officer will also act as a Nunavik Nickel Committee representative.

4) Nunavik Nickel Committee (NNC)

The Agreement provides for the implementation of a committee with decision-making powers, named the *Nunavik Nickel Committee* (NNC). The committee is designed to:

- Serve as a communication forum between CRI and Inuit parties
- Provide an effective framework for cooperation regarding the NNiP and the implementation of the Agreement
- To carry out the functions specified in the Agreement

Specifically, the results of the planned environmental, social and economic measures will be reported and discussed during NNC meetings. Section 3.1 lists the actions of this committee in detail and specifies the elements relative to this addendum.

In light of this, the Agreement will continue to be a basis for the pursuit of NNiP activities and will provide the mechanisms required so that the community's concerns are heard and taken care of.

4 Consultation with the Community

4.1 Consultation Process

Under the NNiP framework, the consultation process led by CRI with the local communities, gave way to the establishment of an impact and benefit agreement, called the Nunavik Nickel Agreement (hereafter named "The Agreement") The Agreement was established in 2008 between CRI, the land corporations of Salluit and Kangiqsujuaq, the Municipality of Puvirnituq and the Makivik Corporation, under the framework of the Global CA and is written in detail in Section 3.5 (Agreement with Native Communities). The presence of the Makivik Corporation among the signatories also ensures representation of all Nunavimmiuts.

The Agreement provides for a dynamic consultation process, specifically through the implementation of a committee with decision-making powers, named the *Nunavik Nickel Committee*. It's composed of representatives from each of the following partners, specifically the president of Qaqqalik (Land Corporation of Salluit), the president of Nunaturlik (Land Corporation of Kangiqsujuaq), a representative from the mayor of NV Puvirnituq, the mining coordinator of the Makivik Corporation, in addition to four representatives from CRI. These meetings allow for the exchange of information on various aspects, e.g., planning mining activities, certain issues and challenges, in addition to anticipated developments. The committee therefore met on several occasions since the Agreement was signed.

The Agreement provides for the possible integration of new deposit exploitation, in addition to weighing their relative benefits and repercussions. Points 3.2.1 to 3.2.3, applicable to the projects of Phase 2a, are presented below.

Extracted from the Agreement:

> *"3.2.1 The Parties acknowledge that Canadian Royalties has identified a number of mineral deposits within the Claims Area, but only the deposits referred to as the Expo, Ivakkak, Mequillon, and Mesamax deposits have been specifically designated for development and extraction, as described in Chapter 4 of the Environmental Impact Study.*
>
> *3.2.2 In the event that Canadian Royalties intends to extract mineral deposits from the Claims Area, other than at the Expo, Ivakkak, Mequillon, and Mesamax deposits, Canadian Royalties shall, at its expense, prior to proceeding with such New Development cause to have performed an Environmental Assessment regarding such New Development, the results of which shall be reported to the Inuit Parties.*
>
> *3.2.3 Based on the Environmental Assessment referred to in sub-subsection 3.2.2, Canadian Royalties shall prepare, in consultation with the Inuit Parties, a summary in the format of Annex 7, of the impacts, mitigation measures, monitoring programs and significance of residual impacts after mitigation of each impact resulting from such New Development based on the four (4) criteria referred to in subsection 4.3. By noting, where applicable, those impacts, mitigation measures, monitoring programs and significance, after mitigation that are different than those identified in Annex 7; which summary, once agreed to by the Parties and following its execution by the Parties, shall become an annex to and form part of this Agreement as a New Development Annex.*
>
> *3.2.4 In the event that there is no appropriate mitigating work or works that would eliminate or diminish certain of the identified impacts resulting from such New Development, to a level of significance that is mutually acceptable to the Parties, considering the level of significance presently foreseen in Annex 7 related to such impact, the Parties shall negotiate other mutually satisfactory measures, including compensatory measures."*

In regard to the clauses of the Agreement, it has been established that an appendix summarizing the impacts and mitigation measures of Phase 2a must be added thereto, adjoining Annex 7 of the Agreement (Table 7-36 of this document), which applies to the activities of the current NNiP.

An *ad hoc* meeting was held on March 22, 2021 to communicate CRI's long-term mine development plan and new mining projects to the NNC, in addition to establishing the planned consultation process, based on the creation of a specific sub-committee for Phases 2a and 2b.

The sub-committee provides for the participation of two representatives designated by the Inuit stakeholders, plus two CRI representatives. Thereafter, the representatives following Mr. Willie Keatainak, and Mr. Lukasi Pilurtuut) were appointed to represent the Inuit stakeholders and Mr. Stéphane Twigg and Mr. Andy Pirti) were appointed to represent CRI. Mr. Jean-Marc-Séguin, of the Makivik Corporation, was designated as a facilitator for the sub-committee.

The objective and mandate of this sub-committee is to conduct a review of the Phase 2a ESIA and develop an additional mitigation measures appendix, which will be included in the Agreement. This appendix will become Annex 7.2 of the Agreement, like Annex 7.1, added in 2021 to include the mitigation measures relating to the Allammaq and Puimajuq deposits exploitation projects. The sub-committee will conduct the ESIA review, will relay communications for and by the communities and report to the NNC to provide a summary, recommendations and develop a summary of impacts and mitigation measures (Annex 7) agreed between the parties.

The consultation process to be followed by the sub-committee is as follows:

1. Review all relevant documentation and create a summary presentation of new impacts and associated mitigation measures;
2. Sub-committee meetings to discuss the reports produced on the projects under study, their impacts and the mitigation measures suggested;
3. Validate the results with the communities via presentations and communications;
4. Make a summary presentation to the attention of the NNC, as to lead toward the integration of the new mitigation measures in the form of a summary table (Annex 7)
5. Signature of the stakeholders for the official integration of the new Annex 7 (mitigation measures) into the Agreement. This takes place at a signatory meeting of the Agreement.

Thereafter, the sub-committee will conduct the ESIA review and report the summary and recommendations to the NNC.

In addition, one regular NNC meeting also took place on August 17, 2021. This focused on, among other points, the social, environmental and technical aspects relative to the operations and the administration of the Agreement.

During this meeting it was mentioned that CRI would like access to the data from a recent study completed by the Inuit on territory use, as to integrate this data into this addendum. To this intent, Makivik responded to this request in part. The results are presented in Chapter 6, along with those of certain monitoring programs on the human environment, specifically the statistics regarding the number of Inuit workers employed by CRI or certain contractors, in addition to the challenges in terms of training and success stories.

4.2 Sub-Committee Meetings for Phase 2

The first meeting of the sub-committee relating to Phase 2 was held on November 10, 2021. The sub-committee's terms of reference have been reviewed and operating rules have been established.

The specific projects for Phases 2a (Expo South, Nanaujaq, Méquillon UG2 and Ivakkak UG) and 2b (Delta) were presented along with a work schedule. The anticipated impacts were also presented in summary. The characterization work on the environment completed in the summer of 2021 by professionals from the firm, Aecom, in terms of the ESIA, has been detailed. The next steps were presented, including the process leading to the

production and transmission of this addendum to the ESIA (mid-2022), in addition to presenting the results to the sub-committee. The results will be presented specifically in the form of an addition to Annex 7 of the Agreement, to facilitate the understanding of the impacts identified, the mitigation measures, the associated environmental monitoring and the significance of the residual impacts after mitigation. It is therefore planned to hold additional meetings in 2022, to ensure the consultation process leading to the approval of Annex 7 by all the stakeholders continues its due course.

4.3 Community Concerns Raised

During the NNiP's environmental and social impact assessment, consultations were carried out in 2006 with the Inuit communities to consider their concerns in regard to the NNiP development and the resulting direct and indirect mining activities.

Concerns were raised regarding the following: Hiring, high school training to work in the mines, student summer jobs, labour relations, Inuit employee turnover rate, effects of job creation (negative concerns in the face of increased cash on hand for those with substance abuse problems), business opportunities and the local economy (companies other than those in Abitibi – involvement and investments, profits and royalties), the effect the mine has on the environment (destruction of fox dens, archaeological sites, etc.), modification of water quality (contaminated water and dust discharge activities), potential contamination of fish, change in air quality, contamination of caribou meat, changes in the population's hunting and fishing activities and post-closure effects.

Many of the jobs generated by the new projects should be filled by Inuit beneficiaries under the JBNQA according to the Agreement. It should be noted that the Agreement initially promotes the hiring of Inuit from Salluit, Kangiqsujuaq and Puvirnituq, with the goal to reduce concerns associated with Inuit employability. Moreover, Annex 7 (Appendix C of this document), produced in collaboration with Inuit partners and the global environmental monitoring program, is also to respond to the concerns raised during the consultations completed during the initial impact assessment.

CRI will continue to consider these concerns raised during the initial impact assessment as part of Phase 2a. No new concerns, specific to Phase 2a projects, were raised following the first sub-committee meeting held on November 10, 2021.

CRI, via the NNC and the monitoring on the planned social environment (Monitoring 35 and 36[8] of the Environmental Monitoring Program), has remained and will remain attentive to the concerns expressed by the communities in terms of NNiP activities. For example, additional environmental monitoring, consisting of surface water sampling at three stations located along the Puvirnituq River, was implemented following certain concerns and questions raised by members of the northern village of Puvirnituq during a visit by the Environmental Department in January, 2020 as part of Monitoring 35. Also, the establishment of a NNC sub-committee will be created in 2022 and dedicated specifically to the question of the NNiP restoration. The creation of this sub-committee was already a commitment by CRI and piqued interest expressed by the communities during the NNC *ad hoc* meeting on March 22, 2021. The mining restoration aspect of our sites is a major issue that has been raised many times by our partners.

CRI will continue to respond to the concerns expressed by the communities before and during Phase 2a and modifications may be made to Annex 7 of the Agreement as required.

[8] Monitoring 35 involves the information program for the Inuit communities and program 36, the plan for evaluating NNiP perceptions.

5 Description of the project and project alternatives

This section of the study includes determining the project alternatives, their selection, by way of indicative parameters, of the alternative or alternatives on which the detailed analysis of the impacts will relate and lastly, the description of the alternatives selected.

5.1 Comparative Analysis of Alternatives

The goal of analyzing the alternatives is to adequately meet CRI's needs, while also considering the environmental, social, economic and technical issues. In addition, they are analyzed while considering the potential for GHG emissions, the impact that climate change could have and the feasible climate change adaptation strategies. To this intent, the present analysis of alternatives is based on six criteria divided into several stages:

- Meets the needs CRI (yes or no);
- Contributes to the economic profitability of the deposit's exploitation (negative, low, medium, high);
- Technically feasible (difficult, achievable, uncertain);
- Generates impacts on the physical environment (none, low, medium, high);
- Generates impacts on the biological environment (none, low, medium, high);
- Generates impacts on the social environment (none, low, medium, high);

Plans are available for some projects, while the graphical representation was not available for others.

5.1.1 Ivakkak UG Project

The natural elevation of the terrain at the Ivakkak pit site is approximately 475 m due to its undulating topography. The dimensions planned for the Ivakkak extraction pit are approximately 250 m wide, 360 m long and 110 m deep, which brings the depth of the pit to an elevation of approximately 365 m. The deposit to be exploited for this project is located under the pit between the 365 and 300 m elevations. The section of the deposit that is not provided for in the exploitation of the Ivakkak open-pit project (Ivakkak OP) represents 55% of the ore from the Ivakkak deposit located within the mining lease issued by the *Ministère de l'Énergie et des Ressources Naturelles* (Ministry of Energy and Natural Resources) (MERN) at CRI.

The analysis of the alternatives for the Ivakkak UG project focused mainly on the deposit exploitation method and the location of the surface infrastructures. Table 5-1 presents the choice of alternative selected based on the constraints and impacts on the natural and social environments.

5.1.1.1 Alternative 1: To Exploit the Extension of the Ivakkak Open-Pit Deposit

The first alternative consists of enlarging the open-pit that will be exploited to allow the ore to be reached at depth. This alternative would require a surface enlargement of the working areas and access roads to allow for safe descent inside the pit to reach the bottom of the deposit. This situation would generate a major encroachment on the natural environment when the pit would be enlarged. Moreover, this option would require greater efforts for the ore extraction and would increase the amount of waste rock to be managed. These increased efforts for ore extraction and waste rock management would lead to greater use of diesel-powered vehicles, which may contribute to an increase in greenhouse gas emissions. The impact on the social aspect would be considerable with this alternative, since the effect on the landscape of an open-pit is generally negatively perceived by the Inuit communities and the territory's users.

Therefore, this alternative was rejected from the start of the process due to the major impacts generated and the constraints associated with the exploitation (waste rock management) (see Table 5-1).

Table 5-1: Comparison of Alternatives for the Ivakkak UG Project – Location of Surface Facilities

Criteria	Alternative 1 Exploitation of the extension of the Ivakkak open-pit deposit	Alternative 2 Ore extraction from a portal in the existing Ivakkak pit	Alternative 3 Ore extraction from a portal located in the natural environment
Meets CRI's needs	Yes	Yes	Yes
Economic viability	Low	High	High
Technical viability	Achievable	Uncertain	Achievable
Impacts on the biological environment	Major (more significant encroachment)	Minor (very little additional surface affected)	Minor (surface area affected reduced, no sensitive component affected besides wetlands)
Impacts on the physical environment	Major (greater impacts on the ground)	Minor (very little newly disturbed ground)	Minor (less surface affected)
Impacts on the human environment	Major (larger pit, visual aspect largely modified)	Minor (the additional impacts are almost null)	Minor (for the noise and landscape)

5.1.1.2 Alternative 2: Ore Extraction from a Portal in the Existing Ivakkak Pit

Alternative 2 consists of building access infrastructures to the underground deposit from the open-pit mined at the Ivakkak site and continuing the exploitation of the deposit underground (Map 5-1). This alternative would limit the length and depth of the underground ramp and thus reduce costs compared to alternative 1. This alternative would also make it possible to limit new encroachments on the natural environment to a minimum and have low construction costs.

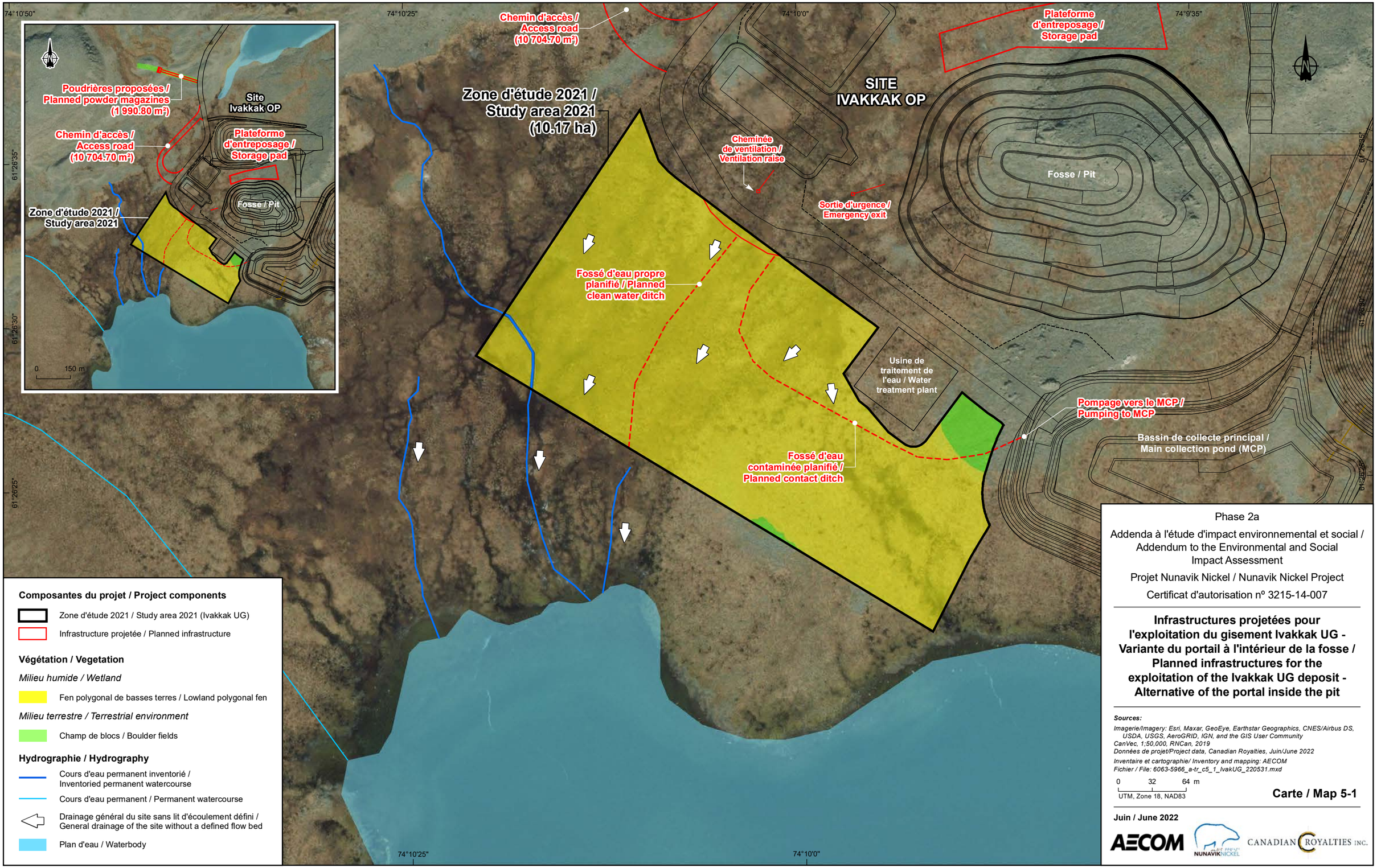
However, it would mean that a portal would have to be created at the bottom of the pit. The technical viability of this development will not be definitive until the pit is completed, and an assessment of the pit walls' stability is completed following a geotechnical analysis. Geotechnical drilling was done in the summer of 2021 and a report was provided by a specialized consultant to optimize the possibilities. This alternative represents the one with the least impact on the natural environment, but its technical viability is not yet known.

The impacts of alternative 2 will be assessed in detail in chapter 7, since it is impossible to exclude this option at this stage of the project.

5.1.1.3 Alternative 3: Ore Extraction from a Portal Located in the Natural Environment (Selected Alternative)

The third and final alternative for ore extraction from the deep-lying Ivakkak deposit, is to exploit it underground from a portal and surface infrastructure (Map 5-2). The new infrastructures will be located in a natural environment in a location adjacent to the location already authorized for exploiting the Ivakkak open-pit deposit. The site chosen for the infrastructures' installation required for underground exploitation is the one that best meets CRI's needs, primarily: to extract all of the ore under the Ivakkak mining lease, to mine the deposit in a technically feasible, safe and financially profitable, all while minimizing the environmental impact as much as possible. This alternative was planned from its creation to avoid impact to the waterways present in the area under study and to limit the access distance to the underground deposit. The portal's location for access to the underground deposit, in addition to the access tunnels and other underground infrastructures, have been planned as to reduce construction costs and make the project as beneficial as possible from an economic viewpoint.

Just like alternative 2, the impacts of alternative 3 will be assessed in detail in chapter 7, since it is impossible to differentiate between these two alternatives at this stage of the project.



Composantes du projet / Project components

- Zone d'étude 2021 / Study area 2021 (Ivakkak UG)
- Infrastructure projetée / Planned infrastructure

Végétation / Vegetation

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Milieu terrestre / Terrestrial environment

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

- Cours d'eau permanent inventorié / Inventoried permanent watercourse
- Cours d'eau permanent / Permanent watercourse
- Drainage général du site sans lit d'écoulement défini / General drainage of the site without a defined flow bed
- Plan d'eau / Waterbody

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Infrastructures projetées pour l'exploitation du gisement Ivakkak UG - Variante du portail à l'intérieur de la fosse / Planned infrastructures for the exploitation of the Ivakkak UG deposit - Alternative of the portal inside the pit

Sources:

Imagerie/Imagery: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1:50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, Juin/June 2022

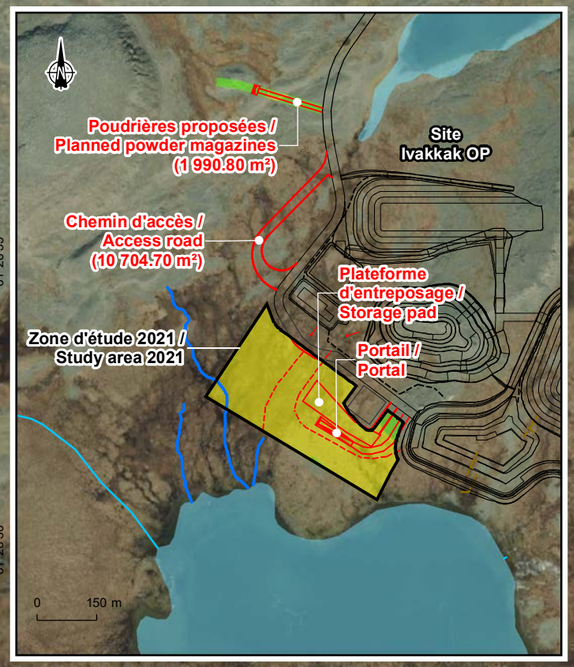
Inventaire et cartographie/ Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c5_1_IvakUG_220531.mxd

0 32 64 m
UTM, Zone 18, NAD83

Carte / Map 5-1

Juin / June 2022

AECOM · NUNAVIK NICKEL · CANADIAN ROYALTIES INC.



74°10'50"
74°10'25"
74°10'0"
74°9'35"
61°26'35"
61°26'30"
61°26'25"

Chemin d'accès / Access road (10 704.70 m²)

Zone d'étude 2021 / Study area 2021 (10.17 ha)

Cheminée de ventilation / Ventilation raise

Sortie d'urgence / Emergency exit

SITE IVAKKAK OP

Fossé d'eau propre planifié / Planned clean water ditch

Plateforme d'entreposage / Storage pad

Usine de traitement de l'eau / Water treatment plant

Pompage vers le MCP / Pumping to MCP

Bassin de collecte principal / Main collection pond (MCP)

Portail / Portal

Fossé d'eau contaminée planifié / Planned contact ditch

Composantes du projet / Project components

- Zone d'étude 2021 / Study area 2021 (Ivakkak UG)
- Infrastructure projetée / Planned infrastructure

Végétation / Vegetation

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Milieu terrestre / Terrestrial environment

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

- Cours d'eau permanent inventorié / Inventoried permanent watercourse
- Cours d'eau permanent / Permanent watercourse
- Drainage général du site sans lit d'écoulement défini / General drainage of the site without a defined flow bed
- Plan d'eau / Waterbody

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Infrastructures projetées pour l'exploitation du gisement Ivakkak UG - Variante du portail à l'extérieur de la fosse / Planned infrastructures for the exploitation of the Ivakkak UG deposit - Alternative of the portal outside the pit

Sources:

Imagerie/Imagery: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1:50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, Juin/June 2022

Inventaire et cartographie/ Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c5_2_IvakUG_220531.mxd

0 32 64 m
UTM, Zone 18, NAD83

Carte / Map 5-2

Juin / June 2022

AECOM
NUNAVIK NICKEL
CANADIAN ROYALTIES INC.

5.1.2 Méquillon UG2 Project

The Méquillon UG2 project is an extension of the Méquillon UG1 project. Therefore, the project analysis did not focus on the surface infrastructures' location already planned for Méquillon UG1. Instead, the project alternatives analyzed were more focused on the location of the waste rock crushing plant required for the backfilling needs of the underground mine, in addition to the location of the cement bag storage area for the cement slurry.

The alternative retained for each project component has been selected based on the constraints and impacts on the natural and social environments. Tables 5-2 and 5-3 present a comparative analysis of the alternatives.

Table 5-2: Comparison of Alternatives for the Méquillon UG2 Project – Waste Rock Crushing Plant

Criteria	Alternative 1 Backfilling of sites without crushing	Alternative 2 Underground waste rock crushing plant	Alternative 3 Above-ground crushing plant
Meets CRI's needs	No	Yes	Yes
Economic viability	None	Low	High
Technical viability	Difficult	Difficult	Achievable
Impacts on the biological environment	No (lack of site development for crushing)	None	Minor (small land area affected, dust accumulation on surrounding environment)
Impacts on the physical environment	No (lack of site development for crushing)	Moderate (no land area affected, but air quality degradation due to increased dust)	Moderate (dust emissions)
Impacts on the human environment	Minor (noise and landscape impacts)	Major (ambient air quality and dust management for workers in confined spaces)	Moderate (noise and dust emissions, but in open space)

Table 5-3: Comparison of Alternatives for the Méquillon UG2 Project – Cement Bag Storage Area

Criteria	Alternative 1 Addition of silos to Deception Bay for bulk cement storage	Alternative 2 Pad for containers intended for the storage of cement bags
Meets CRI's needs	Yes	Yes
Economic viability	Low	High
Technical viability	Difficult	Achievable
Impacts on the biological environment	Moderate (increased risks associated with spills in the aquatic environment)	Minor (no risks associated with spills in the aquatic environment)
Impacts on the physical environment	Minor (already an anthropic zone)	Minor (small surface area affected)
Impacts on the human environment	Moderate (addition of silos and air quality modelling required)	Minor (temporary pad and no village in the vicinity)

5.1.2.1 Waste Rock Crushing Plant

5.1.2.1.1 Alternative 1: Backfilling of Sites Without Crushing

The first alternative involves backfilling the workings with rock from the Méquillon waste rock piles, but without prior crushing. This option would have the advantage of not requiring a crushing plant for backfilling activities and therefore prevents the need for location space in addition to associate construction costs.

Backfilling sites using waste rock as is, however, is technically unfeasible. First, this rock was blasted in anticipation of being transported out of the pit by 775 mine trucks with a capacity of 70 tons. Therefore, there would be far too many large rocks and too much sorting for this rock to be loaded onto 30-ton capacity CATAD30 type trucks to bring it back underground. Second, the portion of rock that can be returned underground would mostly be too coarse, preventing proper cohesion with the concrete and creating poor quality backfill.

5.1.2.1.2 Alternative 2: Underground Waste Rock Crushing Plant

The second alternative is to build an underground crushing plant. This alternative would also have the benefit of limiting new encroachments on the environment outside of the mine. However, underground crushing presents several challenges in terms of technical implementation, specifically regarding the space available inside. This option also presents significant health and safety challenges, specifically in terms of air quality and dust management inside the mine. In fact, this location poses a significant risk of dust redistribution in the underground ventilation system since the dust removal systems do not completely remove all dust. Full respiratory protection would be required for all workers given the constraints of the underground crushing plant. The underground location also presents a higher risk for the maintenance team who would have to work in a confined environment. This location also increases the risk of underground fires due to heat, friction and hot work. It is important to keep in mind that managing fires underground is much more dangerous than on the surface. Furthermore, increased traffic on the ramp and in the crushing area would also increase the risk of collisions. Lastly, the underground alternative could pose potential problems in terms of terrain control in the crushing activities sector.

Considering all of these significant operational and health and safety challenges, in addition to the additional costs that would be required to overcome these constraints, this alternative was not retained by CRI.

5.1.2.1.3 Alternative 3: Above-Ground Crushing Plant (Selected Alternative)

Alternative 3 is to install the waste rock crushing plant on the surface. A sprinkler dust control system will be required during crushing activities to limit the dust being released into the air. Crushing would be done during the summer. Therefore, the crushing would be carried out over a shortened period and the yearly production required would be produced in a few months. Although this option requires a surface area, it offers the best benefits in terms of technical viability, worker health and safety, in addition to its economic viability.

5.1.2.2 Storage Area for Cement Bags

The Méquillon underground mine construction sites must be backfilled with concrete. A cement slurry plant must be built on-site and bulk cement powder storage will be required.

5.1.2.2.1 Alternative 1: Addition of silos to Deception Bay for bulk cement storage

Alternative 1 regarding the location of the storage area consists of adding silos at Deception Bay to store cement in bulk. This alternative would require a pneumatic transfer directly from the boats as to then store the bulk cement in the permanent silos. Due to the risks of cross-contamination, the bulk cement cannot be transported on the same vessels that transport the concentrates. This alternative also poses constraints in terms of land use, since the space available for the silo installation is very limited and close to the coast. Moreover, a new conveyor would probably be necessary for transferring the cement to the silos. Capital costs would also be very high, making profitability unappealing. This alternative was therefore quickly discarded from the analysis.

5.1.2.2.2 Alternative 2: Pad for containers intended for the storage of cement bags (selected alternative)

Alternative 2 consists of installing a container pad near the Méquillon site. Installing temporary storage pads is a common practice for several of the NNiP deposits. This alternative offers the greatest simplicity in terms of technical viability. It is also the most beneficial option in terms of financial profitability since it is much less expensive to implement compared to alternative 1. Lastly, alternative 2 would require less encroachment in terms of land use compared to alternative 1. Therefore, it is also the option with the least significant environmental impact and represents the least risk during operations.

5.1.3 Nanaujaq

Analysis of the alternatives for the Nanaujaq project mainly focused on the exploitation mode of the deposit and the location of the surface infrastructures.

5.1.3.1 Alternative 1: Exploit the New Deposit Via an Open Pit

Alternative 1 consists of exploiting the Nanaujaq deposit via an open-pit. This option presents several constraints in terms of environmental impacts. In particular, this option requires significant encroachment on the natural environment given its location alongside the road and the presence of hydrous wetlands in proximity. Moreover, since the deposit is directly under a watercourse, it was determined that finding a suitable plan for open-pit exploitation, with minimal impact on the surface water runoff would be difficult. Thus, considering the surrounding hydrological basin, it was decided to proceed underground as to limit the environmental risks.

5.1.3.2 Alternative 2: Exploit the New Deposit in an Underground Mine (Selected Alternative)

Alternative 2 proposes to exploit the new Nanaujaq deposit in an underground mine. Considering the environmental constraints described for the open-pit exploitation of alternative 1, alternative 2 is the one that minimizes the impact on surface water runoff the most. Therefore, the site chosen for the infrastructures' installation required for underground exploitation is the one that best meets the project's needs, which are to mine the deposit in a technically feasible and financially profitable way, all while minimizing the environmental impact as much as possible.

Table 5-4: Comparison of Alternatives - Nanaujaq Project

Criteria	Alternative 1 Exploit the new deposit via an open pit	Alternative 2 Exploit the new deposit in an underground mine
Meets CRI's needs	Yes	Yes
Economic viability	Low	High
Technical viability	Uncertain	Achievable
Impacts on the biological environment	Major (permanent footprint over a larger area due to the pit, in which a collection pond is added, the piles and other infrastructures)	Moderate (modification of the environment over a considerable area with the addition of several infrastructures, a collection pond and two piles)
Impacts on the physical environment	Major (greater change in soil quality)	Moderate (superficial soil modification)
Impacts on the human environment	Moderate (greater visual impact)	Minor (low visual impact, no modification to territory use)

5.1.4 Expo South Project

5.1.4.1 Alternative 1: Do Not Complete the Project and Leave the Ore in the Ground

The Expo South deposit has an estimated total ore tonnage for underground exploitation of 681 kt. The option to not undertake the project does not meet CRI's needs and does not allow the company to continue their activities in a sustainable way. Moreover, only minor construction work is required for exploiting the Expo South deposit (Table 5-5. The alternative that excludes exploiting the Expo South deposit is therefore rejected.

5.1.4.2 Alternative 2: Exploit the New Underground Mine Deposit (Selected Alternative)

Since the Expo South deposit is an ore lens adjacent to the Expo West deposit, alternative 2 consists of exploiting the Expo South deposit as an extension to the underground mine. As this is an extension, the existing infrastructure will be reused and therefore no other location is possible.

The site chosen for the infrastructures' installation required for underground exploitation, is the one that best meets the project's needs, which are to mine the deposit in a technically feasible and financially profitable way, all while minimizing the environmental impact as much as possible.

Table 5-5: Comparison of Alternatives - Expo South Project

Criteria	Alternative 1 Do not complete the project and leave the ore in the ground	Alternative 2 Exploit the new underground mine deposit
Meets CRI's needs	No	Yes
Economic viability	Negative	High
Technical viability	N/A	Achievable
Impacts on the biological environment	None	Minor (very small land area affected)
Impacts on the physical environment	None	Minor (little ground stripping required)
Impacts on the human environment	None	Minor (minor visual impact, no modification to territory use)

5.1.5 Related Projects

Related projects without alternatives are also presented within the framework of this request. These projects are presented in Section 5.2.5 and include:

- Modification to the tailings management method at the Expo tailings disposal site
- Expansion of the ore stockpile at the Expo industrial complex;
- Expansion of the waste rock piles at the Expo industrial complex;
- Increase in the occupancy rate of the Expo camp;
- Regularization of the Deception Bay camp location;
- Addition of a new landfill cell at the northern landfill site.

5.2 Description of the Alternatives Selected

5.2.1 Ivakkak UG Project

5.2.1.1 Ivakkak Deposit Location

The Ivakkak deposit is located 45 km west of the Expo industrial complex. This deposit is accessible by land via the road connecting the Expo and Ivakkak deposits. CRI wants to exploit this section of the deposit via underground extensions. Map 2-1 presents the deposit's location. The central geographical coordinates of the Ivakkak site are as follows:

Table 5-6: Central Geographical Coordinates of the Ivakkak UG Site

	Degrees	Decimal degrees	NAD83 / UTM zone 18N
Latitude	61º 26’ 30.83" N	61.4419° N	6,812,300 m N
Longitude	74º 9’ 25.79" W	-74.1572° W	544,950 m E

The underground deposit is on mining lease 883.

5.2.1.2 Surface Infrastructures

The surface infrastructures can be seen on Maps 5-1a and 5-1b.

5.2.1.2.1 Existing Infrastructure under the Ivakkak OP Authorized Project

Several infrastructures are already in place for the Ivakkak deposit open pit exploitation and will be retained and used for underground exploitation. These infrastructures are as follows: an ore stockpile, two waste rock piles (PAG and NAG), and infrastructures related to water management such as the two ponds (MCP and LCP), in addition to the service pad (maintenance shop, offices, telecommunications tower, etc.). Thus, very little additional infrastructure is required for underground exploitation.

5.2.1.2.2 Additional Infrastructure Required for Ivakkak UG Underground Exploitation

The infrastructures that must be built for exploiting the Ivakkak UG deposit are as follows:

- A granular backfill pad occupying an area of 9,195 m² (approximately 209 m x 63 m) to install the following components:
  - Equipment required for underground mine production;
  - Ventilation-related infrastructures;
  - Generators and infrastructure to power the underground mine;
- A traffic lane for bi-train trucks to load ore, with a footprint of 10,705 m²
- An access portal to the underground mine (alternative 3 only);
- An emergency exit;
- A ventilation raise;
- Water collection ditches;
- A production water supply system;
- Two magazines powder, one for detonators and one for explosives.

The additional infrastructures required for the underground mine will be installed in 2024.

The Ivakkak UG mine's surface infrastructures are illustrated on Maps 5-1 and 5-2.

5.2.1.3 Deposit Description

The portal entrance to the Ivakkak UG underground mine will be located south of the future Ivakkak open-pit mine. Further drilling is planned for the exploration and delineation of the Ivakkak deposit's underground section once the access road is completed in 2022 (CRI, 2020).

5.2.1.3.1 Mineralogy

According to Golder's report (2018), the Ivakkak pit deposit is believed to consist of a narrow peridotite-pyroxenite-gabbro dyke within a sequence of mafic volcanic rocks and sedimentary rocks. The dyke mineralization includes massive sulphides (over 90% sulphides) and net-textured (between 25% and 75% sulphides). The disseminated mineralization would present trace amounts, approximately 25% sulphides. Pyrrhotite, chalcopyrite and pentlandite are the primary sulphide minerals. The deposit area includes the following major lithologies: mafic volcanic rock, metasediment, ultramafic rock and gabbro.

5.2.1.3.2 Geochemical Characterization

A geochemical characterization program for waste rock, ore, tailings and quarry import fill has been carried out during several sampling campaigns since 2006. As part of this program, waste rock samples from all mined pits and lithologies, ore samples, tailings samples from Mesamax, Expo, Méquillon and Ivakkak and surface soil samples distributed throughout the project were analyzed. These sampling campaigns made it possible to create a geochemical characterization of the materials through chemical analysis, acid-generating potential evaluations, metal leaching evaluations and metallurgical evaluations.

The characterization results obtained for the Ivakkak pit are considered representative of the underground deposit.

The following reports are part of the studies relevant to determining the site's acid-generating and leaching potential:

- Golder Associates Ltd. 2018. Waste rock kinetic test results – Nunavik Nickel Project. Report No. 10-1127-0085.
- Golder Associates Ltd. 2010. Environmental geochemistry of waste rock from the Allammaq, Mesamax, Expo, Méquillon and Ivakkak deposits, Nunavik Nickel Project;
- Golder Associates Ltd. 2008. Report - Waste rock kinetic test results, Nunavik Nickel Project;
- Golder Associates Ltd. 2007. Static test results for waste rock and overburden, Raglan south Nickel Project.

The results and tests carried out at the Ivakkak deposit are summarized in Table 5-7.

According to a technical memo prepared by a senior CRI geologist (2021a), it is estimated that the geochemical composition of the Ivakkak pit is also representative of the deposit's underground section. Thus, CRI assumes that the ore from the Ivakkak deposit is leachable and has potentially acid generating (PAG).

Table 5-7: Summary of Waste Rock Classification from the Ivakkak Site According to Directive 019

Lithology	Estimated proportion of waste rock	Static test results		Kinetic test results		Waste rock classification according to the kinetic test
		AMD potential	Leachability	Leachate pH	Leachability	
Gabbro	<5%	NAG	Non-leachable	Not tested		Low risk
Mafic volcanic	75%	NAG	Non-leachable	Neutral	Non-leachable	Low risk
Metasedimentary	10%	NAG	Non-leachable	Neutral	Non-leachable	Low risk
Ultramafic	<10%	PAG	Leachable	Acid	Leachable	Acid-generating and leachable

Source: Golder, 2018

5.2.1.4 Resources and reserves

According to the latest reports on the site's resources and reserves, the estimated total tonnage for the underground exploitation of the Ivakkak UG deposit is 411 kt. Tables 5-8 and 5-9 present the tonnage of mineral resources and reserves.

Table 5-8: Ivakkak UG Deposit Ore Resources

Type	Tonnes	Ni (%)	Cu (%)	Co (%)	Pt (g/t)	Pd (g/t)	Au (g/t)
Measured / Indicated	434,788	1.27	1.76	0.05	0.66	3.21	0.14
Inferred	324,004	1.25	1.57	0.05	0.67	3.57	0.16

Table 5-9: Ivakkak UG Deposit Ore Reserves

Type	Tonnes	Ni (%)	Cu (%)	Co (%)	Pt (g/t)	Pd (g/t)	Au (g/t)
Proved / Probable	410,682	0.95	1.26	0.04	0.51	2.53	0.11

5.2.1.5 Ore Extraction

The section of the deposit at depth to the west-northwest will be mined underground after the closure of the open-pit.

Underground exploitation of the Ivakkak deposit will be carried out using the same method as the Allammaq deposit, i.e., with longhole drilling.

Ramp and vertical development will take approximately a year and a half. Exploitation will then take place at a rate of 1,000 to 1,500 tonnes of ore per day, over a period of approximately one year.

Given the presence of continuous permafrost, calcium chloride (115 g/l) is used as a dense fluid during drilling to keep the water used in a liquid state.

AD30 trucks will haul the material underground to the Ivakkak surface ore stockpile. The material will then be re-handled and loaded into long-haul bi-train trucks and transported to the Expo complex ore stockpile.

The Ivakkak UG project will generate approximately 125 kt of waste rock and 411 kt of ore. A summary of the waste rock, ore, concentrate, and tailings amounts estimated for the project's operating life is presented in Table 5-10.

Table 5-10: Tonnage (t) of Waste Rock, Ore, Concentrate and Tailings Produced During the Ivakkak UG Deposit Exploitation

Waste rock	Ore	Concentrates	Tailings
124,707	410,682	29,623	381,059

5.2.1.5.1 Underground mine characteristics

The underground mine will be accessible via a single ramp to the surface, extending continuously to the bottom of the deposit.

The top access to the mine will be used for drilling and blasting operations, possibly backfilling as well, while the lower access will be used for loading ore. There will be an emergency exit with ladders and a ventilation raise to supply the mine with fresh air.

The planned depth of the underground mine is 170 m up to an elevation of approximately 300 m. Spacing of levels and cross-sections will vary with depth to surface, as the mine is located in northern Quebec, where permafrost conditions exist to considerable depths below the surface.

Table 5-11: Nominal Spacing of Levels and Cross-sections by Depth of the Ivakkak UG Mine

Depth under surface	Condition	Room height between the levels	Room width (perpendicular cross-sections)
0-200 m	Permafrost	30 m	20 m
200-300 m	Thawed	30 m	16-20 m

Figures 5-1 and 5-2 illustrate the Ivakkak UG mine's projected plan.

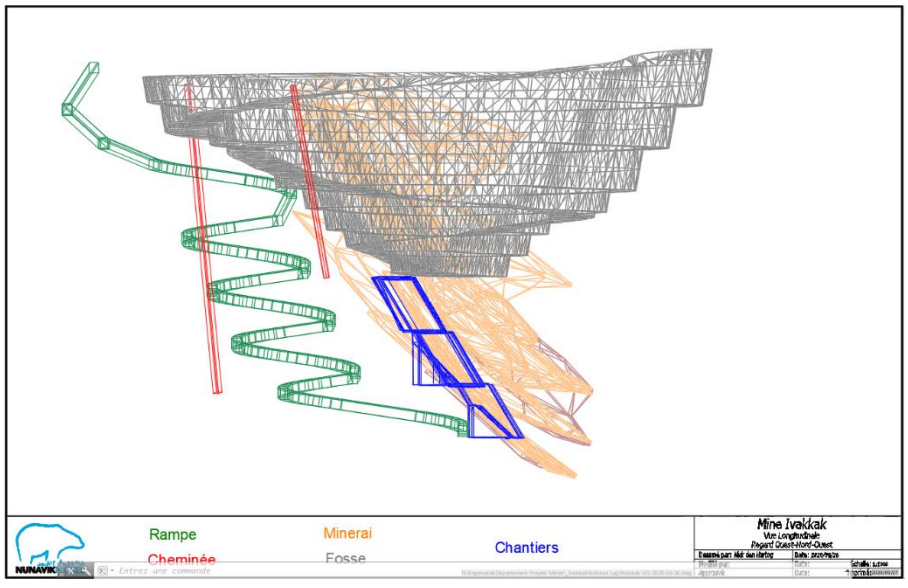


Figure 5-1: Ivakkak UG Mine Plan, Longitudinal View

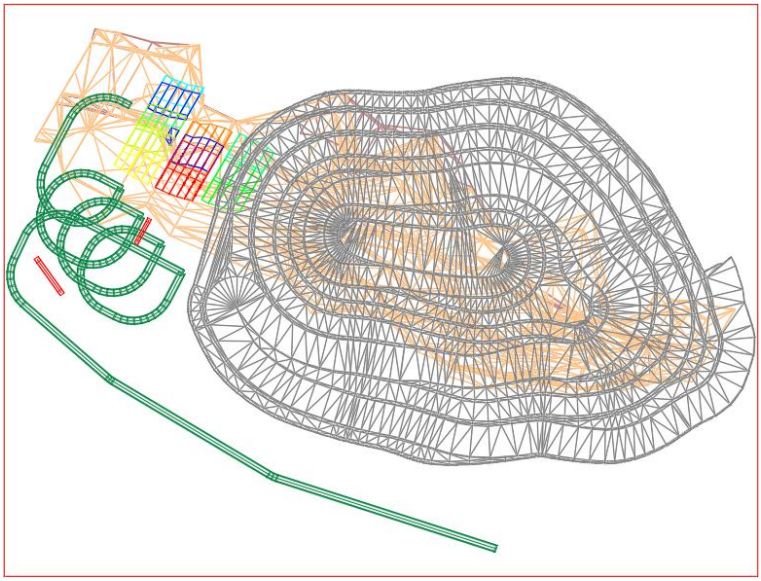


Figure 5-2: Plan View of the Ivakkak UG Mine

5.2.1.5.2 Explosives Preparation and Transport

The emulsion will be used as the main explosive for ore production as to optimize the fragmentation. Electronic detonators will be used to reduce the chances of finding undetonated explosives. The holes drilled for explosives will be filled using an emulsion pump designed for this purpose. Emulsion will be supplied from the Dyno Nobel emulsion plant, which is located east of the Expo mining complex. After manufacturing at the Dyno Nobel plant, the emulsion will be transported to the Ivakkak site and transferred to emulsion loading equipment going underground. The emulsion prepared at the factory will be used immediately upon arrival at the site to load the blast holes, so it will not be stored at the Ivakkak site.

The ANFO and standard detonators will be used for the development. In this case, an ANFO loader will be used for loading rounds.

Commercial emulsions and detonators from the Expo industrial complex are stored for some time in the powder magazine authorized by the *Sûreté du Québec* and by Natural Resources Canada near the Ivakkak deposit before being used. These depots will have a storage capacity equivalent to at least one week of exploitation. There will be powder magazines built underground when the development is advanced enough.

Explosives requirements are estimated at approximately 207 tonnes of ANFO for development and 77.2 tons of emulsion for construction sites.

The plastic from explosive packaging is returned to the explosives depot and managed separately from other packaging types. They are burned in the explosives depot area located at Expo, in accordance with the Act Respecting Explosives (L.R.Q., c. E-22).

5.2.1.5.3 Mining Equipment

The equipment used on the Ivakkak UG site is detailed in Table 5-12.

The boreholes will be created by a top hammer longhole drill to insert the emulsion. A backhoe loader will be used to load the mining trucks to transport ore.

Production and service equipment also includes a grader and a 20,000 L tanker truck for watering surfaces to prevent the dust from rising, when required.

Table 5-12: Mining Equipment Required at the Ivakkak UG Site

Equipment	Quantity
Electric boom/ double boom hydraulic drill	2
Power bolter	2
Power bolter - Maclean	2
Loader-shuttle) / Scoop CAT R1700	3
Service truck	1
Tow truck (30 t capacity)	5
Fuel/oil truck	1
ANFO charger	1
Tanker truck - 20,000 L	1
Forklift truck	1
Longhole drill	1
ITH production drill 3.5" dia.	1
Grader	1
Emulsion pump	1
Scissor lift	1
Underground van	6

Arctic diesel will be used for mining equipment, pumps and generators.

Table 5-13 shows the anticipated maximum weekly trucking frequencies.

Table 5-13: Anticipated Maximum Trucking Frequencies During the Ivakkak UG Deposit Exploitation

Ore (reserves) (tonnes)	Operation time (years)	Tonnage hauled at full production (tonnes/day)	Truck capacity (tons)	Number of trips per week
410,682	1	1,500	30	350

5.2.1.6 Ore, Tailings, Waste Rock and Overburden Management

5.2.1.6.1 Tailings Management

All mine tailings generated in the context of the NNiP are managed in the tailings disposal site at the Expo mining complex. Therefore, no tailings will be accumulated on the Ivakkak site.

5.2.1.6.2 Waste Rock Management

Drill core analysis have shown that a large part of the waste rock that will be produced following the Ivakkak pit exploitation will be non-reactive. Thus, there will be two waste rock piles planned for this operation, i.e., a 3.74 Mm^3 pile for NAG waste rock and a 0.76 Mm^3 pile for PAG waste rock.

The waste rock produced for the excavation of the portal and the development of the underground mine will be stored on the appropriate waste rock pile according to its nature, i.e., on one of the two piles which will then already exist for the Ivakkak pit exploitation. This waste rock will then be returned underground for backfilling the exploited works of the Ivakkak UG mine at the end of exploitation.

5.2.1.6.3 Ore management

The ore extracted using AD30 type trucks will be transported by mining trucks to be temporarily stored near the pit on the ore pile that will be set up there. It will then be transported by road trucks over a distance of 45 km to the Expo industrial complex's ore stockpile, where it will undergo processing at the concentrator, combined with the ore from the other mines, at a rate of up to 4,500 t/d.

The ore will be stored in an ore stockpile at the Expo site before being processed at the plant.

5.2.1.6.4 Overburden management

No overburden or topsoil will be stockpiled for reuse during restoration. The amount of topsoil present on the deposit's site are not significant and insufficient to have any reuse value.

5.2.1.7 Water Management

5.2.1.7.1 Industrial Water

Surface drainage water consists mainly of water from precipitation and from snow melt running off the mining site, specifically onto the waste rock piles, the ore pad and the portal area.

To restrain the volume of runoff water and limit the affected watershed area, a ditch and berm network will be built into each side of the Ivakkak mining site. This way, any water and clean snow outside the berms will be free from potential contamination and could be directed to the natural receiving water network without prior treatment.

Potentially contaminated water will be directed to the water collection ponds at the Ivakkak site. The main collection pond (MCP) with a capacity of 239,800 m² will be located southeast of the Ivakkak pit. The lower collection pond (LCP) will be located west of the Ivakkak pit. A pump system installed at the low point of the retention pond will allow the continuous pumping of free water during the period of spring thaw and the summer season. The pumped water will be handled by the Ivakkak water treatment plant (WTP) and discharged at the discharge point which will be approved in the ministerial authorization for the Ivakkak open-pit deposit exploitation (Y/ Ref: 7610-10-01-70080-85 / 402102956). These water management infrastructures have already been authorized for the Ivakkak site.

It is estimated that the production of underground mine water will be negligible since it will not be heated; if necessary, it would be directed to the MCP by pumping.

The water required for mining operations will come from clean water tanks located on the surface when operations begin. The water will then be recirculated after the supply sumps have been put into operation. Periodic additions of fresh water (at variable frequency depending on the season) in the network will be required to compensate for the loss caused during extraction outside the mine.

For the underground exploitation of Ivakkak UG in particular, it is planned to add additional ditches to manage the sectors affected by the various ventilation shafts and the portal. A pump will be used to transfer water into the MCP at the eastern end of the contact water ditch.

It should be noted that for all deposits where the addition of ditches will be required, the typical sections will follow the Figure 5-3 model (taken from Golder, 2021). Thus, the width of the footprint of contact or contaminated water ditches (including the berm) is 10 m maximum and 11 m for clean water ditches (including the berm).

5.2.1.7.2 Mine Wastewater Treatment

A water treatment plant is planned and will be installed on the Ivakkak site starting in the fall of 2022 as part of the open-pit exploitation. This same treatment unit will be used to operate the underground mine.

5.2.1.7.3 Domestic Wastewater

Domestic wastewater from the Ivakkak UG site will be stored temporarily in a 10,000 L tank and will be transported by siphon truck to the Expo industrial complex where it will be treated.

5.2.1.7.4 Drinking Water

Drinking water required for the employees working at the Ivakkak mine will come from the Expo drinking water treatment system and be brought by 20L bottles, for consumption only. Fresh water from Lac du Bombardier will be transported by tanker truck and will be stored in a 10,000 L tank that will be located near the Ivakkak site service building. This fresh water will cover needs other than human consumption (washrooms, sinks, etc.).

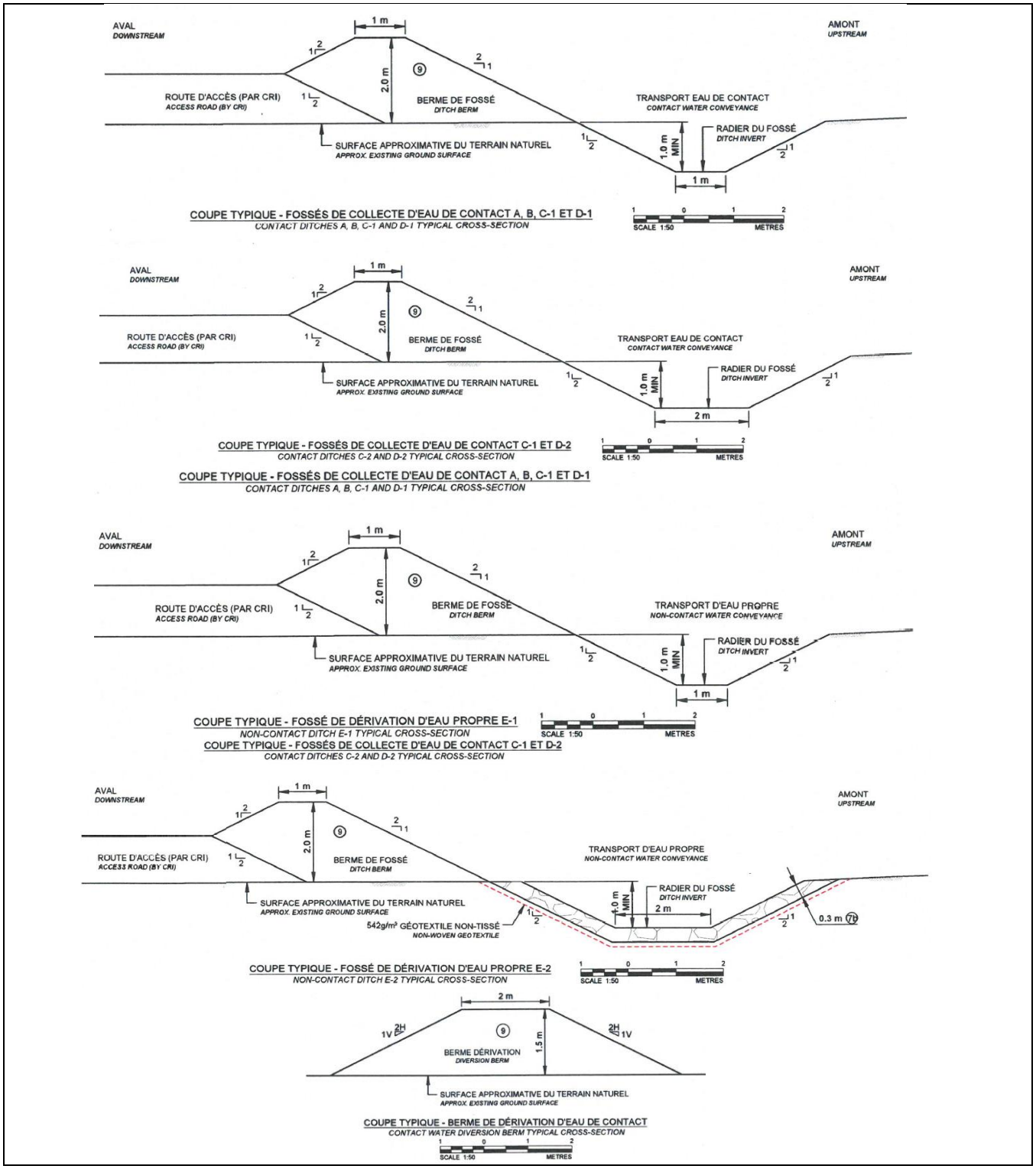


Figure 5-3: Typical Sections of Contact Water Collection (Contaminated Water) and Clean Water Diversion Ditches

5.2.1.8 Access Roads

An authorization has been issued for the construction of the road between the Ivakkak and Méquillon mines (Y/ref.: 7610-10-01-70080-81 / 402026453). The materials will come from various quarries between the two mines, quarries whose exploitation has also been authorized.

It should be noted that for all deposits where access roads are required, typical sections will follow the pattern shown in Figure 5-4. The access roads right-of-way and the road itself covers a width of approximately 17 m.

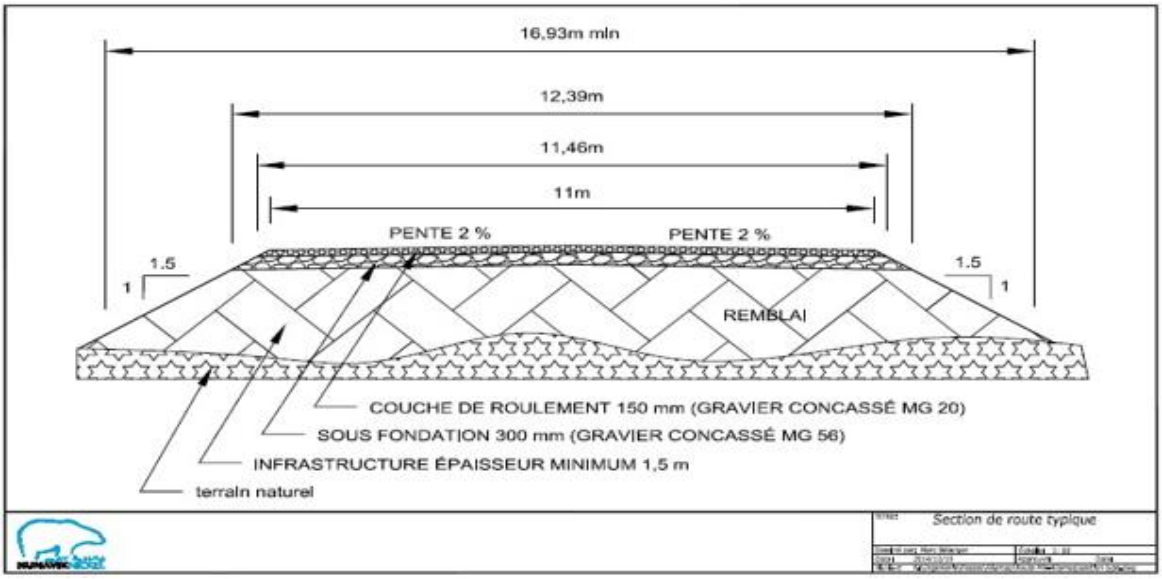


Figure 5-4: Cross-section of a Typical Road Section

5.2.1.1 Waste Management

Much effort is made to limit waste production within the framework of the NNiP. Waste resulting from construction and exploitation are collected by conveyor trucks and brought to the Expo industrial complex. Due to the numerous sources of waste, activities and infrastructures for waste management have been centralized to the southeast of the Expo industrial complex.

The primary sources of waste at the Ivakkak mine site are household waste, oils, explosive packaging and scrap from the mechanical workshop. As estimated in the context of the NNiP, each worker will produce around 2 MT of waste annually, or approximately 30 MT annually for the duration of the Ivakkak UG project. All waste will be managed according to the procedures provided for in the context of the NNiP (Tables 5-14 and 5-15).

5.2.1.1.1 Non-Hazardous Waste

Measures to encourage the collection and separation of waste at the source, in addition to recycling are provided for in the CRI management plan, which is in line with the 4R principle. A storage space for recoverable materials has been set up at the Expo complex to encourage their collection and separation at the source and thus promote recycling. Non-hazardous waste is sent there and sorted according to the different materials with potential for reuse and recycling, such as wood, metals, plastic, rubber, etc. Combustible non-recyclable waste is burned. Non-recyclable and non-combustible waste are sent to the authorized LEMN near the Expo site.

Table 5-14: Non-Hazardous Residual Materials Management Summary

Waste	Storage	Layout method
Waste with potential for reuse or recycling	Placed at the recyclable materials storage site	Recycling at a site in southern Quebec
Waste non-recyclable combustibles	N/A	Burning in a cell designated for this purpose at LEMN
Waste non-recyclable and non-combustible, sludge and ash	N/A	Permanent landfill at LEMN

5.2.1.1.2 Hazardous Waste

Hazardous waste (HW) such as used oils, solvents, batteries, tires, are stored in a warehouse located at the Expo complex. It consists of a series of marine containers that meet the Regulation respecting hazardous materials standards. HW and special waste are either recovered on the Expo site or temporarily stored in the warehouse, or in one of the transit areas awaiting shipment to southern Quebec.

Table 5-15: Hazardous Waste and Special Waste Management Summary

Hazardous Waste	Storage	Layout method
Batteries and cells	Battery recovery containers placed at each location where they are generated, then transferred in barrels to the HW warehouse	Transport to southern Quebec for disposal in an authorized center
Used oil	1000 L tank containers in the workshop where they are produced	Recovery of heating fuel using an authorized furnace
Solvents	HW warehouse	Transport to southern Quebec for disposal in an authorized center
Biomedical waste	Rigid, sealed and waterproof containers inside the infirmary	Transport to southern Quebec for disposal in an authorized center
Obsolete tires	HW warehouse Some tires kept on site as a safeguard (number insignificant)	Transport to southern Quebec for recycling or recovery
Obsolete vehicles	Mechanical workshop storage areas	Dismantling and disposal according to the material type
Contaminated ground	Quatrex-type barrels or bags stored in a dedicated container in the Hazardous waste warehouse	Transport to southern Quebec for treatment in an authorized center

5.2.1.2 Workforce

About fifteen employees will be assigned to the Ivakkak UG project, as presented in Table 5-16.

Workers will be divided into 2 shifts, 6:00 a.m. to 6:00 p.m. and 6:00 p.m. to 6:00 a.m.

Table 5-16: Workforce Required for the Ivakkak UG Deposit Exploitation

Responsibility	Number of employees required
Driller	1
Loader-shuttle operators (scoop)	2
Truck operator	4
Jumbo operator	1
Bolter operator	1
Foreman	1
Blasters	2
Service miners	2
Construction miners	1

It is also necessary to consider the CRI employees assigned to the supervision and engineering of the works, the persons responsible for the maintenance of the buildings, in addition to the health care staff, who'll divide their time between the various exploitation sites.

5.2.1.3 Mine Restoration

Under the terms of the Mining Act, the project is subject to the restoration of land affected by mining activities. The Ivakkak site is included in the Nunavik Nickel Project Restoration Plan (NNiPRP). Underground exploitation will be included in the next plan revision. This plan will be produced in accordance with the particularities and general requirements contained in the Guidelines for Preparing Mine Closure Plans in Quebec from MERN, and in which the applicable measures will be found. It will specifically include a detailed description of the restoration and rehabilitation work planned during the exploitation phase and once exploitation operations are complete.

The following actions are generally planned:

- Securing mined sites and areas;
- Dismantling and disposing of buildings and infrastructures;
- Restoring waste rock pile areas and temporary ore storage areas;
- Managing surface water and contaminated water, if any;
- Scarifying secondary access roads to obstruct access to the remnants of the mining infrastructure;
- Monitoring the integrity of the infrastructures and performing comprehensive environmental monitoring.

In accordance with the regulations, CRI will follow up the mining restoration to ensure that the discharge objectives are met for the protection of the receiving environment.

The restoration activities specific to the Ivakkak UG project to be carried out upon closure are briefly described in the following sections. It should be noted that the restoration of the preauthorized project's elements within the framework of the Ivakkak pit exploitation, such as the waste rock pile, the ore pad and the site's water management infrastructures will not be detailed here and can be viewed in the restoration plans developed thus far for the site.

5.2.1.3.1 Underground Mine Restoration

The waste rock produced during the Ivakkak mine development will be managed on the surface and then gradually returned to the depleted tunnels to ensure safety during exploitation. The additional waste rock produced will also be used as backfill material at the end of the mine's exploitation.

The physical stability of the surface pillars will also be assessed by a qualified engineer. Any risk of these pillars collapsing will be reduced beforehand by backfilling the at-risk sections. Since the underground mine is in permafrost and will not be heated, the mine water produced will be negligible. It is possible that the water level will reach static conditions in a long-term perspective.

To eliminate the need for fencing maintenance after exploiting the underground deposit, the portal (ramp access) to the underground mine will also be secured with NAG rocks. To ensure the safety of the premises, the daylight openings from the ventilation raises and emergency exit will be plugged with concrete caps. Trilingual signs (English, French and Inuktitut) indicating the danger will be installed at the entrance to the gate and condemned raises. No fence or barrier will be erected around the underground mine, as the sector is not visited often, no matter the season. The ditches that ensure water segregation around the portal area will also be restored.

5.2.1.3.2 Surface Infrastructure and Heavy Machinery

All buildings and surface infrastructure that will not be used for post-closure monitoring of the underground mine will be removed and recovered for reuse in the context of the NNiP. The remaining buildings and infrastructures will also be recovered after the monitoring complies with the applicable requirements. Surfaces will be leveled as required to control erosion and restore as much of the natural appearance as possible.

5.2.1.3.3 Reusable Products, Petroleum Products and Residual Materials

- Petroleum products, gasoline, diesel, oils and greases will be returned to the Expo mining complex where they will be temporarily stored in a safe manner before being used in the context of NNiP activities.

- Chemicals that have not been used for water treatment will be returned to the Expo mining complex where they will be temporarily stored in a safe manner before being used in the context of NNiP activities.

- Waste materials, non-hazardous and hazardous, will be disposed of in accordance with CRI's residual materials management procedures, which are based on the regulations in force.

5.2.1.3.4 Potentially Contaminated Soil and Materials

After mining activities have stopped, a characterization study of the land will be carried out, as prescribed by section 31.51 of the EQA. CRI will take the necessary measures in accordance with the provisions of the EQA and the Land Protection and Rehabilitation Regulation (c. Q-2, r.18.1.01) in the event that this characterization reveals the presence of contaminants above and beyond the criteria established by the regulations. Contaminated soil, if any, will be transported to southern Quebec for treatment at an authorized site.

5.2.1.4 Project Schedule

The Ivakkak UG project activities will be carried out according to the schedule presented in Table 5-17.

Table 5-17: Ivakkak UG Project Schedule

Activities	Dates
Construction of roads and access roads	N/A
Portal construction and development of the access ramp, emergency exit and ventilation raise, production water supply, equipment pad	2024-2025
Water management infrastructure construction • New ditches around the portal area	2024
Construction / installation of support infrastructure related to the underground mine • Additional generators	2024
Operations	2025-2026-2027
Restoration	Starting in 2027

5.2.1.5 Project Cost

The Ivakkak UG site costs are detailed in

Table 5-18: Ivakkak UG Project Phase Cost Detailstable 5-18.

Table 5-18: Ivakkak UG Project Phase Cost Details

Project phase	Cost ($2022 CAD)
Access road	-
Water management infrastructures	$6M
Surface infrastructures	$2M
Ramp development	$9.9M
Operational development	$12M
Engineering	$0.5M
Production costs	$72.3M

5.2.2 Méquillon UG2 Project

5.2.2.1 Méquillon Deposit Location

The Méquillon deposit is located approximately 23 km north of the Pingualuit National Park limits and 26 km from Lac Pingualuk. The mining activities planned at the Méquillon deposit will not cross the park's limits in any case. This deposit, located about 18 km southwest of the Expo complex, is accessible by land following the construction of the road connecting the Expo deposit to the Méquillon deposit.

The Méquillon site's central geographical coordinates are indicated in table 5-19.

Table 5-19: Central Geographical Coordinates of the Méquillon Site

	Degrees	Decimal degrees	NAD83 / UTM zone 18N
Latitude	61°30'37,8000"N	61.5105° N	6,820,289 m N
Longitude	73°45'1,8000"W	-73.7505° W	566,490 m E

The extension planned by this project (Méquillon UG2) is an extension of the current Méquillon deposit. CRI wishes to exploit this section of the deposit via underground extensions. A section of the underground deposit (Méquillon UG2) is located on land for which the mining lease has not yet been obtained. The project's impacts must therefore be assessed for this section of the deposit.

The location of the Méquillon UG deposit is shown on Maps 2-1 and 5-2 and Figure 5-5.

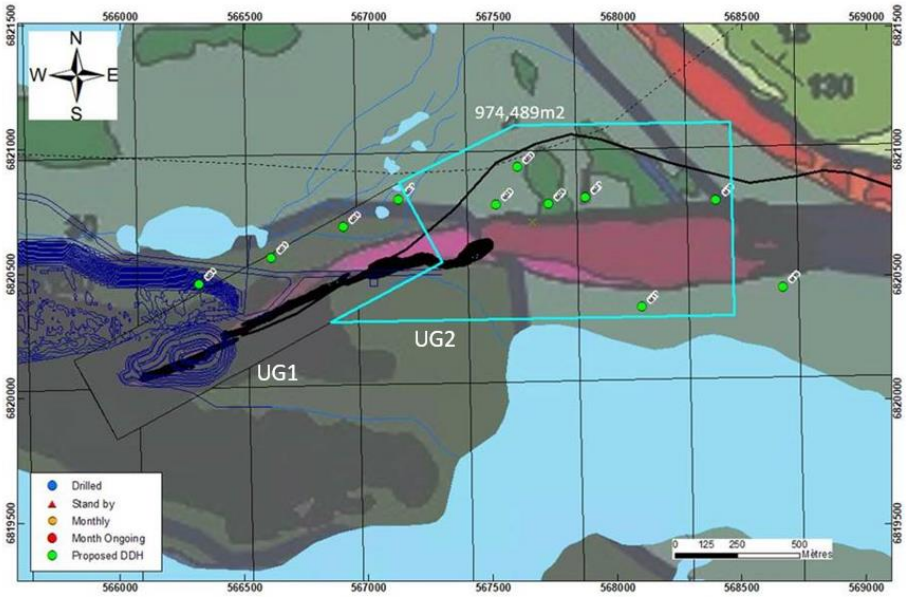


Figure 5-5: Méquillon Underground Mine, UG1 and UG2 Phases Identification

5.2.2.1 Surface Infrastructures

Map 5-3 shows all surface infrastructures at the Méquillon site.

5.2.2.1.1 Existing Infrastructure Under the Méquillon and Méquillon UG1 Authorized Project

Several infrastructures already in place and authorized as part of Méquillon pit exploitation and the Méquillon UG1 underground mine, will be retained for Méquillon UG2 underground exploitation, i.e., an ore stockpile, a waste rock pile, infrastructure related to the management such as the water collection pond, diversion ditches and the water treatment plant, a service pad and the access portal to the underground pit. Thus, very little additional infrastructure is required for Méquillon UG2 underground exploitation.

5.2.2.1.2 Additional Infrastructure Required for Méquillon UG2 Underground Exploitation

The infrastructure required for the exploitation of Méquillon UG2 can be summarized as:

- A ventilation raise;
- An emergency exit;
- Water collection ditches;
- A storage and material pad;
- Two magazines powder, one for detonators and one for explosives;
- A cement slurry plant;
- A crushing infrastructure for cemented backfill;
- A pad for containers.

The Méquillon UG2 mine's surface infrastructures are illustrated on Map 5-3.

5.2.2.1.3 Waste Rock Crushing Infrastructure

The crusher will be installed on the waste rock pile. The final crusher product will be 80% waste rock less than 300 mm in diameter. The supply of this equipment will be done using an excavator and a wheel loader. The material will then be loaded into underground mine production trucks and brought underground to a mixing bay. The cement slurry will also be brought to this location by a cement mixer to be dumped into the mixing bay. The rock and cement slurry mixture are then transported and dumped on a construction site by a shuttle loader until it is completely filled.

It is estimated that approximately 300 kt of waste rock will need to be crushed annually to meet the cemented rock Méquillon UG mine backfill requirements. Considering the current reserves, the backfilling activities duration is estimated at approximately 10 years (Table 5-20). Although it is possible to crush over a period of approximately 8 months, the annual crushing required will be done over the shortest period possible as to concentrate efforts and improve efficiency. With the crushing equipment planned implementation, the probable hourly tonnage is estimated at around 400 tonnes per hour. Depending on maintenance and mechanical contingencies, the crushing period should therefore be 2 to 3 months per year during the summer period. A consultant is currently performing atmospheric modelling of the crushing operations to confirm this operational choice.

Table 5-20: Tonnage of Waste Rock Crushed Annually for Méquillon UG

Year	Tonnage
1	389,939
2	268,849
3	289,701
4	220,149
5	384,749
6	460,452
7	250,150
8	43,472
9	454,880
10	261,806

Coarse material that cannot be reused as backfill must be set aside and possibly disposed of in the Méquillon pit when its exploitation is completed. The coarse sections could also be crushed and returned to the waste rock pile. For secondary construction sites that will be backfilled only with rock fill without cement, no crushing will be necessary. An excavator will be used to sort and remove oversized rocks.

5.2.2.1.4 Cement Slurry Plant

The cement slurry will be produced by a semi-automatic plant located near the entrance to the mine portal and installed under an 80-foot by 100-foot (approximately 24 m x 30 m) closed dome. The cement slurry plant will have a concrete dome and floor. The design must ensure the storage and handling of 1,000 kg bags of cement at a maximum daily rate of 70 bags. The cement slurry will be obtained by adding a predetermined amount of cement powder to a certain amount of salt water, 6% by volume and heated to 60 degrees Celsius.

The seven main parts of the plant are identified in Figure 5-6. However, it should be noted that the planned design in still in the conceptual stage.

73°46'0" 73°45'30" 73°45'0" 73°44'30" 73°44'0" 73°43'30"

61°31'0" 61°30'45"

Vers le site EXPO / To Expo site

Conduite de rejet projetée / Planned discharge pipeline

Plateforme de services / Service pad

Bail minier / Mining lease

Plateforme de remblai granulaire pour l'entreposage de conteneurs / Granular backfill pad for container storage

Poudrières proposées / Planned powder magazines

Cheminée de ventilation et sortie d'urgence / Ventilation raise and emergency exit #4

Cheminée de ventilation et sortie d'urgence / Ventilation raise and emergency exit #3

Route vers le futur site Ivakkak / Road to future Ivakkak site

Usine de lait de ciment / Cement milk plant

Prolongement Méquillon UG2 (localisation approximative) / **Méquillon UG2 extension** (approximate location)

Déversoir d'urgence / Emergency spillway

Conduite de rejet / Discharge pipeline

Cheminée de ventilation et sortie d'urgence / Ventilation raise and emergency exit #2

Accès prévu / Planned access

Fossé d'eau contact proposé / Proposed water contact ditch

Cheminée de ventilation et sortie d'urgence / Ventilation raise and emergency exit #1

Portail / Portal

Fossé d'eau contact proposé / Proposed water contact ditch

Fossé d'eau contaminée existant / Existing contaminated water ditch

Bassin de collecte / Collection pond

Digue / Dike

Lac Méquillon

Expansion de la halde à minerai / Ore stockpile expansion

Plateforme d'entreposage et de matériel / Pad for storage and material

Usine de traitement des eaux / Water treatment plant

Halde à minerai / Ore stockpile

Fosse d'extraction / Pit

Emprise de la route vers la fosse et la halde à stériles / Road Right-of-Way to pit and waste rock pile

Halde à stériles / Waste rock pile

73°45'30" 73°45'0" 73°44'30' 73°44'0"

Composantes du projet / Project components

- Bail minier / Mining lease
- Halde à minerai existante / Existing ore stockpile
- Expansion de la halde à minerai / Ore stockpile expansion
- Infrastructures pour la mine Méquillon / Infrastructures for the Méquillon mine
- Infrastructures projetées / Planned infrastructures

Végétation / Vegetation

Milieux humides / Wetlands

- Fen de combe à neige / Snowbed fen
- Fen polygonal de basses terres / Lowland polygonal fen

Milieux terrestres / Terrestrial environments

- Champ de blocs / Boulder fields
- Sol polygonal à ostioles de toundra / Polygonal ground with tundra ostioles

Hydrographie / Hydrography

- Fossé de drainage / Drainage ditch
- Plan d'eau / Waterbody (GRHQ)
- Milieu anthropique / Anthropogenic environment

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Infrastructures projetées pour l'exploitation du gisement Méquillon UG2 / Planned infrastructures for the exploitation of the Méquillon UG2 deposit

Sources:

Imagerie/Imagery: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Géobase du réseau hydrographique du Québec (GRHQ), MERN Québec, nov. 2019
Données de projet/Project data, Canadian Royalties, Avril/April 2022

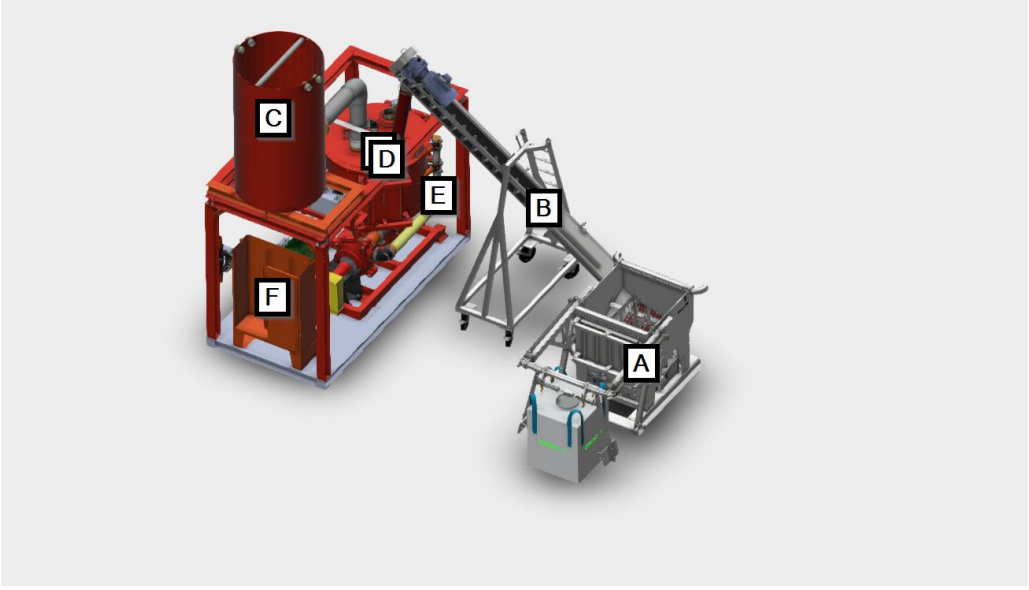
Inventaire et cartographie/Inventory and mapping: AECOM
Fichier/File: 6063-5966_a-tr_c5_3_MeqUG2_220531.mxd

0 65 130 m
UTM, Zone 18, NAD83

Carte / Map 5-3

Juin / June 2022

AECOM NUNAVIK NICKEL CANADIAN ROYALTIES INC.



A) Storage and opening bags towards a dry cement silo
B) Conveyor towards a preparation silo
C) Salt water silos
D) Mixing bin between dry cement and water to create a cement slurry & dust collection system
E) Pump to send the product to the transport truck
F) Electrical installation and control panel

Figure 5-6: Méquillon Site Cement Slurry Plant

5.2.2.1.5 Container Pad

A new pad that can accommodate 640 containers will be used to store concrete bags, in addition to equipment storage and handling. This pad will occupy an area of 26,613 m². Its dimensions will be approximately 260 m by 105 m.

5.2.2.1.6 Storage and Material Pad

This pad will be used to store miscellaneous equipment and will occupy an area of 6,099 m². Its dimensions will be approximately 97 m by 63 m.

5.2.2.2 Deposit Description

5.2.2.2.1 Mineralogy

Mineralization in the Méquillon deposit is in a dyke that continues for over a kilometer that slopes to the east. Just like the open-pit deposit exploitation, the Méquillon underground extension includes the following mineralization: disseminated sulphides, net-textured sulphides, massive sulphides and sulphide veins. Pyrrhotite is the predominant sulphide and is accompanied by varying amounts of chalcopyrite and pentlandite.

The underground mine project area is composed of three main lithologies: metavolcanic (Basalt), ultramafic rocks, and metasediments. The planned development is mostly exposed to basalt, while metasediments are expected to be rarely encountered based on the geological model provided (P&E, 2020).

According to a technical memo prepared by a senior geologist from CRI (2022b), the Méquillon deposit shows very good continuity of the different mineralized zones and a constancy of the net-textured domain that is easy to follow and also found at depths in the exploration holes towards the east. Therefore, it is estimated that the geochemical composition of the Méquillon pit is also representative of the deposit's underground section.

5.2.2.2.2 Geochemical Characterization

A geochemical characterization program for waste rock, ore, tailings and quarry import fill has been carried out during several sampling campaigns since 2006. As part of this program, waste rock samples from all mined pits and lithologies, ore samples, tailings samples from Mesamax, Expo, Méquillon and Ivakkak and surface soil samples distributed throughout the project were analyzed. These sampling campaigns made it possible to create a geochemical characterization of the materials through chemical analysis, acid-generating potential evaluations, metal leaching evaluations and metallurgical evaluations. The characterization results obtained for the Méquillon pit are considered representative of the underground deposit.

The following reports are part of the studies relevant to determining the Méquillon site's acid-generating and leaching potential:

- Golder Associates Ltd. 2018. Waste rock kinetic test results – Nunavik Nickel Project. Report No. 10-1127-0085;
- Golder Associates Ltd. 2010. Environmental geochemistry of waste rock from the Allammaq, Mesamax, Expo, Méquillon and Ivakkak deposits, Nunavik Nickel Project;
- Golder Associates Ltd. 2008. Report - Waste rock kinetic test results, Nunavik Nickel Project;
- Golder Associates Ltd. 2007. Static test results for waste rock and overburden, Raglan south Nickel Project.

The results and tests carried out for the Méquillon deposit are summarized in table 5-21.

The ore from the Méquillon deposit is therefore considered leachable and is potentially acid generating (PAG). CRI assumes that the ore from the underground deposit is also leachable and PAG.

5.2.2.3 Resources and Reserves

According to the latest reports on the resources and reserves, the estimated total tonnage for the underground exploitation of the Méquillon underground deposit is 1,446 kt. Tables 5-22 and 5-23 present the tonnage of mineral resources and reserves.

Table 5-21: Summary of Waste Rock Classification from the Méquillon Site According to Directive 019 (Golder, 2018)

Lithology	Estimated proportion of waste rock	Static test results		Kinetic test results		Waste rock classification according to the kinetic test	Groundwater protection measure
		AMD potential	Leachability	Leachate pH	Leachability		
Gabbro	5%	PAG	Non-leachable	Not tested		Acid-generating	Level A
Mafic volcanic	10%	NAG	Non-leachable	Neutral	Non-leachable	Low risk	None
Metasedimentary	5%	PAG	Non-leachable	Not tested		Acid-generating	Level A
Ultramafic	85%	PAG	Non-leachable	Acid	Leachable	Acidogenic and leachable	Level A

Table 5-22: Méquillon UG2 Deposit Ore Resources

Type	Tonnes	Ni (%)	Cu (%)	Co (%)	Pt (g/t)	Pd (g/t)	Au (g/t)
Measured / Indicated	1,023,683	0.70	0.91	0.03	0.63	2.42	0.129
Inferred	509,392	0.62	1.00	0.03	0.64	2.48	0.132

Table 5-23: Méquillon UG2 Deposit Ore Reserves

Type	Tonnes	Ni (%)	Cu (%)	Co (%)	Pt (g/t)	Pd (g/t)	Au (g/t)
Proved / Probable	1,446,727	0.576	0.778	0.026	0.549	2.093	0.112

5.2.2.4 Ore Extraction

The ore extraction rate for the Méquillon UG2 underground deposit will be 2,300 t/d. The underground mine, including UG1 and UG2, will have a 12-year operating life. The annual production will be around 840,000 tons per year once the full production is reached.

It is estimated that approximately 231 kt of waste rock and 1,447 kt of ore in total will be generated during the Méquillon UG2 exploitation. A summary of the waste rock, ore, concentrates and tailings amounts estimated for the project's operating life is presented in Table 5-24.

Table 5-24: Tonnage (t) of Waste Rock, Ore, Concentrate and Tailings Produced During the Méquillon UG2 Deposit Exploitation.

Waste rock	Ore	Concentrates	Tailings
230,862	1,446,727	104,355	1,342,372

5.2.2.4.1 Underground Mine Characteristics

The underground mine will be accessible via a single ramp to the surface, extending continuously to the bottom of the deposit. The portal and access ramp have already been authorized as part of the application for authorization to exploit the Méquillon UG1 mine.

The deposit will be mined according to the transverse longhole method. These boreholes allow the block to be broken down in successive transverse sections. Given the presence of continuous permafrost, calcium chloride (115 g/l) is used as a dense fluid during drilling to keep the water used in a liquid state. The deposit will be divided into several empty chambers separated by pillars to prevent the walls from collapsing. The primary chambers will be exploited first, then backfilled with consolidated material to provide support when excavating the adjacent secondary chambers. To limit the ground surface impacts, a concrete plant was included in the design of the Méquillon UG2 underground mine. Secondary mine chambers will simply be backfilled, as they will not be exposed in the same way. Spacing of levels and cross-sections will vary with depth to surface, as the mine is located in northern Quebec, where permafrost conditions exist to considerable depths below the surface.

The Méquillon UG2 characteristics will be the same as Méquillon UG1. Spacing between the levels varies from 26 to 34 m, the width and length of the stopes vary from 15 to 20 m and 15 to 30 m respectively (table 5-25).

Table 5-25: Nominal Spacing of Levels and Cross-sections by Depth for Méquillon UG

Depth under surface	Condition	Room height between the levels	Room width (perpendicular cross-sections)
0-200 m	Permafrost	34 m	20 m
200-300 m	Thawed	30 m	20 m
330-480 m	Thawed	26 m	15 m

The transverse sections will be exploited from bottom to top. The top access to the mine will be used for drilling and blasting operations, possibly backfilling as well, while the lower access will be used for loading ore. Secondary exits will be provided by ladders in the ventilation raises.

Figure 5-7 illustrates the projected plan of the Méquillon UG2 underground mine.

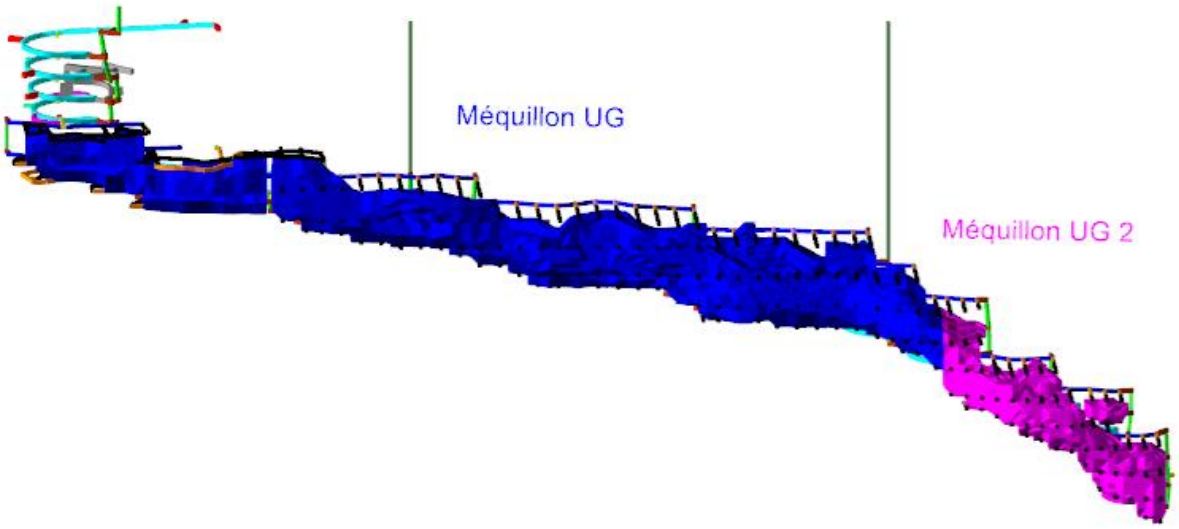


Figure 5-7: Méquillon Underground Mine

Excavation of the ramp and mining the underground sites will generate waste rock, which will later be returned underground to backfill the mined sites. The same equipment currently used for the pit will be used for loading and transporting ore.

5.2.2.4.2 Explosives Preparation and Transport

The emulsion will be used as the main explosive for ore production as to optimize the fragmentation. Electronic detonators will be used to reduce the chances of finding undetonated explosives. The holes drilled for explosives will be filled using an emulsion pump designed for this purpose.

The ANFO and standard detonators will be used for the development. In this case, an ANFO loader will be used for loading rounds. This choice is based on the ore's characteristics, the exploitation type as well as the manufacturing and transportation costs. The supply will come from the explosives storage site located near the Dyno Nobel plant. Explosives requirements are estimated at approximately 580 tonnes of emulsion and 460 tonnes of ANFO.

Commercial emulsions and detonators from the Expo industrial complex are stored for some time in the powder magazine authorized by the *Sûreté du Québec* and by Natural Resources Canada near the Méquillon deposit before being used. These magazines will have a storage capacity equivalent to at least one week of operation. There will be powder magazines built underground when the development is advanced enough.

The plastic from explosive packaging is returned to the explosives depot and managed separately from other packaging types. They are burned in the explosives depot area located at Expo, in accordance with the *Act Respecting Explosives* (L.R.Q., c. E-22).

5.2.2.4.3 Mining Equipment

The equipment used on the Méquillon site is detailed in Table 5-26.

The boreholes will be created by a longhole drill to insert the emulsion. A backhoe loader will be used to load the mining trucks to transport ore.

Production and service equipment also includes a grader and a 20,000 L tanker truck for watering surfaces to prevent the dust from rising, when required.

Table 5-26: Equipment Required

Equipment	Quantity
Electric boom/ double boom hydraulic drill	3
Power bolter	3
Loader-shuttle) / Scoop CAT R1700	3
Service truck	1
Tow truck (30 t capacity)	7
Gas/oil truck	2
ANFO charger	1
Tanker truck - 20,000 L	1
Forklift truck	1
Longhole drill	2
ITH production drill 3.5" dia.	2
Grader	1
Emulsion pump	1
Scissor lift	2
Personal Vehicle	10

Arctic diesel will be used for mining equipment, pumps and generators.

Table 5-27 shows the anticipated maximum weekly trucking frequencies.

Table 5-27: Anticipated Maximum Trucking Frequencies for the Exploitation of the Méquillon UG2 Deposit

Ore (reserves) (tonnes)	Operation time (years)	Tonnage hauled at full production (tonnes/day)	Truck capacity (tons)	Number of trips per week
1,446,727	2	2,300	30	537

5.2.2.5 Management of Ore, Tailings, Waste Rock and Overburden

5.2.2.5.1 Tailings Management

All mine tailings generated in the context of the NNiP will be managed in the tailings disposal site at the Expo mining complex. Therefore, no tailings will be accumulated on the Méquillon site.

5.2.2.5.2 Waste Rock Management

Waste rock from the underground mine will be stored in the waste rock pile already authorized for exploiting the Méquillon open-pit site. The development of the waste rock pile, the ore pad, and the water management infrastructures are included in the certificate of authorization for mining activities under Article 22 of the EQA (V/Réf. : 7610-10-01-70080-77 / 401 764 637).

Due to underground exploitation techniques, it will be necessary to backfill approximately 1.0 Mt of waste rock in the underground mine sites to ensure safety during operations. The waste rock produced during the development of the mine will be managed on the surface, then crushed before being returned in full to the depleted stopes. During operations, additional waste rock production will also be managed on the surface and used as backfill material at the end of the mine's exploitation.

5.2.2.5.3 Ore Management

The extracted ore is hauled to the surface and loaded directly onto the conveyor trucks, unless road conditions are not conducive for safe transport to the Expo industrial complex. It is then temporarily stored in the current ore stockpile of the Méquillon site, if required. The ore will be stored in an ore stockpile at the Expo site before being processed at the plant.

5.2.2.5.4 Overburden Management

No overburden or topsoil is, or will be, stockpiled for reuse during restoration. The quantities present on the natural soil in this northern context are insignificant and insufficient for them to have any value in terms of reuse.

5.2.2.6 Water Management

5.2.2.6.1 Industrial Water

Surface water from rainwater and snowmelt that comes into contact with waste rock and ore or that runs off near the dumps is collected using collection ditches and sent to the main collection pond. Drainage infrastructure that integrates the existing ditch network at the Méquillon site will be implemented as part of the modifications for Méquillon UG1. The existing contact water ditch will be extended slightly to the west to accommodate the expansion of the ore stockpile and the portal. For the Méquillon UG2 underground exploitation, the only ditches required will be for the additional access roads, for the ventilation raises and the emergency exits.

It is estimated that the production of underground mine water will be negligible since it will not be heated; if necessary, it would be directed to the MCP via the contact water ditches.

The water required for mining operations will come from clean water tanks located on the surface when operations begin. The water will then be recirculated after the supply sumps have been put into operation. Periodic additions of fresh water (at variable frequency depending on the season) into the network will be required to compensate for the loss caused during extraction outside the mine.

5.2.2.6.2 Mine Wastewater Treatment

The water accumulated in the MCP is treated each summer by the already authorized water treatment plant (WTP) as to reduce the concentration of metals and total suspended solids (TSS), as well as controlling the discharged water's pH levels. The effluent is discharged at the outlet of Lake No. 3 and is subject to environmental monitoring incorporating the requirements of Directive 019 and the MDMER.

The industrial water from the Nanaujaq project, described later in the document, will be pumped to the MCP Méquillon and treated at this WTP, in the same way as the water from the Méquillon site.

5.2.2.6.3 Domestic Wastewater

Domestic wastewater will be temporarily stored in a 10,000 L reservoir and sent by siphon truck to the Expo industrial complex where it will be treated.

5.2.2.6.4 Drinking Water

Drinking water required for the employees will come from the Expo drinking water treatment system and be brought by 20 L bottles, for consumption only. Fresh water from Lac du Bombardier will be transported by tanker truck and will be stored in a 10,000 L tank that will be located near the service building. This fresh water will cover needs other than human consumption (washrooms, sinks, etc.).

5.2.2.7 Access Roads

The same existing main road network will be used to transport ore, waste rock and tailings. The exploitation of the Méquillon UG2 section will not require any additional roads, other than the access roads to the ventilation raises and emergency exits.

5.2.2.8 Waste Management

Due to the numerous waste sources, activities and infrastructures for waste management have been centralized to the southeast of the Expo industrial complex. Under the framework of the Méquillon UG2 project, waste will continue to be managed in the same way as currently authorized and described previously in section 5.2.1.1 of this document.

The primary sources of waste at the Méquillon mine site are domestic waste, oils, explosive packaging and scrap from the mechanical and welding workshop. As estimated in the context of the NNiP, each worker will produce around 2 MT of residual materials annually, or approximately 108 MT annually for the duration of this project.

5.2.2.9 Workforce

About fifteen employees will be assigned to the Méquillon UG1 and UG2 deposit during the work, as presented in Table 5-28.

The workforce will work continuously, 24 hours a day, 7 days a week, 52 weeks a year. Workers will be divided into 2 shifts, 6:00 a.m. to 6:00 p.m. and 6:00 p.m. to 6:00 a.m.

Table 5-28: Workforce Required for the Operation of Méquillon UG2

Responsibility	Number of employees required
Driller	12
Loader-shuttle operators (scoop)	6
Truck operator	16
Jumbo operator	2
Bolter operator	2
Refuelling truck operator	1
Service operators	3
Surveyor	2
Foreman	4
Blasters	2
Service miners	2
Construction miners	2

It is also necessary to consider the CRI employees assigned to the supervision and engineering of the works, the persons responsible for the maintenance of the buildings, in addition to the health care staff, who'll divide their time between the various exploitation sites.

5.2.2.10 Mine Restoration

Under the terms of the Mining Act, the project is subject to land restoration affected by mining activities. A restoration plan for the Méquillon site was produced in accordance with the particularities and general requirements contained in the Guidelines for Preparing Mine Closure Plans in Quebec from MERN. It addresses open pit operation, as well as UG1 and UG2 underground operations. This plan was already sent to MERN and MELCC and specifically includes a detailed description of the restoration and rehabilitation work planned during the exploitation phase and once mining operations are complete.

The following interventions are generally foreseen:

- Securing mined sites and areas;
- Dismantling and disposing of buildings and infrastructures;
- Restoring waste rock pile areas and temporary ore storage areas;
- Managing surface water and contaminated water, if any;
- Scarifying secondary access roads to obstruct access to the remnants of the mining infrastructure;
- Monitoring up the works' integrity and performing comprehensive environmental monitoring.

In accordance with the regulations, CRI will monitor the mining restoration to ensure that the discharge objectives are met for the protection of the receiving environment.

The restoration activities specific to the Méquillon UG2 project to be carried out upon closure are briefly described in the following sections. It should be noted that the restoration of the pre-authorized project's elements within the framework of the Méquillon pit exploitation, such as the waste rock pile, the temporary storage pile and ore transshipment, as well as the site's water management infrastructures, will not be detailed here and can be viewed in the restoration plans developed thus far for the site.

5.2.2.10.1 Underground Mine Restoration

The waste rock produced during the Méquillon UG2 mine development will be managed on the surface and then gradually returned to the depleted tunnels to ensure safety during exploitation. The additional waste rock produced will also be used as backfill material at the end of the mine's exploitation. The physical stability of the surface pillars will also be assessed by a qualified engineer. Any risk of these pillars collapsing will be reduced beforehand by backfilling the at-risk sections. Since the underground mine is in permafrost and will not be heated, the mine water produced will be negligible. It is possible that the water level will reach static conditions in a long-term perspective.

To eliminate the need for fencing maintenance after exploiting the underground deposit, the portal (ramp access) to the underground mine will also be secured with NAG rocks. To ensure the safety of the premises, the daylight openings from the ventilation raises will be plugged with concrete caps. Trilingual signs (English, French and Inuktitut) indicating the danger will be installed at the entrance to the gate and condemned raises. No fence or barrier will be erected around the underground mine, as the sector is not visited often, no matter the season.

5.2.2.10.2 Surface Infrastructure and Heavy Machinery

All buildings and surface infrastructure that will not be used for post-closure monitoring will be removed and recovered for reuse in the context of the NNiP. When it has been shown that the monitoring complies with the applicable requirements, the remaining buildings and infrastructure will also be recovered. Surfaces will be leveled as required to control erosion and restore as much of the natural appearance as possible.

5.2.2.10.3 Reusable Products, Petroleum Products and Residual Materials

- Petroleum products, gasoline, diesel, oils and greases will be returned to the Expo mining complex where they will be temporarily stored in a safe manner before being used in the context of NNiP activities.

- Chemicals that have not been used for water treatment will be returned to the Expo mining complex where they will be temporarily stored in a safe manner before being used in the context of NNiP activities.

- Waste materials, non-hazardous and hazardous, will be disposed of in accordance with CRI's waste management procedures, which are in accordance with the regulations.

5.2.2.10.4 Potentially Contaminated Soil and Materials

After mining activities have stopped, a characterization study of the land will be carried out, as prescribed by section 31.51 of the EQA. CRI will take the necessary measures in accordance with the provisions of the EQA and the Land Protection and Rehabilitation Regulation (c. Q-2, r.18.1.01) in the event that this characterization reveals the presence of contaminants above and beyond the criteria established by the regulations. Contaminated soil, if any, will be transported to southern Quebec for treatment at an authorized site.

5.2.2.11 Project Schedule

The exploitation of Méquillon UG2 is planned between 2033 and 2035, according to the schedule of activities presented in Table 5-29.

Table 5-29: Méquillon UG2 Project Schedule

Activities	Dates
Construction of the Méquillon UG1 portal and ditches	Q4 2022
Development of the Méquillon UG1 ramp	Q1 2023 - Q2 2024
Operations (Méquillon UG1)	Q3 2024 – 2032
Operations (Méquillon UG2)	2033-2035
Restoration Méquillon UG1 and UG2	Starting in 2035

5.2.2.12 Project Cost

A feasibility study has been carried out for the entire Méquillon UG project including the Méquillon UG1 and Méquillon UG2 deposits. The Capex and Opex operating life costs are $189.8M CAD and $1,798.1M CAD for a total of $1,987.9M CAD (Table 5-30).

Table 5-30: Méquillon UG Project Phase Cost Details

Project phase	Cost ($2022 CAD)
Water management infrastructures	$50K
Ramp development	$231M
Engineering	$500K

5.2.3 Nanaujaq

5.2.3.1 Nanaujaq Deposit Location

The Nanaujaq deposit is located on the Expo-Méquillon road and is accessible by land at the TR-3 and TR-4 crossings. CRI wishes to exploit this section of the deposit via underground extensions. The Nanaujaq site's central geographical coordinates are indicated in table 5-31.

Table 5-31: Central Geographical Coordinates of the Nanaujaq site

	Degrees	Decimal degrees	NAD83 / UTM zone 18N
Latitude	61°30'45.1"N	61.512528° N	6,820,596 m N
Longitude	73°40'18.5"W	-73.671804° W	570,673 m E

An application to obtain a mining lease will be submitted to MERN after this addendum is filed and the restoration plan is approved. The Nanaujaq deposit's location is shown on Maps 2-1 and 5-4.

5.2.3.2 Surface Infrastructures

The surface infrastructure required for the exploitation of the Nanaujaq deposit can be summarized as:

- The development of an ore stockpile with a 20,000 m³ capacity
- The development of a waste rock pile with a 75,000 m³ capacity

- The construction of mine water management infrastructures including:
  - A water collection pond with a 25,828 m³ capacity;
  - A dyke and a spillway;
  - Water collection and diversion ditches;
  - An effluent discharge pipeline toward Méquillon;
- An access portal to the underground mine;
- Two ventilation raises and emergency exits;
- Two magazines, one for detonators and one for explosives;
- A telecommunications tower;
- An infrastructure pad occupying an area of 309 m² (approximately 19 m x 16 m) in the portal area for the installation of an electrical room, a mercaptan system and fans;
- A general infrastructure pad occupying an area of 7,245 m² (approximately 85 m X 85 m) including:
  - Offices;
  - Sanitary facilities and storage for clean water and sanitary waste water;
  - A maintenance shop;
  - Storage containers;
  - Generators;
  - A diesel distribution system and diesel storage.

The Nanaujaq mine surface infrastructure is shown on Maps 5-4 and 5-5.

5.2.3.3 Deposit Description

5.2.3.3.1 Mineralogy

As described in the technical memorandum by Golder (2022b), the local geology of the NNiP deposits consists of mafic volcanic and metasedimentary rocks, as well as intrusions of ultramafic rocks. The Nanaujaq deposit presents lithology and mineralogical assemblages similar to the other deposits. The different lithologies include veins, stringers, sediment, basalt and gabbro. The different lithologies demonstrate disseminated sulphides including nickel, copper and platinum group elements.

5.2.3.3.2 Geochemical Characterization

The site's acid-generating and leaching potential have been classified in the report *Caractérisation géochimique du minerai et des roches stériles du projet souterrain Nanaujaq. Mémorandum technique 1018-20138922-6000-MTF-Rev0* (Golder, 2022b). This report is included in Appendix D.

According to this document, due to the knowledge acquired on the geochemistry of the other NNiP deposits, Golder's geochemical characterization program for the Nanaujaq site focused on the potentially problematic units with respect to their acid-generating potential, i.e., sulfides.

The ore and waste rock were classified according to the *Guide de Caractérisation des Résidus Miniers et du Minerai* (MELCC, 2020), the soil and water quality criteria of the *Guide d'intervention – Protection des Sols et Réhabilitation des Terrains Contaminés* (Beaulieu, 2021), and according to the static test results carried out. Depending on the results obtained, the materials were then categorized according to the site's applicable categories, being either acid-generating, leachable, low risk or high risk.

According to the results obtained, the sedimentary rock tailings are classified as acid-generating. Basalt and gabbro tailings have variable characteristics but must therefore be considered acid-generating. Therefore, measures will be implemented to manage all waste rock as being acid-generating. The basalt and gabbro waste rock units did not show signs of leaching beyond the applicable criteria, while just under half of the sediment samples showed short-term leaching potential.

Ore from the Nanaujaq site was found to be similar to ore from other NNiP deposits. It has been classified as acid-generating and leachable and will therefore be subject to the same protective measures.

5.2.3.4 Resources and Reserves

According to the latest reports on the resources and reserves, the estimated total tonnage for the underground exploitation of the Nanaujaq underground deposit is 1,371 kt. Tables 5-32 and 5-33 present the tonnage of mineral resources and reserves.

Table 5-32: Nanaujaq Deposit Ore Resources

Type	Tonnes	Ni (%)	Cu (%)	Co (%)	Pt (g/t)	Pd (g/t)	Au (g/t)
Measured / Indicated	1,613,700	1.28	1.05	0.07	0.36	1.34	0.06
Infered	119,159	0.97	0.77	0.05	0.24	0.99	0.04

Table 5-33: Nanaujaq Deposit Ore Reserves

Type	Tonnes	Ni (%)	Cu (%)	Co (%)	Pt (g/t)	Pd (g/t)	Au (g/t)
Proved / Probable	1,370,509	0.763	0.630	0.042	0.210	0.819	0.042

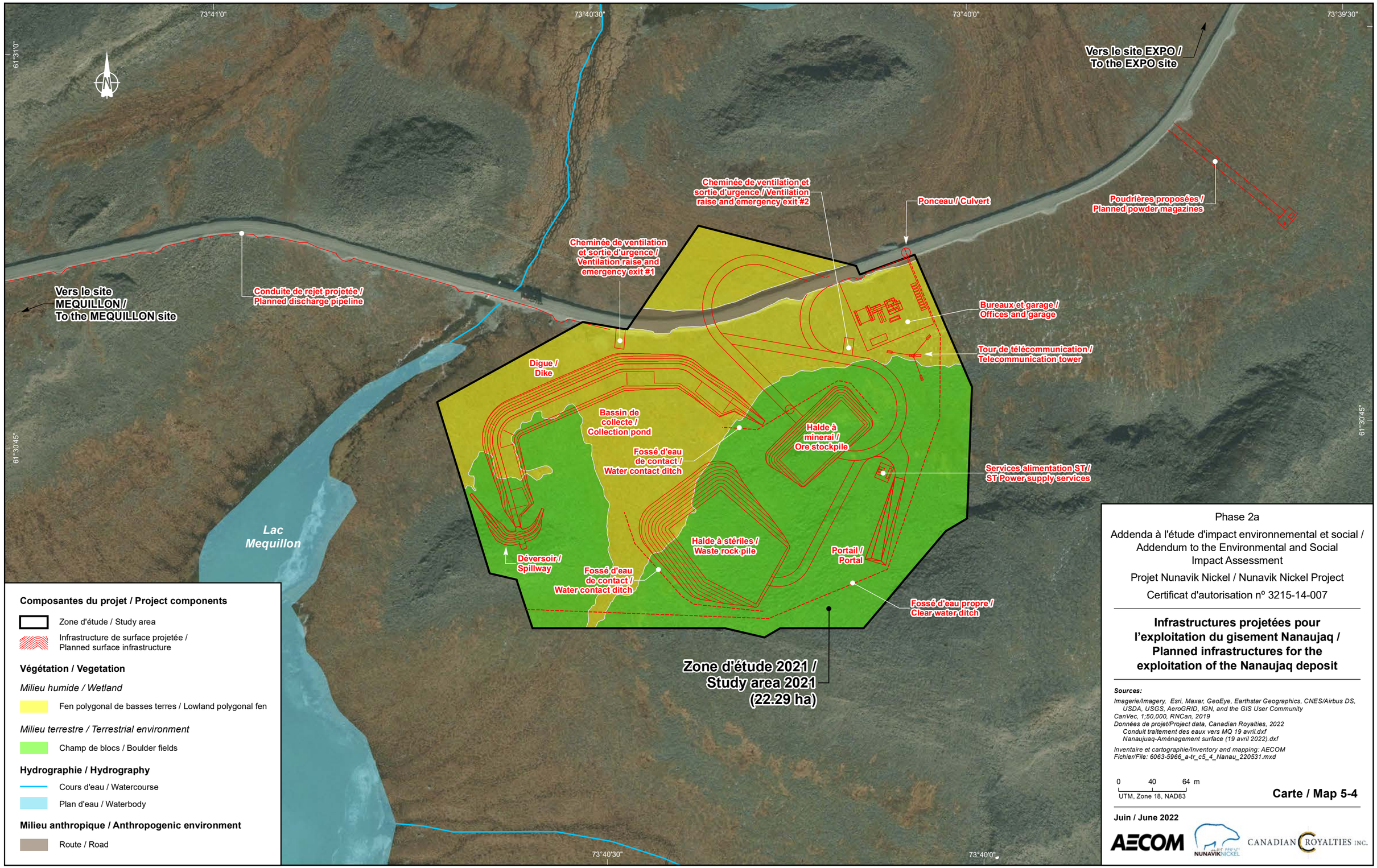
5.2.3.5 Ore Extraction

The ore extraction rate for the Nanaujaq underground deposit will be 1,750 t/d. The underground mine should produce a total of 1,371 kt of ore over an operating life of 4 to 5 years, including around 600 kt for the development and 700 kt for stope operation. The annual production will be around 500 kt per year once full production is reached.

Extraction will take place over a four-year period according to the mining exploitation plan (Table 5-34).

Table 5-34: Yearly Extraction, Nanaujaq Deposit

Year	1	2	3	4	Total
kt ore/year	120	407	379	464	1,370



Composantes du projet / Project components

- Zone d'étude / Study area
- Infrastructure de surface projetée / Planned surface infrastructure

Végétation / Vegetation

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Milieu terrestre / Terrestrial environment

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

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

Milieu anthropique / Anthropogenic environment

- Route / Road

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Infrastructures projetées pour l'exploitation du gisement Nanaujaq / Planned infrastructures for the exploitation of the Nanaujaq deposit

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1:50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, 2022
Conduit traitement des eaux vers MQ 19 avril.dxf
Nanaujuaq-Aménagement surface (19 avril 2022).dxf

Inventaire et cartographie/Inventory and mapping: AECOM
Fichier/File: 6063-5966_a-tr_c5_4_Nanau_220531.mxd

0 40 64 m
UTM, Zone 18, NAD83

Carte / Map 5-4

Juin / June 2022

AECOM · NUNAVIK NICKEL · CANADIAN ROYALTIES INC.

73°42'30" 73°42'0" 73°41'30" 73°41'0" 73°40'30"

61°31'0"

Conduite de rejet projetée / Planned discharge pipeline

Zone d'étude de la route en 2021 / Study area of the road in 2021 (3.31 ha)

Zone d'étude Nanaujaq / Nanaujaq study area

61°30'45"

73°42'0" 73°41'30" 73°41'0" 73°40'30"

Composantes du projet / Project components

- Zone d'étude / Study area
- Conduite de rejet projetée / Planned discharge pipeline

Végétation / Vegetation

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Milieux terrestres / Terrestrial environments

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

- Cours d'eau / Watercourse
- Plan d'eau / Waterbody
- Milieu anthropique / Anthropogenic environment

73°43'30" 73°43'0" 73°42'30"

61°31'0"

Plateforme de services / Service pad

Conduite de rejet projetée / Planned discharge pipeline

Plateforme de remblai granulaire pour l'entreposage de conteneurs / Granular backfill pad for container storage

Zone d'étude de la route en 2021 / Study area of the road in 2021 (3.31 ha)

Cheminée de ventilation et sortie d'urgence / Ventilation raise and emergency exit #4

Méquillon
(Bail minier / Mining lease)

73°44'0" 73°43'30" 73°43'0"

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Conduite de rejet projetée en bordure de la route entre les sites Nanaujaq et Méquillon / Planned roadside discharge pipeline between the Nanaujaq and Méquillon sites

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1:50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, Avril/April 2022

Inventaire et cartographie/Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c5_5_Nan_Meq_rte_220531.mxd

0 48 96 m
UTM, Zone 18, NAD83

Carte / Map 5-5

Juin / June 2022

AECOM NUNAVIK NICKEL CANADIAN ROYALTIES INC.

The Nanaujaq project should generate approximately 270 kt tons of waste rock and 1,371 kt of ore in total for the entire exploitation period (Table 5-35). A summary of the waste rock, ore, concentrates and tailings amounts estimated for the project's operating life is presented in the table below.

Table 5-35: Tonnage (t) of Waste Rock, Ore, Concentrate and Tailings Produced During the Nanaujaq Deposit Exploitation

Waste rock	Ore	Concentrates	Tailings
269,590	1,370,509	98,857	1,271,651

5.2.3.5.1 Underground Mine Characteristics

The Nanaujaq deposit is divided into 2 parts, each of which will be mined using a different method, specifically the longitudinal method for the West zone (approximately 75% of the ore) and longhole drilling for the East zone (approximately 25% of the ore).

The underground mine will be accessible via a single ramp to the surface, extending continuously to the bottom of the deposit (see Figure 5-9 and 5-10). The surface infrastructures can be seen on Map 5-4.

The top access to the mine will be used for drilling and blasting operations, possibly backfilling as well, while the lower access will be used for loading ore. A secondary exit will be provided by ladders in the ventilation raises for fresh-air supply.

The planned depth of the underground mine is 170 m up to an elevation of 300 m. Spacing of levels and cross-sections will vary with depth to surface, as the mine is located in northern Quebec, where permafrost conditions exist to considerable depths below the surface (Table 5-36).

Table 5-36: Nominal Spacing of Levels and Cross-sections by Depth of the Nanaujaq Mine

Depth under surface	Condition	Room height between the levels	Room width (perpendicular cross-sections)
0-200 m	Permafrost	20-25 m	6-30 m

5.2.3.5.2 Explosives Preparation and Transport

The emulsion will be used as the main explosive for ore production as to optimize the fragmentation. Electronic detonators will be used to reduce the chances of finding undetonated explosives. The holes drilled for explosives will be filled using an emulsion pump designed for this purpose. The ANFO and standard detonators will be used for the development. In this case, an ANFO loader will be used for loading rounds. This choice is based on the ore's characteristics, the exploitation type as well as the manufacturing and transportation costs.

Explosives requirements are estimated at 1,400 tonnes of emulsion for site blasting and 370 tonnes of ANFO for horizontal and vertical developments.

The explosives will be supplied from the Dyno Nobel emulsion plant, which is located east of the Expo mining complex; they will then be transported to the Nanaujaq site.

Explosives and detonators will be temporarily stored on the surface in 2 separate magazines with approximately 1 week of production capacity. Two powder magazines will be built underground after the mine's development advances.

The plastic from explosive packaging is returned to the explosives depot and managed separately from other packaging types. They are burned in the explosives depot area located at Expo, in accordance with the Act Respecting Explosives (L.R.Q., c. E-22).

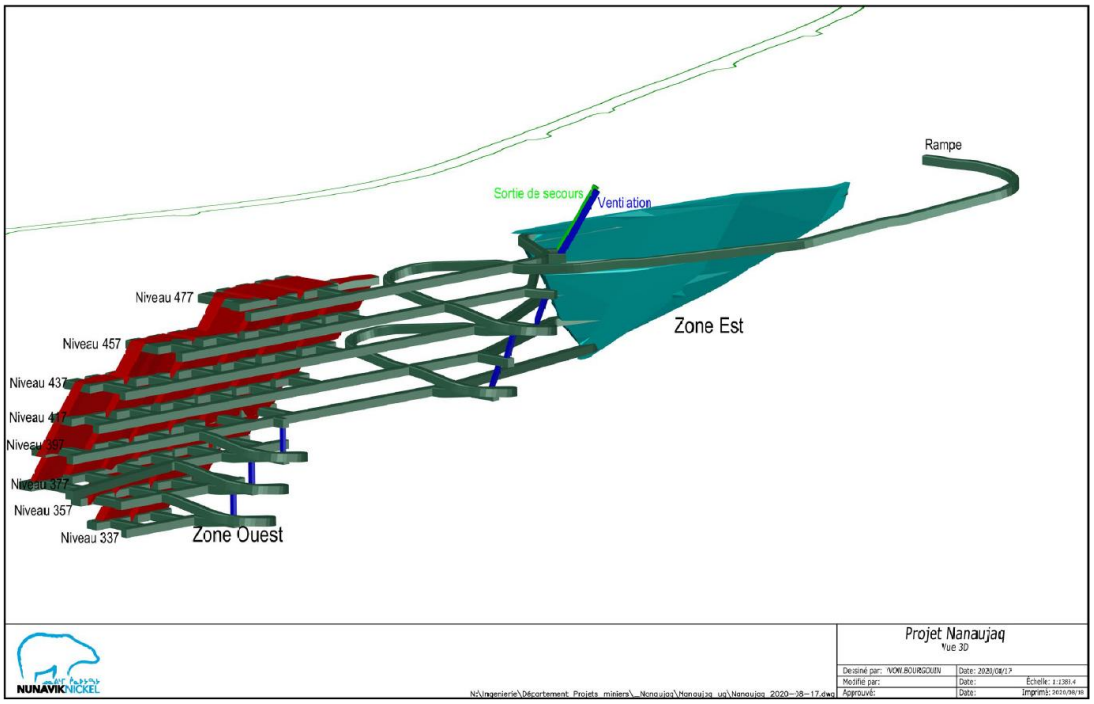


Figure 5-8: 3D View of the Nanaujaq Project

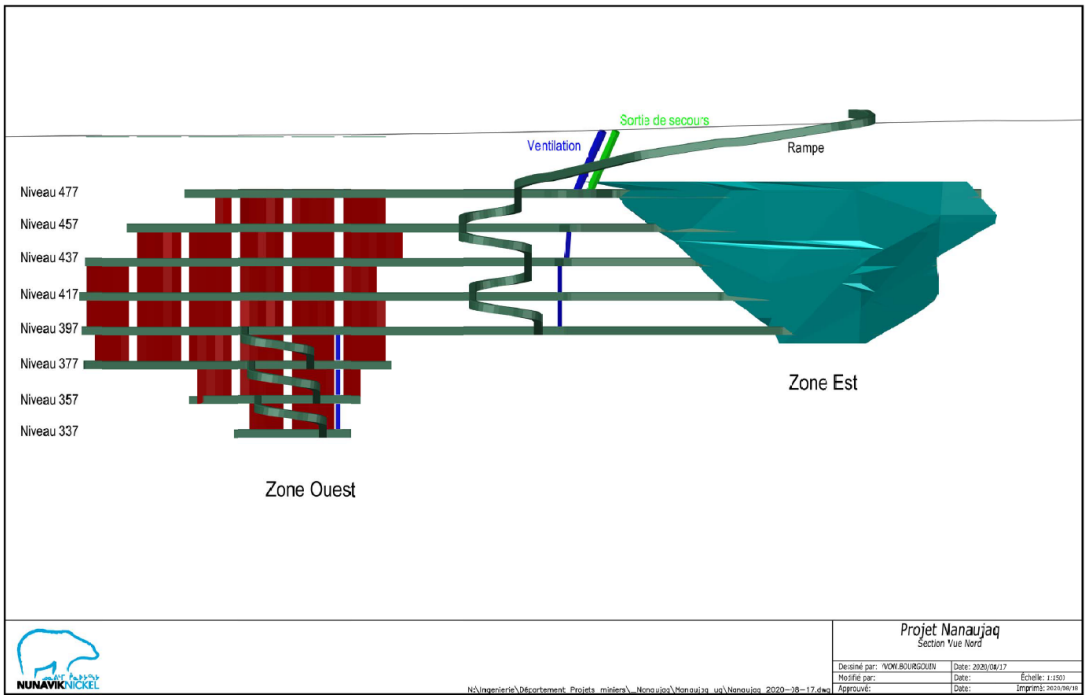


Figure 5-9: Northern View of the Nanaujaq Project

5.2.3.5.3 Mining Equipment

The equipment used on the Nanaujaq site is detailed in Table 5-37.

Table 5-37: Equipment Required

Equipment	Quantity
Electric boom/ double boom hydraulic drill	2
Power bolter	2
Shuttle loader	4
Tow truck (30 t capacity)	6
Gas/oil truck	1
ANFO charger	1
Tanker truck - 20,000 L	1
Longhole drill	2
Emulsion pump	1
Scissor lift	1
Underground van	4

Arctic diesel will be used for mining equipment, pumps and generators.

Table 5-38 shows the anticipated maximum weekly trucking frequencies.

Table 5-38: Anticipated maximum Weekly Trucking Frequencies

Ore (reserves) (tonnes)	Operation time (years)	Tonnage hauled at full production (tonnes/day)	Truck capacity (tons)	Number of trips per week
1,370,509	3	1,750	30	410

5.2.3.6 Management of Ore, Tailings, Waste Rock and Overburden

5.2.3.6.1 Tailings Management

All mine tailings generated in the context of the deposit exploitation project will be managed in the tailings disposal site at the Expo mining complex. Therefore, no tailings will be accumulated on the Nanaujaq site.

5.2.3.6.2 Waste Rock Management

The waste rock pile planned has a capacity of 75,000 m^3 and an elevation of up to 525 m. It is 8 meters high from its lowest point. It occupies a space of 170 m by 140 m and was located just south of the main collection pond (MCP). All water that will be contaminated by this pile's rocks will go directly into the MCP by gravity due to the favourable topography. Its size has been planned as to have enough space to store waste rock until development is sufficiently advanced and production can begin. From this point, the waste rock pile will start to be emptied so backfilling operations can begin.

5.2.3.6.3 Ore Management

The ore stockpile has a capacity of 20,000 m^3, meaning approximately 40 kt, i.e., the equivalent of 1 full site or approximately 3 weeks of production. Since the mines are very far apart and there are nearly 100 km of road to maintain, it is better to wait until a site is filled with ore and concentrate efforts in one location. This way, the bi-train trucks are concentrated on one road sector, which will greatly improve operational safety.

The ore will be stored in an ore stockpile at the Expo site before being processed at the plant.

5.2.3.6.4 Overburden Management

No overburden or topsoil will be stockpiled for reuse during restoration. The quantities present on the natural soil in this northern context are not significant and insufficient for them to have any value in terms of reuse.

5.2.3.7 Water Management

5.2.3.7.1 Industrial Water and Water Management Infrastructures

Surface drainage water consists mainly of water from precipitation and from snow melt running off the mining site, specifically onto the waste rock pile, the ore stockpile and the portal area, since the ore and waste rock are classified as having acid-generating potential.

To restrain the volume of runoff water and limit the watershed area affected, a network of ditches, a dike and a collection pond will be built on the mine site. This way, any water and snow outside the delimited zones will be free from potential contamination and could be directed to the natural receiving water network without prior treatment.

Potentially contaminated water will be directed to the main water collection pond at the Nanaujaq site. This collection pond will be accompanied by a dike, have a 25,828 m^3 capacity and will be located south of the road that connects the Expo and Méquillon sites.

It is estimated that the production of underground mine water will be negligible since it will not be heated; if necessary, it would be directed to the MCP by pumping.

The water required for mining operations will come from clean water tanks located on the surface when operations begin. The water will then be recirculated after the supply sumps have been put into operation. Periodic additions of fresh water (at variable frequency depending on the season) into the network will be required to compensate for the loss caused during extraction outside the mine.

5.2.3.7.2 Mine Wastewater Treatment

Mine water must be treated to reduce metal and total suspended sediments (TSS) concentrations as well as to control the discharged water's pH. The water accumulated at the Nanaujaq site will thus be routed to the Méquillon site's collection pond via PeHD piping to then be treated by the water treatment plant (WTP) at the Méquillon site. The Méquillon site's pond and WTP are already in place and authorized.

5.2.3.7.3 Domestic Wastewater

Domestic wastewater will be temporarily stored in a 10,000 L reservoir and sent by siphon truck to the Expo industrial complex where it will be treated.

5.2.3.7.4 Drinking Water

Drinking water required for the employees will come from the Expo drinking water treatment system and be brought by 20 L bottles, for consumption only. Fresh water from Bombardier lake will be transported by tanker truck and will be stored in a 10,000 L tank that will be located near the Ivakkak site service building. This fresh water will cover needs other than human consumption (washrooms, sinks, etc.).

5.2.3.8 Access Roads

The Nanaujaq deposit is accessible via the road between Expo and Méquillon. The same existing main road network will be used to transport ore, waste rock and tailings.

The operation of the Nanaujaq mine will not require an additional road.

5.2.3.9 Waste Management

The primary sources of waste at the Nanaujaq mine site are domestic waste, oils, explosive packaging and scrap from the mechanical and welding workshop. As estimated in the context of the NNiP, each worker will produce around 2 MT of residual materials annually, or approximately 40 MT annually for the duration of this project.

Due to the numerous sources of waste, activities and infrastructures for waste management have been centralized to the southeast of the Expo industrial complex. Under the framework of the Nanaujaq project, waste will continue to be managed in the same way as currently authorized and described previously in section 4.2.2.9 of this document.

5.2.3.10 Workforce

About twenty employees will be assigned to the Nanaujaq deposit during the work, as presented in Table 5-39. It is also necessary to consider the CRI employees assigned to the supervision and engineering of the works, the persons responsible for the maintenance of the buildings, in addition to the health care staff, who'll divide their time between the various exploitation sites.

Table 5-39: Workforce Required for the Nanaujaq Deposit Exploitation

Responsibility	Number of employees required
Driller	1
Loader-shuttle operators (scoop)	2
Truck operator	4
Jumbo operator	1
Bolter operator	1
Refuelling truck operator	1
Foreman	1
Blasters	2
Service miners	2
Construction miners	2
Site supervisors	2
Day labourer	1

5.2.3.11 Mine Restoration

Under the terms of the Mining Act, the project is subject to the restoration of land affected by mining activities. A restoration plan for the Nanaujaq site will be produced in accordance with the particularities and general requirements contained in the Guidelines for Preparing Mine Closure Plans in Quebec from MERN, and in which the applicable measures will be found. This plan will be submitted to MERN and their approval will be required to obtain the mining lease. It will be accompanied by a financial guarantee in accordance with Article 232.2 of the Mining Act. In particular, it will include a detailed description of the restoration and rehabilitation work planned during the operation phase and once the mining activity is completed.

The following interventions are generally foreseen:

- Securing mined sites and areas;
- Dismantling and disposing of buildings and infrastructures;
- Restoring waste rock pile areas and temporary ore storage areas;
- Managing surface water and contaminated water, if any;
- Scarifying secondary access roads to obstruct access to the remnants of the mining infrastructure;
- Monitoring the works' integrity and performing a comprehensive environmental monitoring.

In accordance with the regulations, CRI will follow up the mining restoration to ensure that the discharge objectives are met for the protection of the receiving environment.

The restoration activities specific to the Nanaujaq project to be carried out upon closure are briefly described in the following sections.

5.2.3.11.1 Underground Mine Restoration

The waste rock produced during the Nanaujaq mine development will be managed on the surface and then gradually returned to the depleted tunnels to ensure safety during exploitation. The additional waste rock produced will also be used as backfill material at the end of the mine's exploitation so no waste rock is left on the surface.

The physical stability of the surface pillars will also be assessed by a qualified engineer. Any risk of these pillars collapsing will be reduced beforehand by backfilling the at-risk sections. Since the underground mine is in permafrost and will not be heated, the mine water produced will be negligible. It is possible that the water level will reach static conditions in a long-term perspective.

To eliminate the need for fencing maintenance after exploiting the underground deposit, the portal (ramp access) to the underground mine will also be secured with NAG rocks. To ensure the safety of the premises, the daylight openings from the ventilation raises and emergency exit will be plugged with concrete caps. Trilingual signs (English, French and Inuktitut) indicating the danger will be installed at the entrance to the gate and condemned raises. No fence or barrier will be erected around the underground mine, as the sector is not visited often, no matter the season.

5.2.3.11.2 Restoration of Piles

Waste rock piles and ore stockpiles will be restored; their ground footprint will then be characterized as to provide adequate management in the event that contamination is present. These accumulative areas will be levelled as required to control erosion and restore their natural appearance.

5.2.3.11.3 Water Management Infrastructure

For the main water collection pond, the restoration principle will be to remove the membranes and spread the dike on-site since it will be built from NAG material.

The ditches that ensure water segregation around the mine site will also be restored.

5.2.3.11.4 Surface Infrastructure and Heavy Machinery

All buildings and surface infrastructure that will not be used for post-closure monitoring of the underground mine will be removed and recovered for reuse in the context of the NNiP. When it has been shown that the monitoring complies with the applicable requirements, the remaining buildings and infrastructure will also be recovered. Surfaces will be leveled as required to control erosion and restore as much of the natural appearance as possible.

5.2.3.11.5 Reusable Products, Petroleum Products and Residual Materials

- Petroleum products, gasoline, diesel, oils and greases will be returned to the Expo mining complex where they will be temporarily stored in a safe manner before being used in the context of NNiP activities.
- Chemicals that have not been used for water treatment will be returned to the Expo mining complex where they will be temporarily stored in a safe manner before being used in the context of NNiP activities.
- Waste materials, non-hazardous and hazardous, will be disposed of in accordance with CRI's residual materials management procedures, which are based on the regulations in force.

5.2.3.11.6 Potentially Contaminated Soil and Materials

After mining activities have stopped, a characterization study of the land will be carried out, as prescribed by section 31.51 of the EQA. CRI will take the necessary measures in accordance with the provisions of the EQA and the Land Protection and Rehabilitation Regulation (c. Q-2, r.18.1.01) in the event that this characterization reveals the presence of contaminants above and beyond the criteria established by the regulations. Contaminated soil, if any, will be transported to southern Quebec for treatment at an authorized site.

5.2.3.12 Project Schedule

The project activities will be carried out according to the schedule presented in Table 5-40. At present, the Nanaujaq project is planned to end in 2029. Therefore, the restoration will begin in 2030. The MCP's deconstruction will be done when the post-operations water analysis in the MCP allows.

Table 5-40: Nanaujaq Project Schedule

Activities	Dates
Construction of the site's access roads	2024
Construction of surface buildings and infrastructures	2024
Construction / installation of electrical, transport and support infrastructure	2024
Water management infrastructure construction	2024
Ramp development	2025
Construction of a ventilation raise and emergency exit	2025
Operations	2026-2029
Restoration	2030-2032

5.2.3.13 Project Cost

The Nanaujaq project's preliminary costs are detailed in the table below:

Table 5-41: Nanaujaq Project Phase Cost Details

Project phase	Cost (CAD$ 2022)
Access road	-
Water management infrastructures	$4M
Surface infrastructures	$4M
Ramp development	$16M
Operational development	$83M
Engineering	$0.5M
Production costs	$177M

5.2.4 Expo South Project

5.2.4.1 Expo Deposit location

The Expo South deposit is located at the Expo industrial complex, more precisely approximately 500 meters from the Expo open pit. The Expo South deposit is an ore lens adjacent to the Expo West deposit. CRI wishes to exploit this section of the deposit via underground extensions. The site is already accessible by land.

The Expo site's central geographical coordinates are indicated in table 5-42.

Table 5-42: Expo Site's Geographical Coordinates

	Degrees	Decimal degrees	NAD83 / UTM zone 18N
Latitude	61º 33’ 24.84" N	61.5569° N	6,825,777 m N
Longitude	-73° 28' 3.72" W	-73.4677° W	581,416 m E

The mining lease request process is underway with the MERN.

The Expo South deposit's location is shown on Maps 2-1 and 5-6.

5.2.4.2 Surface Infrastructures

5.2.4.2.1 Existing Infrastructures Under the Authorized Expo and Expo West Projects

All of the pre-existing elements at the Expo site (infrastructure, power station, industrial processes, camp and the tailings disposal site, in addition to the waste rock pile and water collection pond, water treatment) will be reused to support underground operations of Expo South. Moreover, several pre-existing infrastructures for the Expo West underground exploitation will be retained for the Expo South exploitation, specifically the access portal to the underground deposit, the support infrastructure pad and the temporary ore stockpile. Thus, very little additional infrastructure is required for this new project.

5.2.4.2.2 Additional Infrastructure Required for Expo South Underground Exploitation

The infrastructure required for the Expo South deposit exploitation is limited to a few roads to access the new ventilation raises (three) and emergency exits (three). The Expo South mine's surface infrastructures are illustrated on Map 5-6.

5.2.4.3 Deposit Description

5.2.4.3.1 Mineralogy

As described in the technical memorandum by Golder (2022c), the local geology of the NNiP deposits consists of mafic volcanic and metasedimentary rocks, as well as intrusions of ultramafic rocks.

The Expo South deposit presents lithology and mineralogical assemblages similar to the other NNiP deposits. Since the mining plan is still under development, the sections of the primary lithologies had to be extrapolated from the drilling results.

The different lithologies of the Expo South deposit's mineralized zone include a gabbroic intrusion, a peridotite and a metasedimentary unit. This formation type is seen in several other Nunavik Nickel mine deposits. The different lithologies demonstrate disseminated sulphides including nickel, copper and platinum group elements.

5.2.4.3.2 Geochemical Characterization

The Expo South site's acid-generating and leaching potential have been classified in the report *Caractérisation géochimique du minerai et des roches stériles du gisement Expo Sud – essais statiques. Mémorandum technique 1027-20138922-15000-MTF-RevA* (Golder, 2022c). This report is included in Appendix E.

The ore and waste rock were classified according to the *Guide de Caractérisation des Résidus Miniers et du Minerai* (MELCC, 2020), the soil and water quality criteria of the *Guide d'intervention – Protection des Sols et Réhabilitation des Terrains Contaminés* (Beaulieu, 2021), and according to the static test results carried out. Depending on the results obtained, the materials were then categorized according to the site's applicable categories, being either acid-generating, leachable, low risk or high risk.

According to the results obtained, the sedimentary rock tailings show a low neutralization potential and a considerable sulfur content. This lithology is therefore classified as having acid-generating potential and has a copper leaching potential. Some non-graphitic sediment samples also show iron concentrations higher than those of the final effluent criteria of Directive 019.

Waste rock from gabbro, peridotite and pyroxenite lithologies show a variable acid-generating potential. These lithologies mainly demonstrate a low content or absence of carbonate minerals to neutralize acid drainage. These lithologies are thus classified as acid-generating and must be managed as such. The gabbro and peridotite are also leachable. Peridotite is not leachable but could become leachable if exposed to acid- drainage. None of materials tested classified as being high-risk.

The test results are summarized in Table 5-43.

Table 5-43: Summary of Waste Rock Classification from the Expo South Site According to Directive 019 (Golder, 2018)

Lithology	Estimated proportions of waste rock	Static test results	
		AMD Potential	Leachability
Ultramafic (Peridotite and Pyroxenite)	36%	PAG variable	Leachable
Gabbro	10%	PAG	Leachable
Sediment	54%	PAG	Leachable

All ore samples are considered to have acid-generating potential due to their high sulfur content (average 23%) and low neutralization potential. All ore samples are also considered leachable, especially for nickel.

5.2.4.4 Resources and Reserves

According to the latest reports on the resources and reserves, the estimated total tonnage for the underground exploitation of the Expo South underground deposit is 681 kt. Tables 5-44 and 5-45 present the tonnage of mineral resources and reserves.

Table 5-44: Mineral Resources from the Expo South Deposit

Type	Tonnes	Ni (%)	Cu (%)	Co (%)	Pt (g/t)	Pd (g/t)	Au (g/t)
Measured / Indicated	749,232	1.13	0.94	0.07	0.36	1.38	0.05
Inferred	261,155	0.85	0.52	0.06	0.18	0.99	0.03

Table 5-45: Expo South Deposit Reserves

Type	Tonnes	Ni (%)	Cu (%)	Co (%)	Pt (g/t)	Pd (g/t)	Au (g/t)
Proved / Probable	680,703	0.59	0.43	0.04	0.16	0.71	0.02

5.2.4.5 Ore Extraction

The ore extraction rate for the Expo South deposit will be 1,500 t/d. It is estimated that 49,410 tonnes of ore will be extracted during the development phase and 631,293 tonnes during the sites' exploitation. As per the mining exploitation plan, the planned extraction per year according to the sequence indicated in Table 5-46.

Table 5-46: Yearly Extraction, Expo South Deposit

Year	1	2	3	Total
kt ore/year	49	548	84	681

The Expo south project should generate approximately 346 kt tons of waste rock and 681 kt of ore in total during the exploitation. A summary of the waste rock, ore, concentrates and tailings amounts estimated for the project's operating life is presented in Table 5-47.

73°28'0"
73°27'0"
73°26'0"
61°33'40"
61°33'20"

Halde à stériles existante à régulariser / Existing waste rock pile to be regularized
125 950 m²

Halde à stériles autorisée au CA global initial / Waste rock pile authorized at initial global CA
199 960 m²

COMPLEXE EXPO / EXPO COMPLEX

Halde à minerai autorisée au CA global initial / Ore stockpile authorized at initial global CA
23 162 m²
74 951 m²

Halde à minerai existante à régulariser / Existing ore stockpile to be regularized

Fossé H / Ditch H
Fossé A / Ditch A
Fossé A / Ditch A
Fossé I / Ditch I

Conduite d'effluent de la mine Expo / Discharge pipeline of the Expo mine

Vers le site MEQUILLON / To the MEQUILLON site

Portail Expo Ouest / West Expo portal

EXPO OUEST

Bureaux / Offices

Halde de minerai Expo Ouest / Expo west ore stockpile

Cheminée de ventilation / Ventilation raise #1

Sortie d'urgence / Emergency exit #1

Cheminée de ventilation et sortie d'urgence / Ventilation raise and emergency exit #3

Cheminée de ventilation / Ventilation raise #2

Sortie d'urgence / Emergency exit #2

Zone d'étude 2021 EXPO SUD / Study area 2021 EXPO SOUTH (10.17 ha)

Cheminée de ventilation et sortie d'urgence / Ventilation raise and emergency exit #4

Bail minier demandé / Mining lease requested

Composantes du projet / Project components

- Zone d'étude 2021 / Study area 2021
- Halde utilisée / Existing stockpile
- Infrastructure projetée / Planned infrastructure
- Conduite de rejet de l'effluent / Discharge pipeline

Végétation / Vegetation

Milieu terrestre / Terrestrial environment

- Felsenmeer / Felsenmeer

Lieu d'enfouissement en milieu nordique / Northen landfill (LEMN)

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Haldes à stériles et à minerai à Expo et infrastructures projetées pour l'exploitation du gisement Expo Sud / Expo waste rock pile and ore stockpile and planned infrastructures for the exploitation of the Expo South deposit

Sources:

Imagerie/Imagery, Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
CanVec, 1:50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties 2022

Inventaire et cartographie/ Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c5_6_ExpoSud_220531.mxd

0 70 140 m
UTM, Zone 18, NAD83

Carte / Map 5-6

Juin / June 2022

AECOM · NUNAVIK NICKEL · CANADIAN ROYALTIES INC.

Table 5-47: Tonnage (t) of Waste Rock, Ore, Concentrate and Tailings Produced During the Expo South Deposit Exploitation

Waste rock	Ore	Concentrates	Tailings
345,628	680,703	49,100	631,603

5.2.4.5.1 Underground Mine Characteristics

Exploiting the Expo South deposit does not require a new ramp to the surface since it will be reached from the ramp located between Expo West and Expo South.

However, new ventilation raises will be required for ventilation as well as for the emergency exit. They will be built in 2023. The Canadian Royalties exploration team is also studying the possibility of resources for other ore pockets, which would also be accessible via the Expo West access ramp.

The deposit will be mined according to the transverse longhole method. These boreholes allow the block to be broken down in successive transverse sections. Given the presence of continuous permafrost, calcium chloride (115 g/l) is used as a dense fluid during drilling to keep the water used in a liquid state. The deposit will be divided into several stopes separated by pillars to prevent the walls from collapsing (Figure 5-11). Each stope will be backfilled with rock fill to support the pillars after the exploitation. At 200 m and 300 m deep, it is possible that the ground is thawed, the stope design will be conservative in the geotechnical parameters if the permafrost stops at 200 m underground (Table 5-48).

Table 5-48: Nominal Spacing of Levels and Cross-Sections by Depth

Depth under surface	Condition	Room height between the levels	Room width (perpendicular cross-sections)
0-200 m	Permafrost	20 m	22 m
200-300 m	Thawed	22 m	18 m
300 and over	Thawed	20 m	28 m

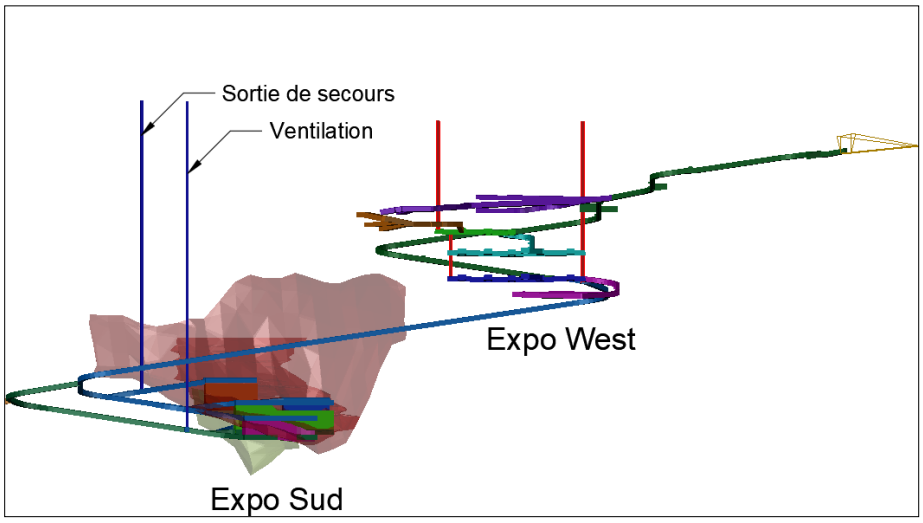


Figure 5-10: Expo South Underground Mine

The sinking of the ramp and mining the underground sites will generate waste rock, which will later be returned underground to backfill the mined sites. Bi-train trucks will be used for loading and transporting ore.

5.2.4.5.2 Explosives Preparation and Transport

The emulsion will be used as the main explosive for ore production as to optimize the fragmentation. Electronic detonators will be used to reduce the chances of finding undetonated explosives. The holes drilled for explosives will be filled using an emulsion pump designed for this purpose. After manufacturing at the Dyno Nobel plant, the emulsion will be transported to the Expo South site and transferred to emulsion loading equipment going underground. It will not be stored at the Expo site.

The ANFO and standard detonators will be used for the development. In this case, an ANFO loader will be used for loading rounds.

Emulsion will be supplied from the Dyno Nobel emulsion plant, which is located east of the Expo mining complex. After manufacturing at the Dyno Nobel plant, the emulsion will be transported to the Ivakkak site and transferred to emulsion loading equipment going underground. The emulsion prepared at the factory will be used immediately upon arrival at the site to load the blast holes.

Explosives requirements are estimated at approximately 229,531 kg of ANFO for development and 252,517 kg of emulsion.

The plastic from explosive packaging is returned to the explosives depot and managed separately from other packaging types. They are burned in the explosives depot area located at Expo, in accordance with the Act Respecting Explosives (L.R.Q., c. E-22).

5.2.4.5.3 Mining Equipment

The boreholes are created by a top hammer longhole drill to insert the emulsion. A backhoe loader will be used to load the mining trucks to transport ore.

Production and service equipment also includes a grader and a 20,000 L tanker truck for watering surfaces to prevent the dust from rising, when required.

All equipment required is presented in Table 5-49.

Table 5-49: Equipment Required

Equipment	Quantity
Electric boom / Jumbo hydraulic	2
Power bolter	1
Service truck (loader-shuttle)	3
Tow truck (30 t capacity)	5
Gas/oil truck	1
ANFO charger	1
Tanker truck - 20,000 L	1
Longhole drill	2
Grader	1
Emulsion pump	2
Scissor lift	1
Personal Vehicle	3

Arctic diesel will be used for mining equipment, pumps and generators.

Table 5-50 shows the anticipated maximum weekly trucking frequencies.

Table 5-50: Anticipated Maximum Trucking Frequencies

Ore (reserves) (tonnes)	Operation time (years)	Tonnage hauled at full production (tonnes/day)	Truck capacity (tons)	Number of trips per week
680,703	2	1,500	30	350

5.2.4.6 Management of Ore, Tailings, Waste Rock and Overburden

5.2.4.6.1 Tailings Management

All mine tailings generated in the context of the deposit exploitation project will be managed in the tailings disposal site at the Expo mining complex.

5.2.4.6.2 Waste Rock Management

Waste rock will be used directly as backfill for the Expo West and Expo South mines. Therefore, the Expo South site does not require a waste rock pile, since all the waste rock will be used as backfill and will not have to be brought to the surface. If more waste rock is needed as backfill after the Expo South development, the required amount will be taken from the Expo pit waste rock pile.

5.2.4.6.3 Ore Management

The ore will be extracted from the mine using AD30 type trucks and will be temporarily stored in the Expo West temporary ore stockpile, before being transported by bi-train trucks and processed at the Expo complex plant.

The Expo West ore stockpile has sufficient capacity to accommodate ore from Expo South without any modifications required.

5.2.4.6.4 Overburden Management

No overburden or topsoil is, or will be, stockpiled for reuse during restoration. The quantities present on the natural soil in this northern context are not significant and insufficient for them to have any value in terms of reuse.

5.2.4.7 Water Management

5.2.4.7.1 Industrial Water and Water Management Infrastructures

Surface drainage water consists mainly of water from precipitation and from snow melt running off the mining site, specifically onto the waste rock pile, the ore storage area and the portal area.

The Expo West ditch network is already designed to minimize contact water that requires treatment. While the new ventilations raise and access roads infrastructures have no impact on water quality, there will be no modifications to the ditches for the Expo South addition.

It is estimated that the production of underground mine water will be negligible since it will not be heated; if necessary, it would be directed to the MCP by pumping.

The water required for mining operations will come from clean water tanks located on the surface when operations begin. The water will then be recirculated after the supply sumps have been put into operation. Periodic additions of fresh water (at variable frequency depending on the season) into the network will be required to compensate for the loss caused during extraction outside the mine.

The mine site drainage water will be diverted to the Expo MCP collection pond through ditches and berms. A pump system installed at the low point of the collection pond will allow the continuous pumping of free water during the spring thaw period and the summer season. The water pumped will be treated by the Expo water treatment plant (WTP) and discharged into the Expo effluent.

5.2.4.7.2 Mine Wastewater Treatment

Expo South is an extension of Expo West and is part of the Expo site's water network. Potentially contaminated water will be routed to the Expo site's existing main pond. There will be no change to the water treatment system.

5.2.4.7.3 Domestic Wastewater

Sanitary wastewater will be temporarily stored in a 10,000 L tank before being transported by siphon truck to the Expo complex wastewater treatment plant.

5.2.4.7.4 Drinking Water

Drinking water required for the employees working at the Ivakkak mine will come from the Expo drinking water treatment system and be brought by 20 L bottles, for consumption only. Fresh water from Lac du Bombardier will be transported by tanker truck and will be stored in a 10,000 L tank that will be located near the Ivakkak site service building. This fresh water will cover needs other than human consumption (washrooms, sinks, etc.).

5.2.4.8 Access Road

An access road will be built at the Expo South site, which bypasses the Expo pit to the south of the Expo West offices. This route will provide access to the Expo South mine's ventilation raise and emergency exit.

5.2.4.9 Waste Management

The primary sources of waste from the Expo South project are domestic waste, oils, explosive packaging and scrap from the mechanical and welding workshop. As estimated in the context of the NNiP, each worker will produce around 2 MT of residual materials annually, or approximately 32 MT annually for the duration of this project.

Due to the numerous waste sources, activities and infrastructures for waste management have been centralized to the southeast of the Expo industrial complex. Under the framework of the Expo South project, waste will continue to be managed in the same way as authorized and described previously in section 4.2.2.9 of this document.

5.2.4.10 Workforce

About twenty employees will be assigned to the Expo South deposit during the work, as presented in Table 5-51. Workers will be divided into 2 shifts: 6:00 a.m. to 6:00 p.m. and 6:00 p.m. to 6:00 a.m., 7 days a week

Table 5-51: Workforce Required for the Expo South Deposit Exploitation

Responsibility	Number of employees required
Driller	2
Loader-shuttle operators (scoop)	2
Truck operator	4
Jumbo operator	1
Bolter operator	1
Foreman	1
Blasters	2
Service miners	2
Construction miners	1

It is also necessary to consider the CRI employees assigned to the supervision and engineering of the works, the persons responsible for the maintenance of the buildings, in addition to the health care staff, who'll divide their time between the various exploitation sites.

5.2.4.11 Mine Restoration

Under the terms of the Mining Act, the project is subject to the restoration of land affected by mining activities. The Expo site is included in the Nunavik Nickel restoration plan. The Expo South underground exploitation will be included in the next revision plan and will be produced in accordance with the particularities and general requirements contained in the Guidelines for Preparing Mine Closure Plans in Quebec from MERN, and in which the applicable measures will be found. In particular, it will include a detailed description of the restoration and rehabilitation work planned during the operation phase and once the mining activity is completed.

The following interventions are generally foreseen:

- Securing mined sites and areas;
- Dismantling and disposing of buildings and infrastructures;
- Restoring waste rock pile areas and temporary ore storage areas;
- Managing surface water and contaminated water, if any;
- Scarifying secondary access roads to obstruct access to the remnants of the mining infrastructure;
- Monitoring the works' integrity and performing comprehensive environmental monitoring.

In accordance with the regulation in effect, CRI will follow up the mining restoration to ensure that the discharge objectives are met for the protection of the receiving environment.

The restoration activities specific to the Expo South project to be carried out upon closure are briefly described in the following sections. It should be noted that the restoration of the preauthorized project's elements within the framework of the Expo pit's exploitation and the site's industrial complex can be consulted in the restoration plans developed thus far for the site.

5.2.4.11.1 Underground Mine Restoration

The waste rock produced during the Expo South mine's development will be used as backfill for the Expo West mine, which will already be in production, and then as backfill for the Expo South sites when production begins. The additional waste rock produced will also be used as backfill material at the end of the mine's exploitation. The physical stability of the surface pillars will also be assessed by a qualified engineer. Any risk of these pillars collapsing will be reduced beforehand by backfilling the at-risk sections.

To eliminate the need for fencing maintenance after exploiting the underground deposit, the portal and all access points to the underground mine will be secured with NAG rocks. To ensure the safety of the premises, the daylight openings from the ventilation raises and emergency exits will be plugged with concrete caps. Trilingual signs (English, French and Inuktitut) indicating the danger will be installed at the entrance to the gate and condemned raises.

5.2.4.11.2 Surface Infrastructure and Heavy Machinery

All buildings and surface infrastructure that will not be used for post-closure monitoring of the underground mine will be removed and recovered for reuse in the context of the NNiP. When it has been shown that the monitoring complies with the applicable requirements, the remaining buildings and infrastructure will also be recovered. Surfaces will be leveled as required to control erosion and restore as much of the natural appearance as possible.

5.2.4.11.3 Reusable Products, Petroleum Products and Residual Materials

- Petroleum products, gasoline, diesel, oils and greases will be returned to the Expo mining complex where they will be temporarily stored in a safe manner before being used in the context of NNiP activities.
- Chemicals that have not been used for water treatment will be returned to the Expo mining complex where they will be temporarily stored in a safe manner before being used in the context of NNiP activities.
- Waste materials, non-hazardous and hazardous, will be disposed of in accordance with CRI's residual materials management procedures, which are based on the regulations in force.

5.2.4.11.4 Potentially Contaminated Soil and Materials

After mining activities have stopped, a characterization study of the land will be carried out, as prescribed by section 31.51 of the EQA. CRI will take the necessary measures in accordance with the provisions of the EQA and the Land Protection and Rehabilitation Regulation (c. Q-2, r.18.1.01) in the event that this characterization reveals the presence of contaminants above and beyond the criteria established by the regulations. Contaminated soil, if any, will be transported to southern Quebec for treatment at an authorized site.

5.2.4.12 Project Schedule

The Expo South project schedule is presented in Table 5-52.

Table 5-52: Expo South Project Schedule

Activities	Dates
Access ramp development between Expo West and Expo South	2023
Construction the road, a ventilation raise and emergency exit	2023
Exploitation period	2024-2025
Restoration period	2026-2027

5.2.4.13 Project Cost

The only capital costs to be invested for the Expo South mine will be the emergency exit, the ventilation raise and access ramp to the deposit, which will be done directly from Expo West (Table 5-53).

Table 5-53: Expo South Project Phase Cost Details

Project phase	Cost (CAD$ 2022)
Access road to ventilation raise and emergency exit	$0.225M
Engineering	$0.5M
Underground infrastructures	$1.22M
Ramp development	$20.28M
Capital development	$16.35M
Operational development	$8.38M
Production costs	$34.06M
Other costs (i.e., concentrator, shipping, geology etc.)	$75.75M

5.2.5 Related Projects

5.2.5.1 Modification of the Expo In-pit Tailings Disposal Management

5.2.5.1.1 Context

A modification to the global CA regarding the Expo in-pit tailings disposal and flooding was issued on January 6, 2022. Therefore, this modification supports the continuation of the already authorized NNiP deposits exploitation, by allowing the tailings to be deposited in an infrastructure other than the tailings cells, which will reach their full capacity in 2022. The authorization modification under section 30 of the EQA was issued on February 8, 2022 (Y/Ref.: 7610-10-01-70080-53 / 402100406).

A modification to these authorized tailings management method is however necessary within the framework of Phase 2a, which extends the NNiP's operating life and also extends the tailings generating period. To this intent, CRI has mandated Golder Associates Ltd. to carry out the design for the tailings disposal in the Expo pit in respect to the Phase 2a projects. As a result, the Expo pit will store most of the Phase 2a mine tailings and will be completely filled when the maximum water level of 534.49 m has been reached.

The study is presented in Appendix F of this document. It details the project design fundamentals, the tailings deposition and closure phase sequence, including water management, mitigation measures and monitoring programs for these phases. The concept was presented as a teleconference by Golder and CRI to a group of experts of the MELCC and MERN on March 28th, 2022. The presentation is available at the end of Appendix F.

Its summary is presented below, along with certain details regarding the tailings production plan and the project schedule.

5.2.5.1.2 Project Description

The excerpt below presents Golder's disposal study summary (2022a) as well as certain details regarding the tailings production plan and the project schedule.

> *"As of January 1, 2022, the total ore reserve of the above deposits is approximately 18.21 Mt. Some of the mine tailings from the deposits affected have been shown to have acid-generating and leachable potential, while other tailings have not yet undergone a complete geochemical characterization, or are in the process of characterization. Since the deposits have geological similarities, all tailings from all deposits that will be deposited in the Expo pit are a priori considered to be acid-generating and leachable, as are those from the preauthorized deposits and those stored in cells 1 and 2 of the existing tailings disposal site. The anticipated*

delay before the Phase 2 tailings acidification is not yet known since the kinetic tests have not yet begun for these deposits. However, the ore's average total sulfur content in some of the Phase 2 deposits is greater than 20% and is also higher than the total sulfur content of the tailings stored in Cell 1 of the current tailings disposal site (from 5.4 13.1%; Golder 2021). Due to their higher sulfur content, the tailings that will come from some Phase 2 deposits could acidify more quickly than the current tailings (Golder, 2013, 2021). Consequently, the oxidation process control will be important, from deposition to closure and it will consist of ensuring a high saturation rate in operation, as well as covering the Expo pit quickly after it has been completely filled. The concept of the in-pit tailings disposal is based on completely filling the pit with tailings, with no pit lake at the disposition end and no pit water discharged into the environment during the post-restoration period, except runoff on the closure cover's surface, which will not come into contact with the tailings. The tailings will be confined by the surrounding frozen soil and bedrock (permafrost) according to the thermal analysis on which the design is based, and no additional measures will be required to prevent the surrounding environment from being contaminated, except the need for rapid recovery at the end of mine's operating life, according to the pit deposition plan, as to prevent acidic drainage developing when the tailings are not flooded.

The water management plan during the Expo pit deposition (operation phase) will initially be associated with the tailings deposition with a volume of supernatant water stored in the pit. The volume available for water in the pit will then be sufficient for the ore processing plant's recirculation requirements. The water will be partially pumped to the water treatment plant starting in 2028 (estimated date according to the simulations), or as soon as the water level reaches 530.8 m, as to reduce the pit's water volume and thus the risk of overflows during the years of exploitation. Pre-treatment using the Fenton process will be required at the water treatment plant before conventional treatment, due to the high concentration of supernatant water in solutes from tailings. Toward the pit filling completion (2030), the storage volume available in the pit will no longer be sufficient to contain the design flood (24-hour rainfall with a return period of 1000 years), nor the volume of water due to snowmelt without overflowing into the environment. The water volumes relating to the pit will then have to be redirected to another water management infrastructure, which must be determined in a later project phase (see paragraph below). The tailings deposition in the Expo pit as part of Phase 2 provides storage capacity until January, 2031. This storage capacity is not sufficient to handle all of the current tonnage anticipated by mine planning. Another tailings management infrastructure, not described in this study, will then be required to store the remaining tailings. Once the Expo pit is filled with tailings, a closure cover will then be quickly placed over the final tailings surface to create a long-term stable surface, to provide chemical stability for the tailings and minimize dust formation and runoff infiltration. This surface will be contoured in such a way as to limit the amount of covering materials required before adding the covering and to prevent any surface water accumulation, which could increase infiltration. Water infiltration control will be done by using a linear low density polyethylene (LLDPE). This membrane will be protected by an engineered backfill resistant to erosion from runoff water. Runoff water will be collected by a drainage network on the closure cover's surface by a ditch at the pit's outlet and its amount measured as to determine when the runoff's quality will be acceptable to be discharged into the environment. This cover system will not be affected by the temperature variation potentially caused by climate change and it is not intended to protect the tailings surface in frozen conditions, although the expected freezing of the tailings by permafrost aggradation is beneficial to the geochemical stabilization of the covered tailings.

During operations, Expo pit's thermal behaviour monitoring during all phases is based on monitoring data from the thermistors that must be installed around the pit and inside the tailings. The monitoring program includes the pit walls geotechnical monitoring, monitoring of the pipes used for tailings deposition and water management, as well as water level monitoring and pit tailings. Management monitoring in the post-operation and post-restoration periods, the post-operation monitoring program will begin when the Expo pit is completely filled with tailings and will end when restoration work is complete and/or until the mine contact waters meet established quality criteria. The post-restoration monitoring period will begin once the site contact water quality is acceptable for discharge into the natural environment. In the post-operation and post-restoration periods, the monitoring program focuses on the inspection and maintenance of the Expo pit's engineered cover and drainage system. The primary risks are surface erosion and profiling degradation

that allow the surface water to drain, which can lead to water accumulation and excessive infiltrations in the covering, as well as water quality degradation.

Therefore, the Expo pit will make it possible to store part of the mine tailings planned in CRI's current mining plan, which extends until 2034. Future studies must be conducted to precisely identify the other tailings disposal site(s) that will be required after the Expo pit is full and to carry out the detailed design."

Moreover, reaching the pit's capacity will be based on reaching a maximum level of 534.47 m (Table C-9 of Appendix C of the design report), established by Golder, rather than by estimating the amount deposited. Indeed, the amount deposited could vary according to several external factors (e.g., the recovery rate, the granulometry, the compaction), whereas the maximum elevation is invariable.

5.2.5.1.2.1 Mine Tailings Production and Disposal Plan

As of January 1, 2022, the total NNiP ore reserves, including the new Phase 2 deposits, is approximately 18.21 Mt. Total tailings production will be approximately 17.33 Mt, based on CRI's estimate of a tailings to ore ratio of 0.96. Their annual production is detailed in Table 5-54.

Data regarding the residual storage capacity of the Expo tailings facility are presented in Golder's study (2022a) and summarized below (Table 5-55). These are based on design data, a drone survey of the windrow in September 2021, as well as a bathymetric survey of the tailings pond. The residual storage capacity of the Expo tailings disposal site's tailings cells was 1.13 Mt according to the latest data available.

The pit's capacity is estimated at 12.69 Mt of tailings. Considering that 17.33 Mt of tailings is expected to be generated by 2034, another tailings management infrastructure, not described in this study, will be designed and subject to the authorization process. It is estimated that the pit will be completely filled in 2031. However, reaching the pit's capacity will be based on reaching a maximum level, established by Golder, rather than an estimate of the tonnage deposited.

Table 5-54: Estimated Annual Production of Mine Tailings (January 2022 to the End of 2034)

Year	Ore	tailings total to be stored	
	(t)	(t)	(m^3)
2022	1,642,500	1,578,985	1,064,724
2023	1,642,500	1,576,047	1 062,743
2024	1,531,840	1,460,337	984,718
2025	1,642,500	1,563,879	1,054,538
2026	1,642,500	1,565,331	1,055,517
2027	1,578,422	1,489,918	1,004,665
2028	1,642,500	1,543,780	1,040,984
2029	1,642,500	1,544,118	1,041,213
2030	1,383,334	1,304,900	879,906
2031	1,136,046	1,084,091	731,012
2032	1,010,000	973,008	656,108
2033	861,000	829,466	559,316
2034	851,000	819,832	552,820
Total	**18,206,643**	**17,333,693**	**11,688,262**

Table 5-55: Update of the Residual Storage Capacity of the Tailings Disposal Facilities

Expo site mine tailings disposal site infrastructure	Cell 1	Cell 2	Total
Design storage capacity (m^3)	3,350,000	4,750,000	8,100,000
Open water present in the tailings disposal site (m^3)	140,000	10,000	150,000
Residual storage capacity as of January, 2022 (m^3)	575,000	185,000	760,000
Residual storage capacity as of January, 2022 excluding free water (tonnes)	852,725	274,355	1,127,080

5.2.5.1.2.2 Surveillance Programs

A surveillance program is planned for the exploitation, post-exploitation and post-restoration phases. These surveillance programs include geotechnical and water quality monitoring. They are detailed in sections 5.4 and 6.4 of the tailings deposition study in appendix (Golder, 2022a).

5.2.5.1.2.3 Workforce, Costs and Project Schedule

About eight employees will be required for the installation, supervision, as well as quality control and welding for the membrane installation work. Moreover, approximately eight CRI staff will also be involved for the material layers under, or on, the membranes (Table 5-56).

The project schedule by activity is presented in Table 5-57. The costs estimated for this work are detailed in Table 5-58.

Table 5-56: Workforce Required for the Expo In-Pit Tailings Disposal Facility

Responsibility	Number of employees required
Quality control technician	1
Welder	1
Installer	5
Supervision	2
Wheel loader operator	1
Truck operator	3
Tractor operator	1
Compactor operator	1
Forklift operator	1

Table 5-57: Expo In-pit Tailings Disposal Facility Project Schedule

Activities	Dates
Tailings deposition period in the Expo pit	2022-2031
Recirculation of the pit supernatant to the ore processing plant	2022-2030
Pumping to the Fenton water treatment plant	Starting in 2026
End of pit filling	2029-2030
Beginning of work closure	Starting in 2031
Covering implementation	2031-2033

Table 5-58: Cost details – Tailings Disposal Site - Expo Pit

Project phase	Cost (CAD$ 2022)
Expo pit (covering)	4,644,698
Drainage work	110,991

5.2.5.2 Expansion of the Ore Stockpile at the Expo Industrial Complex

5.2.5.2.1 Context

The ore from each of the NNiP sites is transported to the Expo site ore stockpile and stored in different piles depending on the ore's characteristics before being processed at the concentrator. The initial design did not consider certain operational necessities, which led to underestimating the surface area requirements. In particular, the multiple deposits of the NNiP each require several separate piles and a certain space is required for the movement of equipment, particularly bi-trains. This resulted in the use of a larger area than that planned in the initial and authorized design and it is planned to regularize this situation.

5.2.5.2.2 Project Description

The authorized storage area is 23,162 m². However, operational necessities led to the occupation of 74,951 m². The project plans to regulate this situation.

An area of 74,951 m² is required for the movement and safe unloading of bi-train transport trucks, which bring the ore to the pile from the satellite mines, as well as for a spacing between the ore piles so heavy machinery can navigate between them. The ore is separated into a maximum of 9 piles on the pad, allowing segregation according to the ore's characteristics coming from the different deposits. This makes it possible to supply the ore processing plant by alternating the different piles according to a predefined recipe and to optimize the ore processing operations. It is planned to continue this strategy during Phase 2a. The surface currently being used is still necessary, for a capacity representing 500,000 tonnes.

The limits of the authorized dump and its proposed expansion are shown on Map 5-6.

5.2.5.2.2.1 Water Management

The water flowing over the ore stockpile is collected by a contact water ditch and directed to the main collection pond (Expo MCP). Another ditch is also used to divert clean water away from the pad. No change in water management is required

5.2.5.2.2.2 Restoration

Restoration of the Expo ore stockpile is covered in the Nunavik Nickel restoration plan; no changes are planned to the restoration method that has been approved.

5.2.5.3 Expansion of the Waste Rock Piles at the Expo Site

5.2.5.3.1 Context

The authorized waste rock pile area is 199,960 m². However, the amount of waste rock generated was underestimated in the initial 2007 ESIA and various circumstances also led to the unplanned waste rock being produced, which resulted in occupying an additional 125,950 m² area. It is planned to regulate this situation.

5.2.5.3.2 Project Description

The authorized area of the pile is 199,960 m², which represents a capacity of 4,632,119 m^3, i.e., 9,495,844 tonnes at 2.05 t/m^3. However, the quantity of waste rock generated during exploitation of the Expo pit led to the occupation of an additional 125,970 m². The pile was extended to the west, which was the only possible side given the topographical constraints to the north, the pit to the south and the tailings cells to the east. The project plans on regulating this situation and the surfaces are represented in Map 5-6.

Among the circumstances that generated unplanned waste rock at the time of the design and since the issuance of the authorization for the pile, two additional expansions of the Expo pit were required in order to obtain a better quality wall. These extensions served to secure the access ramps to the Expo pit. Also, blasting activities of approximately 50,000 tonnes and 750,000 tonnes of ore were required to secure the wall and move the ramps back to the north. The access ramp to Expo East has been widened to allow CAT775 production trucks to safely meet CNESST standards. These activities therefore generated additional waste rock to be stored.

Lastly, approximately 700,000 tonnes of low-grade, unplanned ore was also stored on the dump and gradually returned to the ore processing plant; it will be completely removed before the dump restoration phase.

Although the additional area of 125,950 m² must be maintained for the Phase 2 activities, an additional encroachment on this already occupied area is not required. In fact, part of the waste rock present on the pile will be returned to backfill the underground tunnels of the Expo West (already authorized and in progress) and Expo South projects.

The amount of waste rock stored on the entire pile will be approximately 15,579,353 tonnes, or 7,599,684 m^3, at the end of Phase 2a.

5.2.5.3.2.1 Water Management

The existing Ditch H collects all contact water from the pile, including the sections of the pile that must be regularized, and directs the water to the LCP (lower collection pond), from which the water is pumped to the Expo MCP. No change in water management is required for this project.

5.2.5.3.2.2 Restoration

The Expo waste rock pile restoration is covered in the Nunavik Nickel restoration plan. No change is planned for the restoration concept already presented, i.e., membrane covering.

5.2.5.4 Increase in the Expo Camp Occupancy Rate

5.2.5.4.1 Context

The currently authorized capacity of the Expo camp is 360 workers, and this capacity is authorized for 484 workers during the mining project's construction period.

To maintain the current mining plan activities, the Expo camp must be expanded to accommodate the workforce required for the construction and operation of new deposits. In an effort to increase the number of workers to approximately 700 people at the Expo camp for immediate and future needs, CRI also assessed the capacity of the sanitary wastewater treatment system (Map 5-7).

5.2.5.4.2 Project Description

5.2.5.4.2.1 Present and Future Needs

The camp occupancy estimate between 2022 and 2025 are presented below.

- For 2022, the Expo camp occupancy will be 528 employees with a peak occupancy of 547 employees during the summer.
- In 2023, the Expo camp occupancy will be 600 employees with a peak occupancy of 621 employees.
- In 2024, the Expo camp occupancy will be 675 employees with a peak occupancy of 694 employees.
- For 2025, the Expo camp occupancy will be 618 employees with a peak occupancy of 638 employees. This decline in camp utilization is due to the planned opening of Camp Delta. This deposit will be the subject of a subsequent request during the NNiP's Phase 2b.

Consequently, CRI wishes to increase the camp's capacity to 700 workers. Futhermore, the addition of camp’s capacity will make it possible to deal with exceptional situations, such as a passenger flight unable to leave the same day due to mechanical or weather constraints.

5.2.5.4.2.2 Building Descriptions

The camp expansion will consist of two, three-storey buildings and one, one-storey building to add a total of 206 rooms.

The buildings will be constructed according to the same principle as the existing one, i.e., modular complexes made of 40' containers. The buildings will rest on pile foundations.

A first one-storey building will include 44 rooms. The two, three-storey buildings will include three superimposed wings per building. The first building will consist of wings O, P, Q as an extension of the existing wings L, M, N and will include 78 rooms in total, i.e., 26 rooms per floor. Each floor will also include a stairwell at each end of the hallway, as well as a mechanical room and a concierge room. Each floor will have dimensions of 36.6 meters by 12.2 meters (120' X 40'). This new complex will require the relocation of offices and the construction of a new corridor with utilities (offices, washrooms, locker rooms, dryers, electrical and mechanical room). These buildings will be made of containers, trailers and wooden arctic corridors and will rest on concrete blocks or jack stands.

The other three wings of the second building will have 84 rooms, or 28 rooms per floor.

5.2.5.4.2.3 Domestic Wastewater Treatment

CRI mandated CIMA+ to determine the best way (cost/benefit analysis) to increase the treatment plant's capacity to meet the anticipated needs in terms of sanitary wastewater treatment and ensure an effluent that meets MELCC requirements.

The current purification system includes two equalization tanks, two (2) rotary biological contactors (RBC) operating in parallel, two settling tanks and two (2) UV reactors operating in series. CRI wishes to acquire a more efficient treatment technology than that of RBCs.

The CIMA firm recommended to change the existing treatment process for this:

- Pre-treatment: grease trap / screen (sieve)
- Primary treatment: dissolved air flotation (DAF)
- Secondary treatment: RBGS / dissolved air flotation (DAF)
- Disinfection: UV reactor

The firm also assessed that it would be more beneficial to implement the new treatment chain in a new building, outside of the biodisc building. Thus, the biodisc treatment will be able to ensure the treatment of sanitary wastewater while new treatment unit is being implemented. It will also be possible to wait so all the performance requirements are met before demolishing the two biodiscs and thus keep the two systems operational during the adjustment periods.

The sector's details are being developed (redundancy, capacity, expected performance) and will be presented in the project regional authorization requests.

5.2.5.4.2.4 Drinking Water Supply

The drinking water required by workers staying at Expo will come from Bombardier lake, which will have previously been treated by the Expo water treatment system already in place and authorized.

Due to more workers, water consumption will be increased. However, this domestic water consumption remains marginal compared to the water needs of the ore processing plant. Calculated on the basis of an average consumption of 250 L/person/day, the estimated additional drinking water consumption for the Expo camp could reach approximately 173,500 liters/day at peak occupancy in 2024, which represents an increase of about 62,000 L/day. Comparatively, an average of 2,005,582 L/day was withdrawn from Lac du Bombardier, of which 1,744,847 L was intended mainly for the operations of the ore concentrate plant and 111,237 L/day for the consumption of potable water.

No modifications, other than minor ones, are planned for the drinking water treatment system.

5.2.5.4.2.5 Waste Management

Waste will continue to be managed as already authorized under the NNiP. The increase in workers will lead to a minor increase in the quantity of waste. The addition of a landfill cell described later in this report is the result of extending operations, not increasing workers.

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Augmentation de la capacité du campement Expo / Increase in the capacity of the Expo camp

Sources:

Imagerie/Imagery : Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Données de projet/Project data, ING-365_02 - Implantation.dwg, Canadian Royalties, Mai/May 2022

Cartographie/Mapping: AECOM
Fichier/File: 6063-5966_a-tr_c5_7_Expo_batim_220531.mxd

0 40 80 m
UTM, Zone 18, NAD83

Carte / Map 5-7

Juin / June 2022

CANADIAN ROYALTIES INC.
NUNAVIK NICKEL
AECOM

5.2.5.4.2.6 Workforce, Costs and Project Schedule

Approximately 45 employees are required to construct the buildings.

Project costs were estimated at $14.5M. The work schedule is shown in Table 5-60.

Table 5-59: Schedule for the Project to Increase the Expo Camp's Capacity

Activities	Dates
Building construction for adding 44 rooms	March, 2022
Building construction for adding 162 rooms	Between October and December, 2022

5.2.5.4.2.7 Restoration

The Expo camp restoration is included in the Nunavik Nickel restoration plan. The restoration concept for the new accommodation modules will be the same as what has already been approved.

The camp will be offered to the local Nunavik population when the NNiP mining activities are complete. However, it will be dismantled at the end of the restoration phase if not required by the local population. Demolition materials will be sorted and sent for recycling or disposal.

5.2.5.5 Increase in LEMN Capacity by Adding a Landfill Cell

5.2.5.5.1 Context

To increase the LEMN capacity (northern landfills), a second landfill cell is required to manage waste that will continue to be generated during Phases 2a and 2b. The remaining capacity of the current cell will not be sufficient to cover all the needs of these two phases.

5.2.5.5.2 Project Description

The second landfill cell will be located within the already authorized LEMN right-of-way. The dimensions will be approximately 19 m by 91 m for an area of approximately 1,505 m². It is expected that this new cell will provide the space required for NNiP Phases 2a and 2b.

An updated plan of the LEMN, including the planned new landfill cell, is shown on Map 5-6. A space has also been provided for the installation of geotubes, in order to dewater the sludge, resulting from the treatment of domestic wastewater, stored in the two sludge cells and thus extend the life of the cells. This addition is exempt from an application for authorization or a declaration of conformity according to the REAFIE, if the conditions set out in the regulation are met. The project was presented in an email to the regional management of the MELCC and the exemption was confirmed.

5.2.5.5.2.1 Workforce, Costs and Project Schedule

The work requires about 5 employees. The equipment required will be a 390 excavator, 775 trucks and a D6 tractor and the work will be carried out according to the schedule indicated in Table 5-61.

Table 5-60: Project Completion Schedule to Add a Landfill Cell to LEMN

Activities	Dates
Authorizations	2024
Construction	2024
Operation	2024-2034

The excavation work costs are estimated at approximately $49,440.

5.2.5.5.2.2 Restoration

No change is planned for the restoration measures described in the existing LEMN restoration plan.

5.2.5.6 Regularization of the Deception Bay Camp Location

5.2.5.6.1 Context

As part of the changes to the global CA from March 5, 2012 (Project to increase permanent accommodation capacity in Deception Bay) and July 7, 2014 (Port infrastructure development in Deception Bay), the location of the permanent post-construction camp was planned northwest of the concentrate warehouse and port infrastructure (see Map 5-8). Concretely, the relocation of the camp to this location did not prove to be realistic due to the lack of space and the effects of the proximity of the port infrastructures on worker health and safety (see Map 3.1 of the modification request for the 2014 CA; WSP, 2014).

5.2.5.6.1.1 Justification

In fact, the camp remained at the location of the temporary construction phase camp (see Map 5-8). CRI confirms that it wants to keep the camp in its current location throughout the NNiP's operation phase and until the restoration is complete.

The location planned in 2012 and then in 2014 did not take into account the additional space near the concentrate warehouse that would be required for additional land infrastructure (maintenance shop, dry, container storage, etc.) as well as for traffic and for parking trucks and other heavy vehicles. This proximity to work areas and the circulation of heavy machinery would have been a permanent risk to worker health and safety.

Ultimately, the camp's current location proves to be the best alternative, avoiding the potential impacts linked to relocation. No new encroachment into the natural environment is planned at the camp for port operations to continue.

5.2.5.6.2 Project Description

The description of the project components is provided below as a reminder.

5.2.5.6.2.1 Camp Capacity and Description

No change is planned in terms of worker capacity accommodation. It is still around 50 people. The average workforce is around 30 people.

The camp is made up of prefabricated modular buildings that include dormitories with sanitary facilities (showers and toilets), a kitchen, a cafeteria, a laundry room, administrative offices, as well as recreational areas (lounge, gymnasium).

74°50'0"
74°40'0"
74°30'0"
74°20'0"
74°10'0"
74°0'0"
62°15'0"
62°10'0"
62°5'0"

Détroit d'Hudson / Hudson Strait
Pointe Rouge
East Channel
Colline Avvajalik
False Passage
Île Siurartuuq
Main Channel
Île Arctic
Baie Ujararjuaq
Pointe Noire
Rivière Qungapalik
Baie Kangirsugaarjuk
Port de Baie Déception / Deception Bay port
Baie Déception / Deception Bay
Déception
Baie-d'Hudson, NO
Rivière-Koksoak, NO
Rivière
Lac Duquet
Nord-du-Québec (10)
Kativik (AR)
Lac François-Malherbe
Déception
Lac Paumart

A
Baie Déception / Deception Bay
Camp permanent prévu à l'EIES (2012) / Permanent camp planned at ESIA (2012)
0 60 m

B
Bail/ Lease 002333-21-910
Baie Déception / Deception Bay
Vers le port de Baie Déception / To Deception Bay port
Camp actuel Baie Déception / Deception Bay current camp
0 60 m

Cap Buteux
Baie Déception / Deception Bay
Détroit d'Hudson / Hudson Strait
Salluit
Déception
Carte / Map 5-8
Havre Douglas / Douglas Harbor
Purtuniq
Kattiniq
Kangiqsujuaq
Complexe Expo/ Expo complex
0 30 km

Secteur d'étude / Study area
Baie d'Ungava / Ungava Bay
Mer du Labrador / Labrador sea
Baie d'Hudson / Hudson Bay
Traité de 1927 du Conseil privé / 1927 Privy Council Boundary (non définitif) / (not final)
Kuujjuaq
Baie James / James Bay
Chisasibi
Schefferville
QUÉBEC
Waskaganish
Sept-Îles
Golfe du Saint-Laurent / St. Lawrence River
Rouyn-Noranda
Saguenay
T.-N.-L.
Québec
Océan Atlantique / Atlantic Ocean
N.-B.
Gatineau
Saint-Laurent
I.-P.-É.
N.-É.
Ont.
Montréal
ÉTATS-UNIS
Fleuve
0 300 km

Composantes du projet / Project components
- Bail / Lease

Infrastructures / Infrastructure
- Aérodrome / Aerodrome
- Route locale / Local road
- Autre route / Other road

Limites / Boundaries
- Municipalité / Municipality
- Parc national / National park

Sens de l'écoulement / Direction of flow

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Camp Baie Déception / Deception Bay camp

Sources:

BNDT, 1/250 000, RNCan, 2007
Orthophoto, WV3, 19 Août/August 2019
Adresses Québec, MERN Québec, 1er Mars/March 2022
Aire protégée du Québec, MDELCC, 31 Décembre/December 2017
SDA, 1/20 000, MERN Québec, Juillet/July 2020
Données de projet/Project data, Canadian Royalties, 2021

Cartographie/Mapping: AECOM
Fichier/File: 6063-5966_a-tr_c5_8_BaieDecep_220531.mxd

0 1,25 2,5 km
UTM, fuseau 18, NAD83

Carte / Map 5-8

Juin / June 2022

AECOM
NUNAVIK NICKEL
CANADIAN ROYALTIES INC.

5.2.5.6.2.2 Sanitary Wastewater Treatment

Sanitary wastewater is initially collected in a septic tank on-site, then pumped and transported by tanker trucks to the sanitary wastewater treatment plant at Camp Expo.

5.2.5.6.2.3 Drinking Water Supply

No change is planned in terms of drinking water supply. The raw water comes from Bombardier lake and is transported by tank trucks. It then undergoes a filtration, chlorine and UV lamp treatment.

5.2.5.6.2.4 Waste Management

No change is planned in terms of waste management. Waste will continue to be managed as already authorized under the NNiP.

5.2.5.6.2.5 Energy

The camp is currently powered by diesel generators. A global CA modification request submitted in May, 2021 provides for the power supply to the camp from the port facilities via a 5 kV cable. This improvement in energy efficiency will reduce the camp's carbon footprint.

5.2.5.6.2.6 Restoration

The Expo camp restoration is included in the Nunavik Nickel restoration plan since its first revision, approved on September 30, 2015. When the NNiP mining activities cease, the camp will be offered to the local Nunavik population However, it will be dismantled at the end of the restoration phase if not required by the local population. Demolition materials will be sorted and sent for recycling or disposal.

6 Description of the Receiving Environment

This chapter presents the description of the inventories carried out in addition to the initial ESIA, and thereby allows for certain components to be updated. It is therefore not a new impact study on its own, but rather an addendum to an existing ESIA. Thus, the study areas covered by the description of the environment and the description of the impacts in chapter 7 are bounded to the footprint of the project (limited area) since the whole description of the environment and the impacts at the local and regional scales were documented in the initial ESIA.

6.1 Study Areas for Inventories

The study area selected for the Phase 2a inventories covers four sectors in the NNiP study area, primarily the following sectors:

- Ivakkak UG: This sector covers a surface area of approximately 11 ha and is located south of the Ivakkak OP site (Map 6-1). Water from this site drains to the south into a lake. Most new infrastructures are located within areas inventoried in 2021 or during previous inventories, except for the new access road probably built in a wetland (3.11 ha located outside the area studied in 2021). Additional inventories will be carried out in the summer of 2022 to characterize the environment and validate the presence/absence of at-risk plant species.
- Méquillon UG2 sector: This sector is located on a mostly completely impacted surface of 52.59 ha. Only a few surface infrastructures will be added here including a pad for containers and an access road for the ventilation raise and the emergency exit (Map 6-2). These structures cover 2.80 ha and will be built in an environment probably mainly characterized by boulder fields (terrestrial environment) according to knowledge of the site and photo-interpretation. Additional inventories are planned during summer 2022 to characterize the environment on that future pad and the access road and to identify the presence/absence of at-risk plant species.
- Nanaujaq sector: This new deposit is located between the Expo and Méquillon sites and borders along a pre-existing road (Map 6-3). The study area covers 22.29 ha. The study area will include a waste rock pile, an ore pile, a collection pond, ditches for clean water and contaminated water, a portal and access roads, an area for offices and garages, ventilation raises and emergency exits. This sector also includes a small area for the placement of the contact water pipe between the Nanaujaq collection pond and the Méquillon water treatment plant (Map 6-4). This area covers 3. 31 ha. Finally, another additional area for the establishment of two powder magazines will be necessary. This zone will be characterized in the summer of 2022 in order to locate the powder magazines in the terrestrial environment, while remaining close to the Nanaujaq site.
- Expo South sector: This sector is located south of the Expo industrial complex and covers 10,17 ha (Map 6-5). This study area will include access roads, ventilation raises and emergency exits.

The study areas of the different sectors cover the entire natural and human environment that will be affected by the expansion work and their related projects. Appendix G presents the method used for the various inventories carried out in 2021.

6.2 Physical Environment

6.2.1 Climate

The climate of the study area is Arctic. According to the data collected at the Orion weather station located on the Expo camp site at the co-ordinates 583 763 m E, 6 825 870 m N (UTM, NAD83, time zone 18), the average temperature which was recorded between January 1st 2017 and December 31, 2021 was -8.7ºC and the average thickness of accumulated precipitation over one year is 240.5 mm. The minimum and maximum air temperatures recorded during this period were -42.9 °C and 23.0 °C. The vegetation growth season is therefore very short, between the end of June and the beginning of September. Note that in 2011, the average air temperature reported was around -9.5 °C, while precipitation averaged 520 mm per year, of which approximately 50% fell in snow cover (ARK, 2011 *in* WSP, 2015). A specific climate change component is presented in section 6.4.3. Figure 6-1 has the average, minimal and maximum monthly temperatures between January 1st, 2017 and December 31, 2021, in addition to accumulated precipitation.

Wind is also very present on the various sites where it was assessed during the initial impact study and the average annual wind speed was around 20 km/h. However, the Orion station records average annual speeds of 20.5 km/h and where the maximum speed measured was 108.9 km/h. The average annual wind speed is 8.10 m/s (29.2 km/h) at the Expo industrial complex site according to the Government of Canada Wind Atlas (Gouvernement du Canada, 2022b). There is not much variation in average wind speed between seasons, where the lowest average wind speed is observed in summer (7.55 m/s) and the highest speed in the fall (8.63 m/s). Figure 6-1 presents the compass cards for the four seasons. This figure indicates that the prevailing winds blow mainly from the northwest, west and southwest.

The hours of daylight range from a maximum of 20 hours in summer to just 5 hours in winter.

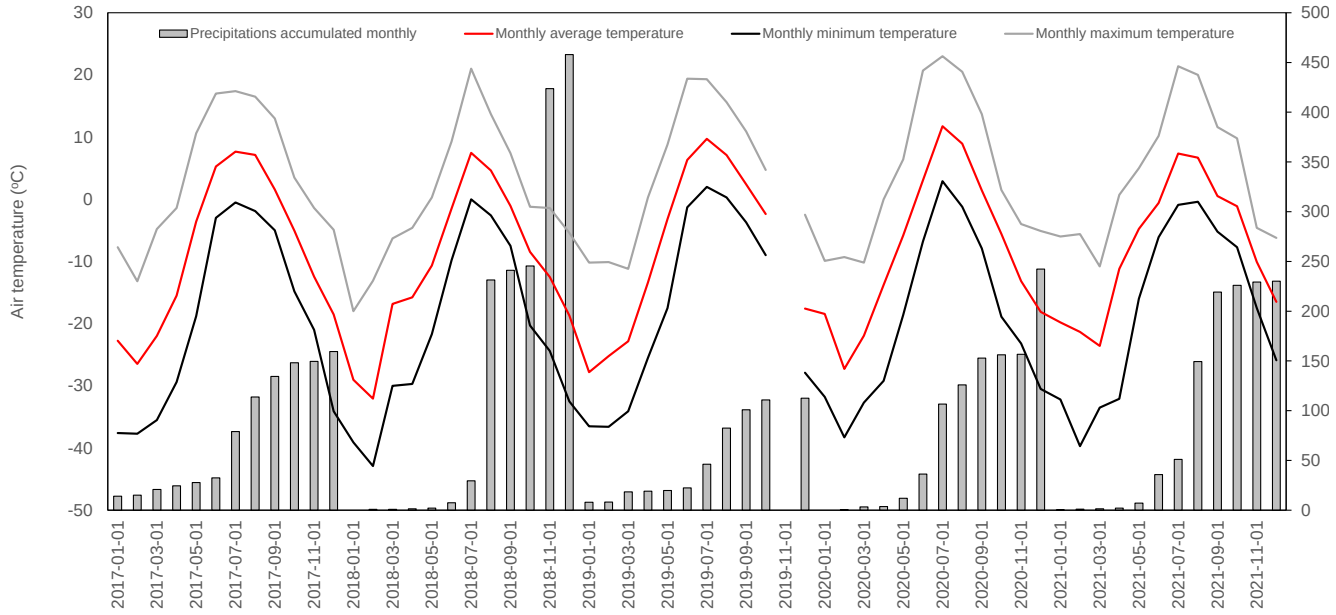
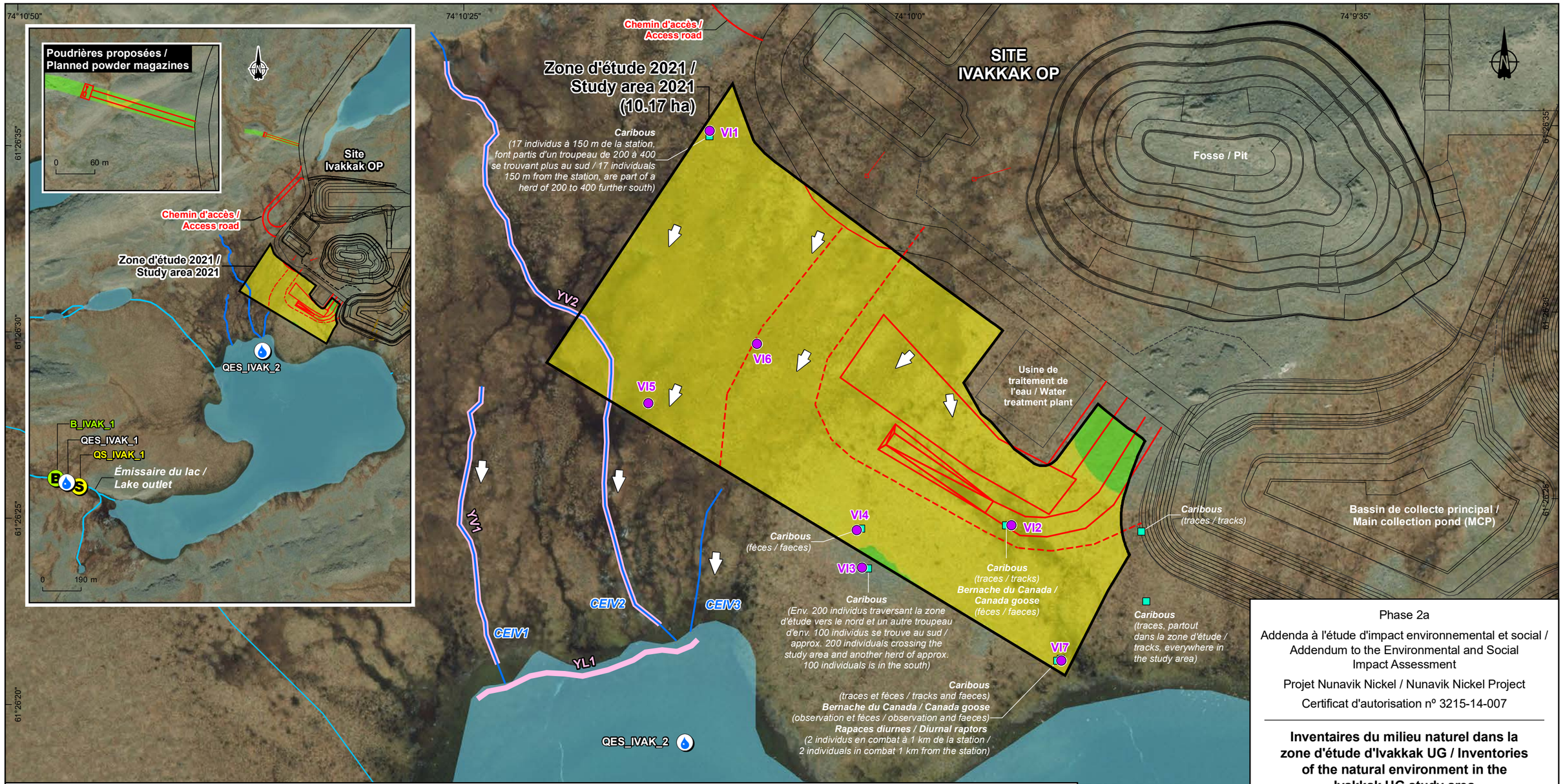


Figure 6-1: Air Temperature and Annual Accumulated Precipitation Monitoring at the Expo Camp Weather Station.



Composantes du projet / Project components

- Zone d'étude 2021 / Study area 2021 (Ivakkak UG)
- Infrastructure projetée / Planned infrastructure

Faune / Wildlife

- Observation fortuite / Casual observation

Ichtyofaune / Fish fauna

- YV1 Transect de pêche à l'électricité / Electric fishing transect

Stations d'inventaire / Survey stations

- B Échantillonnage du benthos / Benthos sampling
- Échantillonnage de l'eau de surface / Surface water sampling
- S Échantillonnage de sédiments / Sediment sampling

Végétation / Vegetation

- VI1 Station de caractérisation de la végétation / Vegetation characterization station

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Végétation (suite) **/ Vegetation** (continued)

Milieu terrestre / Terrestrial environment

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

- Cours d'eau permanent inventorié / Inventoried permanent watercourse
- Cours d'eau permanent / Permanent watercourse
- Drainage général du site sans lit d'écoulement défini / General drainage of the site without a defined flow bed
- Plan d'eau / Waterbody

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Inventaires du milieu naturel dans la zone d'étude d'Ivakkak UG / Inventories of the natural environment in the Ivakkak UG study area

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1:50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, Mars/March 2022
Inventaire et cartographie/ Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c6_1_IvakUG_220531.mxd

0 32 64 m
UTM, Zone 18, NAD83

Carte / Map 6-1

Juin / June 2022

AECOM · Nunavik Nickel · Canadian Royalties Inc.

73°47'0"
73°46'0"
73°45'0"
73°44'0"
73°43'0"
73°42'0"
61°31'30"
61°31'10"

QES_MEQ_2
QS_MEQ_2

Lac Fleury

Vers le site projeté Ivakkak /
To planned Ivakkak site

Conduite de rejet projetée /
Planned discharge pipeline

Vers le site EXPO /
To Expo site

Lac nº3

QS_MEQ_3
QES_MEQ_3

Conduite de rejet /
Discharge pipeline

Prolongement Méquillon UG2
(localisation approximative) /
Méquillon UG2 extension
(approximate location)

QES_MEQ_1
QS_MEQ_1
QES_MEQ_4

Lac Mequillon

73°46'0"
73°45'0"
73°44'0"

Composantes du projet / Project components

- Bail minier / Mining lease
- Halde à minerai existante / Existing ore stockpile
- Expansion de la halde à minerai / Ore stockpile expansion
- Infrastructures pour la mine Méquillon / Infrastructures for the Méquillon mine
- Infrastructures projetées / Planned infrastructures

Végétation / Vegetation

Milieux humides / Wetlands

- Fen de combe à neige / Snowbed fen
- Fen polygonal de basses terres / Lowland polygonal fen

Milieux terrestres / Terrestrial environments

- Champ de blocs / Boulder fields
- Sol polygonal à ostioles de toundra / Polygonal ground with tundra ostioles

Stations d'inventaire / Survey stations

- Échantillonnage de l'eau de surface / Surface water sampling
- Échantillonnage de sédiments / Sediment sampling

Hydrographie / Hydrography

- Cours d'eau permanent / Permanent watercourse
- Cours d'eau intermittent / Intermittent watercourse
- Plan d'eau / Waterbody (GRHQ)
- Milieu anthropique / Anthropogenic environment

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Inventaires du milieu naturel dans la zone d'étude de Méquillon UG2 / Inventories of the natural environment in the Méquillon UG2 study area

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Géobase du réseau hydrographique du Québec (GRHQ), MERN Québec, nov. 2019
Données de projet/Project data, Canadian Royalties, Avril/April 2022

Inventaire et cartographie/Inventory and mapping: AECOM
Fichier/File: 6063-5966_a-tr_c6_2_MeqUG2_220531.mxd

0 150 300 m
UTM, Zone 18, NAD83

Carte / Map 6-2

Juin / June 2022

AECOM
NUNAVIK NICKEL
CANADIAN ROYALTIES INC.

73°41'0" 73°40'30" 73°40'0" 73°39'30"

61°30'50" 61°30'40"

Vers le site EXPO / To the EXPO site

Conduite de rejet projetée / Planned discharge pipeline

Vers le site MEQUILLON / To the MEQUILLON site

Zone d'étude 2021 / Study area 2021 (22.29 ha)

Bernache du Canada / Canada goose (fèces / faeces)

Caribous (fèces et environ 40 individus / faeces and approx. 40 individuals)

Caribous (plus d'une centaine d'individus observés du côté nord de la route Expo jusqu'à ce point / more than a hundred individuals observed from the north side of the road Expo up to this point)

Bernache du Canada / Canada goose (fèces / faeces)

Caribous (fèces et environ 40 individus / faeces and approx. 40 individuals)

Pluvier semi-palmé / Semipalmated plover

QS_NAN_1

VN1 VN2 VN3 VN4 VN5 VN6 VN7 VN8 VN9 VN10 VN11 VN12 VN13 VN14

Lemming sp. (terrier / burrow)

Plectrophane des neiges / Snow bunting

O_NAN1-1 O_NAN1-2 O_NAN1-3 O_NAN2-1 O_NAN2-2 O_NAN2-3 O_NAN3-1 O_NAN3-2 O_NAN3-3

Plongeon huard / Common loon

Lemming sp. (nid d'hiver / winter nest)

Lemming sp. (nid d'hiver / winter nest)

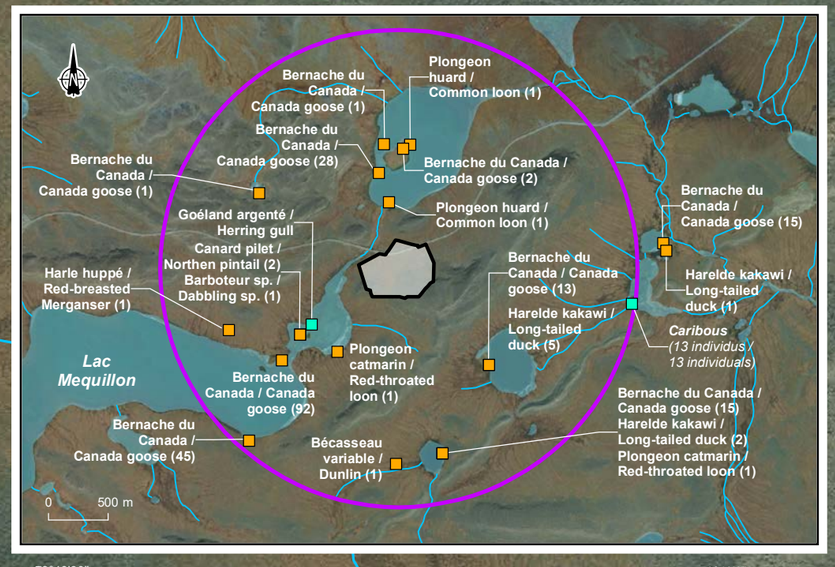
Bernache du Canada / Canada goose (fèces / faeces)

Caribous (traces / tracks)

Plectrophane lapon / Lapland longspur

Draba micropetala

Lac Mequillon



Composantes du projet / Project components

- Zone d'étude / Study area
- Infrastructure de surface projetée / Planned surface infrastructure

Faune / Wildlife

- Observation de sauvagine et d'oiseaux aquatiques / Waterfowl and waterbird observation (1) nbre d'individus / (1) number of individuals
- Observation fortuite / Casual observation
- Transect d'inventaire des oiseaux terrestres et limnicoles / Inventory transect of terrestrial and limnicolous birds
- Parcelle d'inventaire des oiseaux terrestres et limnicoles / Terrestrial and limnicolous birds inventory plot
- Parcelle d'inventaire de la sauvagine et des oiseaux aquatiques / Waterfowl and waterbird inventory plot

Stations d'inventaire / Survey stations

- Échantillonnage de l'eau de surface / Surface water sampling
- Échantillonnage de sédiments / Sediment sampling

Végétation / Vegetation

- VN1 Station d'inventaire de la végétation / Vegetation inventory station
- Espèce floristique à statut précaire / Plant species at risk

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Milieu terrestre / Terrestrial environment

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

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

Milieu anthropique / Anthropogenic environment

- Route / Road

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Inventaires du milieu naturel dans la zone d'étude de Nanaujaq / Inventories of the natural environment in the Nanaujaq study area

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1;50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, 2022
Conduit traitement des eaux vers MQ 19 avril.dxf
Nanaujuaq-Aménagement surface (19 avril 2022).dxf

Inventaire et cartographie/Inventory and mapping: AECOM
Fichier/File: 6063-5966_a-tr_c6_3_Nanau_220531.mxd

0 40 64 m
UTM, Zone 18, NAD83

Carte / Map 6-3

Juin / June 2022

AECOM NUNAVIK NICKEL CANADIAN ROYALTIES INC.

Composantes du projet / Project components

- Zone d'étude / Study area
- Conduite de rejet projetée / Planned discharge pipeline

Faune / Wildlife

- Observation de sauvagine / Waterfowl observation
- Observation fortuite / Casual observation

Végétation / Vegetation

- VR01 Station de caractérisation de la végétation / Vegetation characterization station

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Milieux terrestres / Terrestrial environments

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

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

- Milieu anthropique / Anthropogenic environment

VR19 VR20 VR21 VR22 VR23 VR24

Conduite de rejet projetée / Planned discharge pipeline

Zone d'étude de la route en 2021 / Study area of the road in 2021 (3.31 ha)

Pluvier semi-palmé / Semipalmated plover

Lemming sp. (terrier / burrow)

Plectrophane des neiges / Snow bunting

Plectrophane des neiges / Snow bunting

Zone d'étude Nanaujaq / Nanaujaq study area

Caribous (traces / tracks)

Plongeon huard / Common loon

Lemming sp. (nid d'hiver / winter nest)

Corbeau d'Amérique / Common raven

Bernache du Canada / Canada goose (1 individu observé / 1 individual observed)

Bernache du Canada / Canada goose (fèces, pas d'observation directe, faeces, no direct observation)

Zone d'étude de la route en 2021 / Study area of the road in 2021 (3.31 ha)

Plateforme de services / Service pad

VR01 VR02 VR03 VR04 VR05 VR06 VR07 VR08 VR09 VR10 VR11 VR12 VR13 VR14 VR15 VR16 VR17 VR18 VR19

Conduite de rejet projetée / Planned discharge pipeline

Plectrophane des neiges / Snow bunting (1 mâle observé / 1 male observed)

Lemming sp. (nid / nest)

Limicole à collier / Collared wader

Plectrophane des neiges / Snow bunring (1 mâle observé / 1 male observed)

Bernache du Canada / Canada goose (fèces, pas d'observation directe / faeces, no direct observation)

Méquillon (Bail minier / Mining lease)

Plectrophane des neiges / Snow bunting (1 mâle observé / 1 male observed)

Lemming sp. (fèces / faeces)

Bernache du Canada / Canada goose (fèces, pas d'observation directe / faeces, no direct observation)

Caribou (fèces et traces / faeces and tracks)

Lemming sp. (fèces / faeces)

Bernache du Canada / Canada goose (fèces, brout et traces / faeces, grazing and tracks)

Bernache du Canada / Canada goose (observation directe / direct observation)

Bernache du Canada / Canada goose (fèces, pas d'observation directe / faeces, no direct observation)

Plectrophane des neiges / Snow bunting (1 mâle observé / 1 male observed)

Bernache du Canada / Canada goose (fèces, pas d'observation directe / faeces, no direct observation)

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Inventaires du milieu naturel en bordure de la route entre les sites Nanaujaq et Méquillon / Inventories of the natural environment on the edge of the road between the Nanaujaq and Méquillon sites

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1;50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, Avril/April 2022
Inventaire et cartographie/Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c6_4_Nan_Meq_rte_220531.mxd

0 48 96 m
UTM, Zone 18, NAD83

Carte / Map 6-4

Juin / June 2022

AECOM NUNAVIK NICKEL CANADIAN ROYALTIES INC.

73°28'0"
73°27'0"
73°26'0"
61°33'40"
61°33'20"

Halde à stériles existante à régulariser / Existing waste rock pile to be regularized

125 950 m²

Halde à stériles autorisée au CA global initial / Waste rock pile authorized at initial global CA

199 960 m²

COMPLEXE EXPO / EXPO COMPLEX

Conduite d'effluent de la mine Expo / Discharge pipeline of the Expo mine

Vers le site MEQUILLON / To the MEQUILLON site

EXPO OUEST

Halde à minerai autorisée au CA global initial / Ore stockpile authorized at initial global CA

23 162 m²

74 951 m²

Halde à minerai existante à régulariser / Existing ore stockpile to be regularized

Station météorologique / Weather station

Buse pattue / Hawk
(1 individu en vol à env. 1 km de la station / 1 individual in flight at approx. 1 km from the resort)

Caribous
(traces et poils / tracks and hairs)

Caribous
(fèces / faeces)

V01
V02
V03
V04

Zone d'étude 2021 EXPO SUD / Study area 2021 EXPO SOUTH (10.17 ha)

Bail minier demandé / Mining lease requested

Composantes du projet / Project components

- Zone d'étude 2021 / Study area 2021
- Halde utilisée / Existing stockpile
- Infrastructure projetée / Planned infrastructure
- Conduite de rejet de l'effluent / Discharge pipeline

Faune / Wildlife

- Observation fortuite / Casual observation

Végétation / Vegetation

- V01 Station de caractérisation de la végétation / Vegetation characterization station

Milieu terrestre / Terrestrial environment

- Felsenmeer / Felsenmeer
- Milieu anthropique / Anthropogenic environment
- Station météorologique / Weather station

Lieu d'enfouissement en milieu nordique / Northen landfill (LEMN)

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Inventaires du milieu naturel dans la zone d'étude d'Expo Sud / Inventories of the natural environment in the Expo South study area

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1;50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties 2022

Inventaire et cartographie/ Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c6_5_ExpoSud_220531.mxd

0 70 140 m
UTM, Zone 18, NAD83

Carte / Map 6-5

Juin / June 2022

AECOM · NUNAVIK NICKEL · CANADIAN ROYALTIES INC.

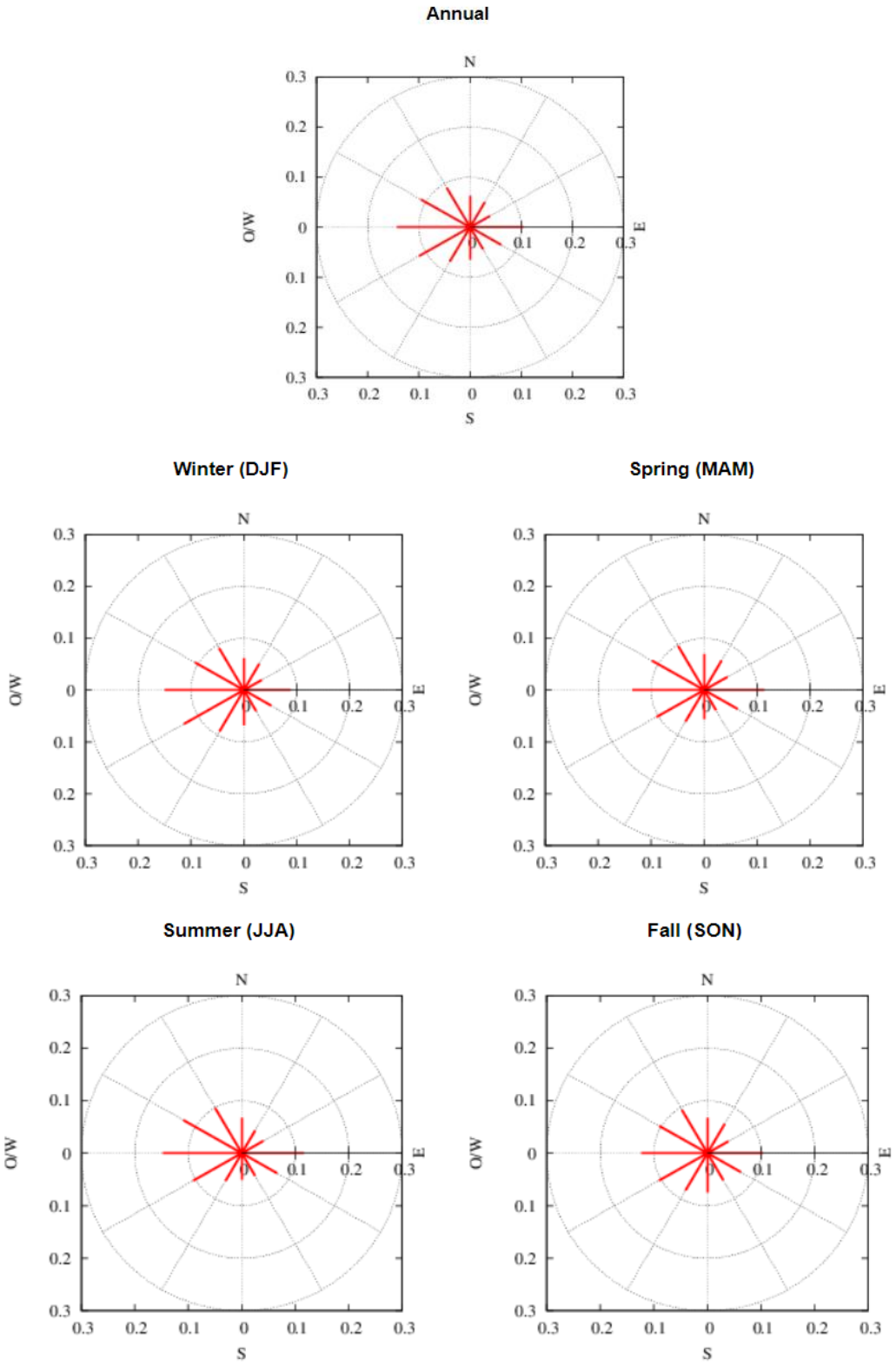


Figure 6-2: Compass Cards at the Expo industrial Complex (Gouvernement du Canada, 2022b)

6.2.2 Air Quality

In 2006 during the initial impact study, the first air quality measurements near the exploration camps showed that the ambient concentrations of atmospheric contaminants were low, and therefore the air quality was rated "good." The air quality has changed slightly near the mining infrastructures since the NNiP operations began. In fact, from the fine particles data collected, the results obtained based on the air quality index (AQI) calculation, according to the formula defined by Environment Canada, indicate that the air quality is rated "good" 97% of the time. However, the air is described as "acceptable" only 3% of the time, mainly because of the airborne dust during periods of strong winds.

None of the metals analyzed exceed the ambient air quality standards and criteria defined in Appendix K of the *Clean Air Regulation* (CAR). These results confirmed the fact that the NNiP study area is isolated and not affected by sources of polluting atmospheric emissions.

Following the implementation of the first NNiP activities**,** annual air quality monitoring is carried out to analyze the influence of construction and operating activities on the ambient air. Table 6-1 shows the results obtained over the past three years.

Table 6-1: Atmospheric Contaminant Concentrations in Ambient Air - Period: 2019/2021

Contaminant	Period	Standard / Criteria	Unit	2019		2020		2021	
				Average	Maximum	Average	Maximum	Average	Maximum
PST	24 hr	**1.20E+02**	µg/m^3	1.65E+01	8.16E+01	1.65E+01	3.60E+01	8.70E+00	4.29E+01
$PM_{2.5}$	24 hr	**3.00E+01**	µg/m^3	4.35E+00	1.76E+01	3.60E+00	1.09E+01	3.70E+00	1.49E+01
Arsenic	1 year	**3.00E-03**	µg/m^3	2.62E-04	5.71E-04	2.07E-04	2.33E-04	2.23E-04	3.55E-04
Beryllium	1 year	**4.00E-04**	µg/m^3	1.68E-04	1.77E-04	1.55E-04	1.75E-04	1.65E-04	2.67E-04
Cadmium	1 year	**3.60E-03**	µg/m^3	1.12E-04	1.18E-04	1.03E-04	1.16E-04	1.10E-04	1.78E-04
Chromium	1 year	**4.00E-03**	µg/m^3	**4.61E-03**	1.94E-02	**5.17E-03**	2.69E-02	3.39E-03	9.67E-03
Copper	24 hr	**2.50E+00**	µg/m^3	8.99E-02	4.62E-01	4.19E-02	1.03E-01	4.60E-02	2.64E-01
Nickel	24 hr	**1.40E-02**[1]	µg/m^3	**3.95E-02**	2.28E-01	**2.49E-02**	7.13E-02	1.12E-02	4.97E-02
Lead	1 year	**1.00E-01**	µg/m^3	6.50E-04	6.55E-03	2.10E-04	2.73E-04	2.89E-04	5.10E-04
Vanadium	1 year	**1.00E+00**	µg/m^3	1.51E-03	4.17E-03	1.14E-03	1.84E-03	1.07E-03	2.15E-03
Zinc	24 hr	**2.50E+00**	µg/m^3	7.38E-03	1.65E-02	5.14E-03	1.20E-02	6.58E-03	2.04E-02

Note: A **grey background and bold characters** indicate an exceedance of the standard/criteria according to CAR.
1 Since April 28, 2022, the new daily standard is 7.00E-02 µg/m^3

The total suspended particulates (TSP) samples were taken using a high-volume sampler between May and September. Given the extreme weather conditions, No TSP monitoring is performed for the rest of the year, from October to April. Out of all samples taken, no exceedance in the CAR standard (120 µg/m^3) was detected.

For the fine particles, the samples are taken uninterrupted using a BAM-1020 device. Just like the TSP, no exceedance in the CAR standard (120 µg/m^3) was detected.

As for metals, exceedances are measured for chromium and nickel. For chromium, the annual average of the concentrations measured in the samples taken is higher than the standard in 2019 and 2020. It is important to note that hexavalent chromium was used for limit value standard (0.004 µg/m^3) and not trivalent chromium (0.1 µg/m^3).

However, the concentration obtained during the lab analysis is total chromium, which can lead to an overestimate of the result. For nickel, the sampling results show that there was an exceedance in the daily standard.

The activities carried out during the first Phase of the project, such as ore loading and crushing, in addition to its storage on dry piles, are identified as being the main sources of dust emissions that contain these metals.

Since 2021, investigations have been carried out to implement mitigation measures to reduce these emission sources.

6.2.3 Topography and Geology of the Study Areas

All of the NNiP Phase 2a projects are located in the geological province of the Ungava pit. The various deposits affected by the request for modification of the initial impact study are located in ground where the lithology is different from one deposit to another. Therefore, the Ivakkak deposit is composed mainly of volcanic rocks (basalt and volcanoclastic), the Méquillon deposit of volcanic and magmatic rocks (basalt, volcanoclastic and gabbro), the Nanaujaq deposit of sedimentary rocks (sandstone, quartzite, conglomerate and limestone) and the Expo deposit of igneous rocks (peridotite).

The relief in the overall study area is generally not very rugged and the altitude varies between 300 and 600 meters (GENIVAR, 2007). NNiP is part of the Puvirnituq Hills physiographic subunit, which is composed of four relatively long and wide rocky ridges. Table 6-2 presents the elevation variations in the different project study areas. The highest site is the Expo South site, where the altitude is approximately 565 m for the entire site. The Ivakkak UG site has a lower elevation, and is located in a flatter environment with an altitude of 470 m.

Table 6-2: Altitude of the Different Study areas for Phase 2a Projects

Project	Altitudes met
Ivakkak UG	470 m
Méquillon UG2	520 and 550 m
Nanaujaq	520 and 545 m
Expo South	About 565 m

Surface deposits are mainly characterized by till from the last glaciation. This deposit type is made from a mixture of rock debris of various sizes ranging from fine particles (clay) to coarse (metric blocks). In the study areas of the Méquillon, Nanaujaq and Expo deposits, the till layer is generally continuous and has an average thickness of less than 1 m, whereas it is greater than 1 m at the Ivakkak deposit site.

As indicated during the initial impact study, the study area is located in a sector of continuous permafrost with an average temperature below -5 °C and which reaches depths of approximately 500 m (GENIVAR, 2007). The drainage capacity of the soil is limited to the active layer thawed during the summer. The ground temperature values measured in the summer of 2006 in the Expo and Mesamax sectors varied between -5 and -7 °C and indicated an active layer thickness of between 1.7 and 2.2 m.

No areas of soil erosion were observed in the natural study areas surveyed in 2021. However, in the Expo South site area, the passing construction vehicles have created ruts that cross the study area and modify the appearance of the land.

6.2.4 Hydrography, Sediment and Water Quality

The Inuit village of Puvirnituq, located more than 250 km west of the study area, gets their drinking water from the Puvirnituq River. The final mining effluent from the NNiP Expo industrial complex is discharged into a tributary of this river approximately 250 km upstream from the village's water intake. To this end, a drinking water quality study was carried out at the mouth of the Puvirnituq River near this village in 2007 (GENIVAR, 2007). Monitoring of surface water quality in the Puvirnituq River has been carried out by CRI since 2010. It is one of the many environmental monitoring in which CRI complies annually.

Regarding groundwater, its flow inside the permafrost is different from what can be observed in areas where the ground is not permanently frozen. In fact, permafrost acts as an impermeable barrier that restricts the flow of groundwater to the talik areas (thicknesses of unfrozen ground, e.g., areas under waterways) and within the active layer during the summer. The water from the active layer flows in the same direction as the slope during summer. The flow of water will then be greater if the active layer melts rapidly or after intense precipitation and will primarily appear on the surface as a sheet of water, depending on the soil's topography. These sheets of water will often follow the paths taken by terrestrial wildlife, e.g., tracks from caribou. It is therefore common to see intermittent streams forming between several wetlands. No fish habitats are present in these waterways.

Underground flow is limited to two to three meters deep, where the ground is permeable since it is not frozen (WSP, 2015). Note that the study areas of the four mines covered by this report do not contain any aquifer, which could be considered a source of drinking water for the Inuit communities of Nunavik.

Further information in regard to the acid soil generating properties during deposit mining covered by this application is provided in chapter 5.2.

The values obtained from the analysis in 2021 for water quality in 2021 and presented in the following sections were compared with the *Surface water quality criteria* from MELCC (2021), more specifically with the *Quality criteria for the protection of aquatic life*. Two criteria for chemical water quality are used to protect all forms of aquatic life on the short (CVAA – criteria that protect against acute effect) and long-term (CVAC – criteria that protect against chronical effect). The CVAC is the highest concentration of a substance at which no negative effects are produced on the aquatic organisms (and their offspring) while they are exposed daily during their entire life. The CVAA is the maximum concentration of a substance at which aquatic organisms can be exposed for a short period of time without being seriously harmed.

Sediment samples were also collected during the 2021 field inventories. The criteria for assessing the sediment quality in Quebec (EC and MDDEP, 2007) were used to interpret the chemical analysis results of freshwater sediment. There are five reference values required for sediment management in Quebec:

REL: **Rare Effect Level**. This criterion is used to monitor changes in sediment quality. When the concentration of all the substances analyzed is less than, or equal to the REL, no measure is considered, since the sediment is deemed to have no effect on the environment.
TEL: **Threshold Effect Level**. When the concentrations are equal to, or less than the TELs and > RELs, the probability that the sediment will have an impact on the environment is considered low.
OEL: **Occasional Effect Level**. Threshold above which the probability of observing adverse biological effects is relatively high.
PEL: **Probable Effect Level**. Threshold above which the probability of observing adverse biological effects is high.
FEL: **Frequent Effect Level**. Threshold above which the probability of observing adverse biological effects is very high.

Although there are five reference values, they are never used simultaneously during sediment management. In fact, only two are used for each of the following three sediment management contexts:

- Prevention of sediment contamination due to industrial discharges;
- Sediment management resulting from dredging activities;
- Restoration of contaminated sites.

Therefore, the occasional effect level (OEL) and the frequent effect level (FEL) constitute the two threshold values that govern the disposal of sediment in aquatic environments (Table 6-3).

Table 6-3: Context of Application of Quality Criteria for Dredged Sediments in Quebec

	Level - → +				
Expected impact	The probability of measuring adverse biological effects is relatively low.	Threshold OEL[A]	The probability of measuring adverse biological effects is relatively high and increases with the concentration.	Threshold FEL[B]	The probability of measuring adverse biological effects is very high.
Dredged sediment management	Sediment can be discharged into open water or be used for other purposes as long as the deposit does not contribute to the deterioration of the receiving environment.		Disposal in open water can only be considered as a valid option if the toxicity tests indicate that the sediments is harmless for the receiving environment and if the deposit does not contribute to the deterioration of the receiving environment.		Discharging into open water is prohibited. Sediment must be treated or safely contained according to the *Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés (Intervention Guide – Soil Protection and Rehabilitation of Contaminated Sites)* (Beaulieu, 2021).

Source: Environment Canada and MDDEP, 2007
[A]: Occasional Effect Level
[B]: Frequent Effect Level

Moreover, in cases where sediment must be removed from a body of water or a watercourse, it should then be considered as soil if it is found on its banks. Consequently, the sediment quality is also established on the basis of the generic criteria for the soils of Quebec. The latter makes it possible to assess the extent of contamination and to set decontamination objectives for a specific use in the event that the sediment is deposited on land environment (Beaulieu, 2021).

In fact, soil management implies compliance with the standards and provisions stated in the *Regulation respecting contaminated soil storage and contaminated soil transfer stations (RESC)*[9] and the *Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés (Intervention Guide – Soil Protection and Rehabilitation of Contaminated Sites)* (Beaulieu, 2021). The basic principle stipulates that contaminated soil (or sediment) cannot be disposed on soil with contaminant concentrations lower than these contaminated soils (or sediment).

The criteria (A, B, C) are defined as follows:

- Criteria A: Background levels for inorganic parameters and quantification limit[10] for organic parameters. For the latter, this criterion corresponds to the quantification limit since these are contaminants that are not found naturally in the soil.
- Criteria B: Maximum acceptable limit for residential lands or lands where certain institutional uses take place such as:
  - Primary or secondary schools;
  - Childcare centres;

[9] https://www.legisquebec.gouv.qc.ca/en/document/cr/Q-2,%20r.%2046
[10] The quantification limit is defined as the minimum concentration that can be quantified using an analytical method with a defined reliability.

- Daycare centres;
- Hospitals;
- Long-term and homecare centres;
- Rehabilitation centres;
- Child and youth protection centres;
- Detention facilities;
- The first meter of the playgrounds in municipal parks.

- Criteria C: Maximum acceptable limit for industrial, commercial, non-sensitive institutional and recreational lands (bike paths and municipal parks, except for the first meter of playgrounds), in addition to those intended to form the base of a roadway or bordering sidewalk.

6.2.4.1 Ivakkak UG

Characterization of the study area for mining the Ivakkak underground deposit highlights the presence of three permanent streams in and around the study area (Map 6-1; Photos 12 to 18 of Appendix H). However, only one portion of the CEIV2 streams enters the study area and covers an area of 0.02 ha, or 0.20% of the study area. This watercourse will not be affected by the construction and operation of the Ivakkak UG deposit.

The Ivakkak UG site is part of the Ivakkak sub-watershed with an area of 7.1 km² (Map 6-6).

Table 6-4 shows the main characteristics of each of these watercourses, in addition to their fish habitat potential in terms of spawning, fry production and feeding habitat, while Appendix I presents the detailed results of the waterways' physical aspects.

Table 6-4: Characteristics of the Waterways that Cross the Study Area in Summer, 2020

Characteristics	CEIV1	CEIV2	CEIV3
Watercourse type (P = permanent; I = intermittent)	P	P	P
Width of bankfull discharge (m)	1.0	3.0	0.80
Average width (m)	0.5	2.0	0.7
Flow type	Lentic	Lentic	Lentic
Facies type (M= meandering; R= rapid)	M	M	M
Substrate (P=pebbles; GR=gravel S=sand; C=clay; SI=silt, OM=organic matter)	S at 50%, SI at 30%, OM at 10%, GR at 10%	OM at 70%, SI at 20%, S at 5%, GR at 5%	OM at 70%, SI at 20%, S at 5%, GR at 5%
Average current velocity (m/s)	0.01	0.02	0.01
Average depth (m)	0.06	0.09	0.06
Max. depth (m)	0.15	0.15	0.15
Passability P=passable, PR = passable with reserve, NPR= non-passable with reserve, NP=non-passable;	NPR	NPR	NPR
Potential fish habitat (salmonids and cottids) Spawning Fry production Feeding adults	Limited Null Occasional Null	Limited Null Occasional Null	Limited Null Occasional Null

Composantes du projet / Project Components

- Zone d'étude / Study area
- Gisement / Deposit (Canadian Royalties)
- Complexe industriel existant / Existing industrial complex (mine à ciel ouvert / open pit)
- Point de rejet / Discharge point
- Route projetée / Proposed road
- Sous-bassin versant / Subwatershed
- A — Identifiant du sous-bassin versant / Subwatershed identification
- 3,0 km² — Superficie du sous-bassin versant / Subwatershed surface area

Infrastructures / Infrastructure

- Aerodrome / Airport
- Route locale / Local road
- Autre route / Other road

Limite / Boundary

- Parc national / National park
- Sens de l'écoulement / Flow direction

Vers Baie Déception / To Deception Bay

Vers Havre Douglas / To Douglas Harbour

73°40'0"

73°20'0"

61°30'0"

74°0'0"

73°0'0"

Rivière Déception

Nord-du-Québec (10)

Kativik (AR)

Rivière-Koksoak, NO

Mine Raglan / Raglan Mine

Kattiniq

Lac Rinfret

Lac Letendre

Lac Raglan

Lac East

Lac Long

Lac Renne

Lac Guindeau

Lac Mercille

Lac Wakeham

Lac du Bombardier

Lac Rocbrune

Lac Perkin

Lac Fleury

Lac Méquillon

Lac Vaillant

Lac du Hibou

Lac Forcier

Lac Gog

Lac Carré

Lac de l'Ours Blanc

Lac Saint-Germain

Lac Vicenza

Puvirnituq

Rivière de

Parc national des Pingualuit / Pingualuit national park

A — 211,6 km² — Aéroport de Donaldson / Donaldson airport

B — 2,6 km² — Mesamax

C — 9,0 km²

D — 6,8 km²

E — 4,0 km²

F — 15,2 km²

G — 153,8 km²

H — 14,8 km²

J — 2,8 km²

K — 7,7 km²

L — 95,9 km²

M — 3,0 km²

N — 14,1 km²

O — 19,1 km²

P — 12,3 km²

Q — 7,1 km² — Ivakkak UG

R — 59,8 km²

Pont-Seuil

Pont/Bridge

Complexe minier Expo / Expo mining complex

Expo Sud

Allammaq

Puimajuq

Nanaujaq

Méquillon UG2

Point de rejet / Discharge point Expo

Point de rejet / Discharge point Méquillon

Point de rejet / Discharge point Mesamax

Point de rejet projeté / Proposed discharge point Ivakkak

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Localisation des bassins versants / Watersheds location

Sources:

CanVec, 1/50 000, RNCan, 2019
Adresses Québec, MERN Québec, 1er mai/may 2020
Aire protégée du Québec, MDELCC, mai/may 2020
Données de projet/Project data, Canadian Royalties, Janvier/January 2021

Cartographie/Mapping: AECOM
Fichier/File: 6063-5966_a-tr_c6_6_Ivak_bv_220531.mxd

0 1,75 3,5 km

UTM, fuseau 18, NAD83

Carte / Map 6-6

Juin / June 2022

AECOM — NUNAVIK NICKEL — CANADIAN ROYALTIES INC.

The water and sediment quality of the streams near the Ivakkak site was documented during the initial impact study in both 2006 and 2021 (see Map 2 for the station locations). A sampling station was present in the lake outlet for both sediment and water quality in 2006, this station was sampled again in 2021. Moreover, the water quality was documented in 2021 in the lake located south of the deposit, which will begin operations soon. The results are presented in Appendix J. Water quality is generally stable in June/July compared to 2006, while several parameters seem to have changed in August for the same period. There's a slight increase in pH in the watercourse sampled in 2021 (pH of 7.32 in July and 7.45 in August) compared to 2006 (pH of 6.9 in June and 7.1 in August) (Appendix J). The pH of the water nevertheless meets the MELCC and CCME criteria for the protection of aquatic life, which are between a pH of 6.5 and 9.0, regardless of the sampling year (MELCC, 2021; CCME 2021). However, the water from the stream and lake located south of the deposit are conducive to acidification due to their buffering capacity, which varies from low to medium (calcium values < 4 mg/L; alkalinity between 7.4 and 11.3 in 2021).

The most significant changes observed between 2006 and 2021 are observed in phosphorus between June 2006 and July 2021, where the values increased from 0.01 to 0.06 mg/L, thus exceeding the MELCC CVAC criteria established at 0.03 mg/L. The values drop back below the detection threshold in August at least, thus indicating the presence of a natural variation in phosphorus levels in the region, which could be attributed to the arrival of geese and ducks in June. In August, the other changes noted between 2006 and 2008 for the outlet stream are an increase in the values of total dissolved solids, dissolved organic carbon, iron, calcium, chloride and magnesium. None of the increases observed resulted in an exceedance of the CVAC. It should be noted that these observed changes reflect the influence of events outside of CRI's mining activities, since the sampling sites are located approximately 25 km from the Méquillon deposit.

Table 6-5 presents a summary of the surface water quality characteristics that show an exceedance of the CVAC of the MELCC and for the long-term effects of the CCME. Water quality in the Ivakkak sector generally meets the MELCC and CCME criteria for the protection of aquatic life. In 2021, only iron exceeded the CCME criteria in the lake south of the deposit for July, while phosphorus exceeded the MELCC and CCME criteria in the lake and its outlet only in July. Lastly, mercury exceeded CCME criteria in the outlet only during the August 2006 inventories.

Table 6-5: Parameters Exceeding the Aquatic Life Protection Criteria of the MELCC for Chronic Effects (2021) and the CCME for Long-Term Effects (2021)

Station	Sample month and year	Parameter - value	CVAC exceedances of the MELCC and for the CCME long-term effects.	Exceedance in CVAA from MELCC
QES_IVAK2 in lake (no measurement in 2006)	July, 2021	Total phosphorus - 0.04 mg/L	Criteria of the MELCC and CCME	No criteria
QES_IVAK1 in watercourse	July, 2021	Total phosphorus - 0.06 mg/L	Criteria of the MELCC and CCME	No criteria
QES_IVAK2 in lake (no measurement in 2006)	July, 2021	Iron - 0.36 mg/L	Criteria of the CCME	-
QES_IVAK1 in watercourse	August, 2006	Mercury - 0.0001 mg/L	Criteria of the CCME	-

Sediment quality in the watercourses of Ivakkak area is good (Table 6-6). However, the natural levels in 2021 show high concentrations of chromium and nickel (exceeding the OEL criteria), which was also observed in 2006. Moreover, a general decrease in metal and metalloid contents is observed in 2021 compared to the values measured in 2006 for the same sampling site, despite the start-up of activities in the study area of the NNiP. The concentrations of metals in the sediment therefore seem to fluctuate over time in the natural state.

In 2021, all the values obtained, with the exception of chromium, tin and nickel, were under the generic A criteria for soils. The three parameters above criteria A are lower than criteria B. The values measured are not attributable to contamination, but rather to high natural levels in the soils and sediment of the region under study.

Table 6-6: Sediment Analysis in a Tributary of the Ivakkak Sector in August 2021 and August 2006

Parameter	Unit	Ivakkak sector	Ivakkak sector	Criteria for the assessment of the freshwater sediment quality[A]					Soil criteria[B]		
		QS_IVAK_1_2021	QS_IVAK_1_2026	REL	TEL	OEL	PEL	FEL	A	B	C
Organic material											
Total organic carbon	mg/kg	0.07	4.2	-	-	-	-	-	-	-	-
Metals and metalloids											
Aluminum	mg/kg	3500	14000	-	-	-	-	-	-	-	-
Antimony	mg/kg	<7	NA	-	-	-	-	-	-	-	-
Silver	mg/kg	<0.5	NA	-	-	-	-	-	2	20	40
Arsenic	mg/kg	1.7	2.2	4.1	5.9	7.6	17	23	5	30	50
Barium	mg/kg	<20	NA	-	-	-	-	-	240	500	2000
Bismuth	mg/kg	<5	NA	-	-	-	-	-	-	-	-
Boron	mg/kg	<10	NA	-	-	-	-	-	-	-	-
Beryllium	mg/kg	<1	NA	-	-	-	-	-	-	-	-
Cadmium	mg/kg	<0.3	0.2	0.33	0.6	1.7	3.5	12	0.9	5	20
Calcium	mg/kg	657	1500	-	-	-	-	-	-	-	-
Chromium	mg/kg	131.00	200.0	25	37	57	90	120	100	250	800
Cobalt	mg/kg	11	26	-	-	-	-	-	30	50	300
Copper	mg/kg	13	15	22	36	63	200	700	65	100	500
Tin	mg/kg	**7**	NA	-	-	-	-	-	5	50	300
Iron	mg/kg	14700	41000	-	-	-	-	-	-	-	-
Lithium	mg/kg	2	NA	-	-	-	-	-	-	-	-
Magnesium	mg/kg	9660	23000	-	-	-	-	-	-	-	-
Manganese	mg/kg	185	**1100**	-	-	-	-	-	1000	1000	2200
Mercury	mg/kg	<0.02	NA	0.094	0.17	0.25	0.49	0.87	0.3	2	10
Molybdenum	mg/kg	<2	NA	-	-	-	-	-	8	10	40
Nickel	mg/kg	**81**	**150**	-	-	47	-	-	50	100	500
Lead	mg/kg	<5	ND 8	25	35	52	91	150	40	500	1000
Potassium	mg/kg	87	NA	-	-	-	-	-	-	-	-
Sodium	mg/kg	<30	**91**	-	-	-	-	-	1	3	10
Strontium	mg/kg	<10	NA	-	-	-	-	-	-	-	-
Selenium	mg/kg	<1	NA	-	-	-	-	-	-	-	-
Silicon	mg/kg	154	NA	-	-	-	-	-	-	-	-
Thallium	mg/kg	<15	NA	-	-	-	-	-	-	-	-
Titanium	mg/kg	199	NA	-	-	-	-	-	-	-	-
Uranium	mg/kg	<20	NA	-	-	-	-	-	-	-	-
Vanadium	mg/kg	19	NA	-	-	-	-	-	-	-	-
Zinc	mg/kg	11	34	80	120	170	310	770	150	500	1500
Total oils and grease	mg/kg	<300	NA								
Petroleum hydrocarbons (C10-C50)	mg/kg	<50	NA						100	500	3500

Table 6-6: Sediment Analysis in a Tributary of the Ivakkak Sector in August 2021 and August 2006 (cont.)

Parameter	Unit	Ivakkak sector	Ivakkak sector	Criteria for the assessment of the freshwater sediment quality[A]					Soil criteria[B]		
		QS_IVAK_1_2021	QS_IVAK_1_2026	REL	TEL	OEL	PEL	FEL	A	B	C
Polycyclic aromatic hydrocarbon (PAH)											
Acenaphthene	mg/kg	<0.003	NA	0.0037	0.0067	0.021	0.089	0.94	0.1	10	100
Acenaphthylene	mg/kg	<0.003	NA	0.0033	0.0059	0.03	0.13	0.34	0.1	10	100
Anthracene	mg/kg	<0.01	NA	0.016	0.047	0.11	0.24	1.1	0.1	10	100
Benzo(a)anthracene	mg/kg	<0.01	NA	0.014	0.032	0.12	0.39	0.76	0.1	10	10
Benzo(a)pyrene	mg/kg	<0.01	NA	0.011	0.032	0.15	0.78	3.2	0.1	1	10
Benzo(b)fluoranthene	mg/kg	<0.01	NA	-	-	-	-	-	0.1	1	10
Benzo(j)fluoranthene	mg/kg	<0.01	NA	-	-	-	-	-	0.1	1	10
Benzo(k)fluoranthene	mg/kg	<0.01	NA	-	-	-	-	-	0.1	1	10
Benzo(b+j+k)fluoranthene	mg/kg	<0.01	NA	-	-	-	-	-	0.1	1	10
Benzo(c)phenanthrene	mg/kg	<0.01	NA	-	-	-	-	-	0.1	1	10
Benzo(g,h,i)perylene	mg/kg	<0.01	NA	-	-	-	-	-	0.1	1	10
Chrysene	mg/kg	<0.01	NA	0.026	0.057	0.24	0.86	1.6	0.1	1	10
Dibenzo(a,h)anthracene	mg/kg	<0.003	NA	0.0033	0.0062	0.043	0.14	0.2	0,1	1	10
Dibenzo(a,i)pyrene	mg/kg	<0.01	NA	-	-	-	-	-	0,1	1	10
Dibenzo(a,h)pyrene	mg/kg	<0.01	NA	-	-	-	-	-	0,1	1	10
Dibenzo(a,l)pyrene	mg/kg	<0.01	NA	-	-	-	-	-	0,1	1	10
Dimethyl-7,12 benzo(a)anthracene	mg/kg	<0.01	NA	-	-	-	-	-	0,1	1	10
Fluoranthene	mg/kg	<0.01	NA	0.047	0.11	0.45	2.4	4.9	0.1	10	100
Fluorene	mg/kg	<0.01	NA	0.01	0.021	0.061	0.14	1.2	0.1	10	100
Indeno(1,2,3-cd)pyrene	mg/kg	<0.01	NA	-	-	-	-	-	0,1	1	10
3-Methyl cholanthrene	mg/kg	<0.01	NA	-	-	-	-	-	0,1	1	10
1-Methyl naphthalene	mg/kg	<0.01	NA	-	-	-	-	-	0,1	1	10
2-Methyl naphthalene	mg/kg	<0.01	NA	0.016	0.02	0.063	0.2	0.38	0.1	1	10
Naphthalene	mg/kg	<0.01	NA	0.017	0.035	0.12	0.39	1.2	0.1	5	50
Phenanthrene	mg/kg	<0.01	NA	0.025	0.042	0.13	0.52	1.1	0.1	5	50
Pyrene	mg/kg	<0.01	NA	0.029	0.053	0.23	0.88	1.5	0.1	10	100
1-Dimethyl, 3 naphthalene	mg/kg	<0.01	NA	-	-	-	-	-	0.1	1	10
1-Trimethyl, 3,5 naphthalene	mg/kg	<0.01	NA	-	-	-	-	-	0.1	1	10
PAH Summary	mg/kg	<0.01	NA	-	-	-	-	-			

[A]: EC and MDDEP, 2007

[B]: Beaulieu, 2021.

REL: Rare Effect Level

TEL: Threshold Effect Level

OEL: Occasional Effect Level

PEL: Probable Effect Level

FEL: Frequent Effect Level

6.2.4.2 Méquillon UG

The sector of the Méquillon site is surrounded by several lakes and waterways (see Map 2-1), including the Mequillon, Vaillant and Fleury lakes (see Map 6-2). It is located in the Méquillon sub-watershed with a surface area of 12.3 km² (map 6-6). Despite the fact that the Méquillon sector is subject to surface water quality monitoring to comply with the MDMER, additional water and sediment quality monitoring was completed in different sectors of the Méquillon site in 2021 to make a qualitative comparison with the baseline. This monitoring will provide support for the assessment of the impact cumulative effects, if appropriate, of the project on the surrounding environment.

The water and sediment quality of the waterways near the Méquillon site was documented during the initial impact study in 2006, then in 2021 (see Map 6-2 for the station locations). Two sampling stations inventoried in 2006 were visited again in 2021 (MEQ1 in Mequillon lake and MEQ3 stations in a watercourse located upstream from the effluent discharge point). The Mequillon lake station is located alongside the Méquillon site and the main collector basin. The station located in the effluent's receiving watercourse (MEQ3), is located upstream from the effluent and is therefore in a sector not influenced by the latter but is located west of the Méquillon site and alongside the road. This watercourse is along the path of the prevailing winds from the Méquillon site. Lastly, the MEQ2 station is located in Fleury lake, which is located north of the deposit and is not directly, or indirectly impacted by the project, since it is somewhat protected from the site's prevailing winds. The detailed results are presented in Appendix K.

Water quality seems to have changed somewhat since 2006 for both the June/July period and in August, which sometimes led to the observation of exceedances of the MELCC and CCME criteria for some parameters. Table 6-7 presents a summary of the surface water quality characteristics showing an exceedance of the MELCC CVAC and CVAA criteria and for the long-term effects of the CCME.

Several of the parameters measured in 2021 have seen a slight increase in concentration since the 2006 baseline (see Appendix K). The pH of the water meets the MELCC and CCME criteria for the protection of aquatic life, which are between a pH of 6.5 and 9.0 (MELCC, 2021; CCME 2021; Appendix K). The pH values are among those that increased between 2006 and 2021, as observed for the Ivakkak sector located in the natural environment. The values in 2021 varied between 6.99 and 7.51 in 2021 compared to values varying between 6.0 and 6.8 in 2006. This temporal change in pH in less acidic waters is generally beneficial to aquatic fauna. The waters of the unnamed tributary that flows into Lake No. 3 (where the outlet receives the Méquillon effluent) (MEQ3 station) and from the Mequillon and Fleury lakes are nevertheless moderately sensitive to acidification, due to their buffer that varies from low to medium (calcium values varying between 0.93 and 5.38 mg/L; alkalinity between 2.9 and 14.4 in 2021).

For the other parameters showing notable changes between 2006 and 2021, note the increase in total dissolved solids between June 2006 and July 2021 for stations MEQ1 and MEQ3 and between August 2006 and 2021 for station MEQ 3. This increase was also observed for the Ivakkak site, which is not yet in operation and therefore in its natural state. At the MEQ1 station, an increase was also noted for manganese (July only), calcium, chlorides, magnesium, sodium and sulphates, but none of these increases resulted in exceeding the aquatic life protection criteria from the MELCC or the CCME. For MEQ3, more changes are observed between the two years in nutrients, major ions and metals. Thus, the ammonia nitrogen contents were higher in June, 2006 (0.06 mg/L) than in July, 2021 (0.03 mg/L), the same is true for the dissolved organic carbon contents in June, 2006 (1.7 mg/L) compared to the July, 2021 values (1.02 mg/L) (Appendix K). In August, the result is the opposite for dissolved organic carbon where an increase is noted in 2021 (value of 3.03 mg/L) compared to 2006 (0.5 mg/L). However, the values remain similar to those observed for the Ivakkak site in 2021. Lastly, an increase in iron in July, 2021 compared to 2006, resulting in an exceedance of the CCME criteria, but a drop in this parameter is observed in August, 2021 compared to August, 2006. Manganese is also higher in 2021 for the two samples at MEQ3, which does not result in exceedances of the CCME or MELCC criteria. Among the major ions, 2006 shows higher values for chlorides (4.9 mg/L) in August, 2006 compared to August, 2021 (3.2 mg/L). However, the values are higher in 2021 than 2006 for calcium, chlorides (except for the month of August), magnesium, sodium and sulphates. None of these increases result in exceeding the MELCC or CCME criteria and several of these increases were observed in the Ivakkak sector.

In 2021, water quality in the Méquillon sector generally meets the MELCC and CCME criteria for the protection of aquatic life. However, some exceedances were noted in this mined sector (Table 6-7). Thereafter, in July and August, we note an exceedance in total phosphorus at all the stations inventoried (with the exception of the MEQ2 station in Fleury lake in August, 2021) and copper (exceedances of the MELCC CVAC and CVAA criteria and CCME criteria) (see Table 6-6). Exceedances of copper during the baseline had been noted and the high copper concentrations were attributed to the high contents of this metal in the rocks and soil of the Ungava Peninsula (GENIVAR, 2007). No exceedance was recorded in 2006 for total phosphorus in June, but the latter was measured at a single location. In 2021, water samples were taken in the Ivakkak sector (section 6.2.4.1), which is not impacted, where total phosphorus exceedances were also measured there, but only in July. However, given the absence of anthropogenic sources of phosphorus in the systems studied, the variations can be attributed to the presence of birds on the bodies of water and in the surrounding wetlands (arrival of Canada geese and large numbers of snow geese on bodies of water; photo 6-1) and by the erosion of the soil and rocks present. In fact, the natural concentration of phosphorus in the water results largely from the amount and type of rocks, plus the soil type in the region (Government du Canada, 2022a).

Photo 6-1: Presence of Geese Near Mequillon Lake, Small Group.

Aluminum and zinc showed a single exceedance at the Fleury lake station in July and August, 2021 respectively. No other exceedances for aluminum were recorded in 2021 in the Méquillon, Ivakkak or Nanaujaq sectors, the values being relatively low at the 2021 sampling stations. Natural high aluminum levels in sediment could explain these values (see Table 6-8). Lastly, iron exceeds CCME criteria in the tributary located west of the Méquillon site (station MEQ3) only in July, 2021. No exceedance was observed there in 2006, but an exceedance was observed in 2021 in the natural environment of the lake located south of the Ivakkak deposit, suggesting naturally high levels for iron as well.

Table 6-7: Parameters Exceeding the Aquatic Life Protection Criteria of the MELCC for Chronic Effects and the CCME for Long-Term effects in 2021 and 2006

Station	Sample month and year	Parameter - value	CVAC exceedances of the MELCC and for the CCME long-term effects.	Exceedance in CVAA from MELCC
QES_MEQ1 (Méquillon lake)	July, 2021	Copper – 0.002	Criteria of the MELCC and CCME	Exceedance of the CVAA for copper established at 0.0014 mg/L[A]
		Total phosphorus - 0.130	Criteria of the MELCC and CCME	No criteria
		Zinc – 0.008	Criteria of the CCME	-
	June and August, 2006	No measurement for total phosphorus, copper or zinc	-	-
	August, 2021	Total phosphorus - 0.045 mg/L	Criteria of the MELCC and CCME	No criteria
		Copper - 0.002 mg/L	Criteria of the CCME	-
QES_MEQ2 (Fleury lake)	July, 2021	Aluminium and iron - 0.137 mg/L and 0.68 mg/L, respectively	Criteria of the CCME	-
		Copper - 0.004 mg/L	Criteria of the MELCC and CCME	Exceedance of the CVAA for copper established at 0.001 mg/L[A]
		Total phosphorus - 0.05 mg/L	Criteria of the MELCC and CCME	No criteria
	August, 2021	Copper - 0.002 mg/L	Criteria of the MELCC chronic effect and CCME	Exceedance of the CVAA for copper established at 0.0009 mg/L[A]
		Zinc - 0.004 mg/L	Criteria of the CCME	-
QES_MEQ3 (tributary west of the Méquillon site)	July, 2021	Copper - 0.004 mg/L	Criteria of the MELCC and CCME	
		Iron - 0.97 mg/L	Criteria of the CCME	-
		Total phosphorus - 0.08 mg/L	Criteria of the MELCC and CCME	No criteria
	June, 2006.	Total phosphorus - 0.01 mg/L	No exceedance	-
		Iron - 0.20 mg/L No measurement for copper	No exceedance	-
	August, 2021	Total phosphorus - 0.04 mg/L	Criteria of the MELCC and CCME	No criteria
		Copper - 0.003 mg/L	Criteria of the CCME	-
	August, 2006	Copper - 0.004 mg/L No measurement for phosphorus	Criteria of the MELCC and CCME	Exceedance of the CVAA for copper established at 0.002 mg/L[A]

[A] The CVAA criteria are established according to an equation considering the hardness measured on-site. For this reason, the value of the criterion varies from one sample to another.

In addition, the effluent at the Méquillon site is also subject to environmental monitoring. 2021 is this site's second year of operations. The Méquillon mine effluent is discharged into the environment from August 11th to October 6, 2021 (absence of discharge from August 23rd to 26th inclusively) for a total effluent of 182,910 m^3. Note that this pipe is located downstream from the MEQ3 sampling station for this sampling campaign.

The sediment from Mequillon lake are those with the highest chromium, copper and nickel contents of the three stations sampled in 2021 (Table 6-8). Chromium exceeds the PELs, whereas in 2006 only the OEL was exceeded. Copper levels in sediment increased from 45 mg/kg in 2006 to 77 mg/kg in 2021, indicating an exceedance of the OEL in 2021. Copper levels also doubled in the sediment of Mequillon lake between 2006 and 2021. However, notable decreases in 2021 compared to 2006 were observed in sediment for total organic carbon, aluminum, cadmium, calcium, iron, magnesium and sodium. This tends to indicate that there is some natural variability in the metal concentrations in the sediment at the spatial and temporal level. In Fleury lake, metal levels are generally lower than those observed in Mequillon lake and in the tributary into which the effluent from the Méquillon site empties. Only the value of chromium exceeds the sediment quality criteria (exceeding the threshold concentrations producing a TEL-effect). However, it should be noted that Fleury lake, since this environment is a reference medium, has detectable levels of petroleum hydrocarbons C_{10}-C_{50} (value of 59 mg/kg), whereas no event was recorded at this location. The presence of hydrocarbons C_{10}- C_{50} would thus be natural. This can be explained by the fact that the lake sampling site was located on the edge of a peat bog (lowland fen). In fact, these environments are rich in organic matter and therefore in hydrocarbons that do not originate from petroleum. These then interfere with the analysis apparatuses and give false positives in the lab (Laporte-Saumure & Groleau, 2019). Lastly, the MEQ3 station, located upstream of the effluent discharge point from the Méquillon site, shows a decrease in all values measured in the sediment in 2021 compared to 2006, with the exception of nickel. The increase in nickel level could be explained by natural variability.

The results obtained during the 2021 inventory campaign in the various environments (directly or indirectly affected and not affected by mining activities) indicated that the water quality seems to have changed since the 2006 baseline, but that these changes would be attributable mainly to natural variations. In fact, the changes observed in the sector influenced by the activities of the Méquillon site were also observed in the Ivakkak sector, which is not yet affected by intensive mining activities (no access road nor any mining activity nearby). The same observation applies to the levels measured in the sediment where the variation does not seem to be linked to mining activities. Climate change could possibly contribute to increased metal levels in sediment, for example if water bodies experience a more frequent rise in water level, which can contribute to leaching soils in the littoral zone.

Table 6-8: Sediment analysis at the Méquillon and Nanaujaq site's sampling stations in August 2021 and August 2006

Station Nº	Unit	MEQ1 (Méq. lake) 2021	MEQ1 2006	MEQ2 (Fleury lake) 2021	MEQ3 2021	MEQ3 2006	NAN1 2021	Criteria for the assessment of the freshwater sediment quality[A]					Soil criteria[B]		
Parameter								REL	TEL	OEL	PEL	FEL	A	B	C
Organic material															
Total organic carbon	mg/kg	0.34	3.3	0.27	1.26	6	0.1	-	-	-	-	-	-	-	-
Metals and metalloids															
Aluminum	mg/kg	12300	20000	7890	8860	20000	6170	-	-	-	-	-	-	-	-
Antimony	mg/kg	<7		<7	<7		<7	-	-	-	-	-	-	-	-
Silver	mg/kg	0.5		<0.5	<0.5		<0.5	-	-	-	-	-	2	20	40
Arsenic	mg/kg	2.7	1.1	<1.5	1.8	2.2	<1.5	4.1	5.9	7.6	17	23	5	30	50
Barium	mg/kg	56		24	48		23	-	-	-	-	-	240	500	2000
Bismuth	mg/kg	<5		<5	<5		<5	-	-	-	-	-	-	-	-
Boron	mg/kg	<10		<10	<10		<10	-	-	-	-	-	-	-	-
Beryllium	mg/kg	<1		<1	<1		<1	-	-	-	-	-	-	-	-
Cadmium	mg/kg	<0.3	0.2	<0.3	<0.3	0.2	<0.3	0.33	0.6	1.7	3.5	12	0.9	5	20
Calcium	mg/kg	1370	2300	1860	1720	2500	1310	-	-	-	-	-	-	-	-
Chromium	mg/kg	99.00	61.00	40.00	55.00	58.00	41.00	25	37	57	90	120	100	250	800
Cobalt	mg/kg	28	19	13	**33**	**40**	12	-	-	-	-	-	30	50	300
Copper	mg/kg	**77**	45	18	45	51	18	22	36	63	200	700	65	100	500
Tin	mg/kg	**5**		<5	**5**		<5	-	-	-	-	-	5	50	300
Iron	mg/kg	36400	46000	20200	33400	58000	17400	-	-	-	-	-	-	-	-
Lithium	mg/kg	10		7	7		4	-	-	-	-	-	-	-	-
Magnesium	mg/kg	11000	13000	6330	6350	11000	5110	-	-	-	-	-	-	-	-
Manganese	mg/kg	498	570	213	956	**1300**	224	-	-	-	-	-	1000	1000	2200
Mercury	mg/kg	<0.02		<0.02	<0.02	0.01	<0.02	0.094	0.17	0.25	0.49	0.87	0.3	2	10
Molybdenum	mg/kg	<2		<2	<2		<2	-	-	-	-	-	8	10	40
Nickel	mg/kg	**109**	**50**	30	**73**	**54**	28	-	-	47	-	-	50	100	500
Lead	mg/kg	6	7	<5	6	5	<5	25	35	52	91	150	40	500	1000
Potassium	mg/kg	1130		404	395		367	-	-	-	-	-	-	-	-
Sodium	mg/kg	**38**	**62**	<30	<30	**48**	<30	-	-	-	-	-	1	3	10
Strontium	mg/kg	<10		<10	<10		<10	-	-	-	-	-	-	-	-
Selenium	mg/kg	<1		<1	<1		<1	-	-	-	-	-	-	-	-
Silicon	mg/kg	522		386	303		293	-	-	-	-	-	-	-	-
Thallium	mg/kg	<15		<15	<15		<15	-	-	-	-	-	-	-	-
Titanium	mg/kg	836		1120	789		1010	-	-	-	-	-	-	-	-
Uranium	mg/kg	<20		<20	<20		<20	-	-	-	-	-	-	-	-
Vanadium	mg/kg	50		31	39		29	-	-	-	-	-	-	-	-
Zinc	mg/kg	55	57	32	40	53	21	80	120	170	310	770	150	500	1500
Total oils and grease	mg/kg	<300		<300	<300		<300								

Table 6-8: Sediment analysis at the Méquillon and Nanaujaq site's sampling stations in August 2021 and August 2006 (cont.)

Station Nº	Unit	MEQ1 2021	MEQ1 2006	MEQ2 2021	MEQ3 2021	MEQ3 2006	NAN1 2021	Criteria for the assessment of the freshwater sediment quality[A]					Soil criteria[B]		
Parameter								REL	TEL	OEL	PEL	FEL	A	B	C
Petroleum hydrocarbons (C10-C50)	mg/kg	<50		59	<50		<50						100	500	3500
Polycyclic aromatic hydrocarbon (PAH)															
Acenaphthene	mg/kg	<0.003		<0.003	<0.003		<0.003	0.0037	0.0067	0.021	0.089	0.94	0.1	10	100
Acenaphthylene	mg/kg	<0.003		<0.003	<0.003		<0.003	0.0033	0.0059	0.03	0.13	0.34	0.1	10	100
Anthracene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.016	0.047	0.11	0.24	1.1	0.1	10	100
Benzo(a)anthracene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.014	0.032	0.12	0.39	0.76	0.1	10	10
Benzo(a)pyrene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.011	0.032	0.15	0.78	3.2	0.1	1	10
Benzo(b) Fluoranthene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
Benzo(j) Fluoranthene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
Benzo(k) Fluoranthene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
Benzo(b+j+k) fluoranthene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
Benzo(c) Phenanthrene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
Benzo(g,h,i) perylene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0,1	1	10
Chrysene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.026	0.057	0.24	0.86	1.6	0.1	1	10
Dibenzo(a,h) anthracene	mg/kg	<0.003		<0.003	<0.003		<0.003	0.0033	0.0062	0.043	0.14	0.2	0.1	1	10
Dibenzo(a,i)pyrene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
Dibenzo(a,h)pyrene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
Dibenzo(a,l)pyrene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
Dimethyl-7,12 benzo(a)anthracene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
Fluoranthene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.047	0.11	0.45	2.4	4.9	0.1	10	100
Fluorene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.01	0.021	0.061	0.14	1.2	0.1	10	100
Indeno(1,2,3-cd) pyrene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0,1	1	10
3-Methyl cholanthrene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0,1	1	10
1-Methyl naphthalene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0,1	1	10
2-Methyl naphthalene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.016	0.02	0.063	0.2	0.38	0.1	1	10
Naphthalene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.017	0.035	0.12	0.39	1.2	0.1	5	50
Phenanthrene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.025	0.042	0.13	0.52	1.1	0.1	5	50

Table 6-8: Sediment analysis at the Méquillon and Nanaujaq site's sampling stations in August 2021 and August 2006 (cont.)

Station Nº	Unit	MEQ1 2021	MEQ1 2006	MEQ2 2021	MEQ3 2021	MEQ3 2006	NAN1 2021	Criteria for the assessment of the freshwater sediment quality[A]					Soil criteria[B]		
Parameter								REL	TEL	OEL	PEL	FEL	A	B	C
Pyrene	mg/kg	<0.01		<0.01	<0.01		<0.01	0.029	0.053	0.23	0.88	1.5	0.1	10	100
1-Dimethyl, 3 naphthalene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
1-Trimethyl, 3,5 naphthalene	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-	0.1	1	10
PAH Summary	mg/kg	<0.01		<0.01	<0.01		<0.01	-	-	-	-	-			

[A]: EC and MDDEP, 2007
[B]: Beaulieu, 2021.
REL: Rare Effect Level
TEL: Threshold Effect Level
OEL: Occasional Effect Level
PEL: Probable Effect Level
FEL: Frequent Effect Level

6.2.4.3 Nanaujaq

The Nanaujaq site is located east of the Méquillon site and is surrounded by several lakes and waterways. Mequillon lake is located to the southwest and its outlet flows along the edge of the Nanaujaq site (about 30 m away). The site is located within the Nanaujaq sub-watershed which has a surface area of 14.9 km² (Map 6-3). This location is only disrupted by a road and no sampling had been carried out in 2006 at the inventory station completed in 2021. The water quality is very good in the outlet of Mequillon lake (Appendix K). In fact, only two exceedances are noted, namely the phosphorus concentration in July at 0.04 mg/L and the copper concentration at 0.001 mg/L (Table 6-9). The sediment also shows no exceedance, with the exception of chromium where the measured value exceeds the TEL at 41 mg/kg (see Table 6-8 in Section 6.2.4.2).

The bodies of water in the study area are therefore naturally rich in phosphorus and metals.

Table 6-9: Parameters Exceeding the Aquatic Life Protection Criteria of the MELCC for Chronic Effects (2021) and the CCME for Long-Term Effects (2021)

Station	Sample month and year	Parameter - value	CVAC exceedances of the MELCC and for the CCME long-term effects.
QES_NAN_1	July, 2021	Total phosphorus - 0.04 mg/L	Criteria of the MELCC and CCME
QES_NAN_1	August, 2021	Copper - 0.001 mg/L	Criteria of the MELCC

6.2.4.4 Expo South

The Expo South site is part of the 153.8 km² sub-watershed, which includes a vast hydrographic network (Map 6-5). This watershed flows towards the Puvirnituq River. No additional sampling for water quality was carried out in the environment surrounding the Expo site, since additional sampling had been carried out for Méquillon and exhaustive environmental monitoring is carried out as part of the environmental monitoring program for the Expo industrial complex.

Therefore, water quality is documented during the annual environmental monitoring done at the Expo industrial complex (see details in Canadian Royalties, 2022c). Overall, 1,078,400 m ³ of treated mining effluent from the Expo mining complex were discharged between July 23rd and October 11, 2021 in a tributary of the Puvirnituq River. The effluent quality analysis for Expo in 2021 showed no exceedance in the requirements of Directive 019 and Appendix 4 of the MDMER from 2021.

The water quality of the receiving environments in the Expo sector (see Monitoring 4 for more details in Canadian Royalties, 2022c) is also carried out several times per year and the parameters measured are compared to the criteria from the MELCC for chronic effects (CVAC) and acute effects (CVAA). The pH generally remains in the range of 6.5 to 9.0 and the water is found to be well oxygenated (>9 mg/L). During this monitoring, the total phosphorus showed exceedances of the CVAC (0.03 mg/L) in 8 (values varying between 0.04 and 0.18 mg/L) of the 15 samples for the stations located near the effluent and those outside the effluent's zone of influence (reference zone). As previously mentioned, phosphorus is not anthropogenic in origin and is most likely natural.

The mercury concentration exceeded the CVAA criterion (0.0016 mg/L) in September, 2021 in the reference zone (0.0024 mg/L – zone not impacted by mining activities), whereas in the zone exposed to mining activities, mercury concentrations for September 2021 exceeded only the CVAC at two out of four monitoring stations (values between 0.0011 and 0.0012 mg/L). Mercury therefore seems to be present in its natural state in the region's waters in view of the data collected in the areas not impacted by the project. However, note that climate change could have an impact on the mercury levels in the waters of our study since the projects are located inside the permafrost zone. In fact, permafrost is a considerable reservoir of mercury and its deep thawing could significantly increase mercury levels in the aquatic environment (Louvet, 2018) independently of mining activity.

The copper concentrations exceeded the CVAA for 11 of the 12 samples in the exposed zone (values between 0.002 and 0.007 mg/L), and for the three samples located in the reference zone (values between 0.002 and 0.007 mg/L) during the three dates of sampling. These values indicate heterogeneous copper concentrations in the study area and that the presence of mining activities does not seem to have a noticeable effect on the metal levels in the aquatic environment. In addition, the copper values measured in this sector were 0.003 mg/L during the baseline.

Lastly, 7 of the 12 samples taken exceeded the CVAC (criteria depending on the hardness for nickel) in the exposed zone (values varying between 0.015 and 0.077 mg/L), whereas only 1 sample out of 3 in the reference zone showed an exceedance of the AALC (values of 0.030 mg/L). The CVAA criteria were exceeded only once for nickel in September at a station in an exposed zone (values of 0.077 mg/L). The results indicate high values for nickel, both in the natural environment and in the exposed area, but that the environment exposed to mining activities seems to have higher nickel values.

It should be noted that CRI follows all regulations in force with regard to the discharge objectives set. No mortality was observed among fish fauna.

All of these results indicate that the metal levels in the study area's water are naturally high in 2021, but that some exceedances could be anthropogenic in origin, such as those noted for nickel.

6.3 Biological Environment

6.3.1 Wetlands and Terrestrial Environments

The natural environments of the study area vary according to three types of terrestrial environments and two types of wetlands. The terrestrial environments are the boulder fields, felsenmeers, polygonal ground with tundra ostioles, whereas the wetlands include lowland polygonal fen and the snowbed fen. The inventory method for terrestrial and wetland environments, in addition to a brief description of each of the five environment types encountered are presented in Appendix G.

6.3.1.1 Ivakkak UG

The characterization and delimitation inventory of terrestrial and wetland environments was completed on July 28, 2021. A second field visit was made on August 13, 2021 to validate the identification of later vegetation, in particular for sedges and grass that had not yet grown or were overgrazed during the first visit to the study area. This second visit also increased the chances of observing at-risk species. An additional inventory will be carried out in the summer of 2022 in the planned roadway for bi-train trucks to load ore that will be north of the 2021 study area.

The study area has a surface area of 10.15 ha and is composed mainly of wetlands, more specifically lowland polygonal fens (9.87 ha that represent 97.2% of the study area; Map 6-1). Only 0.28 ha (2.8%) is located in a boulder field type terrestrial environment. For related projects, the study area covers 3.11 ha probably in a wetland (presumed lowland polygonal fens) for the roadway, while the powder magazines cover 0.02 ha in the lowland polygonal fen and 0.18 ha in boulder fields.

The boulder field type terrestrial environment is covered with approximately 54% vegetation, 35% of which is moss from the genus *Racomitrium*. A total of 12 species were indexed in this environment (Appendix L).

The lowland polygonal fen-type wetlands inventoried in the study area have fairly dense vegetation. The most abundant species are, among others, the moss (unidentified) which, depending on the stations, have a coverage percentage that varies between 80 and 100%. The other most abundant species are Fisher's tundra grass (*Dupontia fisheri*), loose-flowered alpine sedge (*Carex rariflora*) and fragile sedge (*Carex membranacea*) which have an overlap that varies between 2 and 80%. Plant diversity is not negligible with 23 species inventoried.

Table 6-10 shows the areas covered by each of the environments, in addition to the number of vegetation stations completed in the terrestrial and wetland environments (Map 6-1). A total of 7 characterization stations have been inventoried on the extension of the mining site, 6 of which are located in wetlands.

Appendix M reports the wetland and land characterization sheets taken for each of the stations, according to the Bazoge protocol *et al.* (2015). Photos of each of the stations inventoried in the field, in addition to photos of the water environments listed are illustrated in Appendix H.

Table 6-10: Surface Area for Each Type of Environment Found in the Ivakkak UG Study Area

Environment	Environment category	Total surface area (ha)	Total number of characterization stations
Site			
Terrestrial	Boulder field	0.03	1
Wetland	Polygonal lowland fen	9.04	6
Water	Permanent watercourse	0.02	-
Total		**9.09**	**7**
Powder magazines			
Terrestrial	Boulder field	0.18	Inventoried in 2020
Wetland	Polygonal lowland fen	0.02	
Total		**0.20**	
Access road for bi-trains			
Wetland	Polygonal lowland fen	0.02	Inventories to come in the summer of 2022

6.3.1.2 Méquillon UG2

The inventory of vegetation and the delimitation of wetlands for the Méquillon site (UG1 and U2) was completed on August 8, 2020 by AECOM. This inventory was carried out for the Méquillon UG1 expansion (AECOM, 2021). Field delineation established that the study area was composed primarily of anthropogenic terrestrial environments and boulder fields (Table 6-11; Map 6-2). Lowland polygonal fens are observed in some places, covering 6.55 ha of the study area. These wetlands are surrounded by roads and have suffered disturbances such as loss of connectivity. However, the infrastructure planned for the underground mine will have no impact on the wetlands since they' are all located on the boulder field.

The inventoried terrestrial environments cover 45.1 ha of the study area's surface area, representing 84.77% of the characterized area. Of these, 38.54% are anthropogenic environments, 55.88% are boulder fields and 5.58% are polygonal soils and mud circles.

In the characterized area, wetlands cover a surface area of 7.49 ha, representing 14.08% of the study area. Most of the wetlands are characteristic of lowland polygonal fens. A small portion of the study area (0.94 ha) is a snow bed fen. Wetlands are intersected by roads in the study area. The fens south of the study area are affected by the mining activities already in place for the Méquillon deposit open pit mining, where vegetation, soils and hydrology are disrupted. The presence of dust and rocks from roads and fill areas can be noted, as well as the loss of connectivity between wetlands, therefore altering their ecological functions. The infrastructure planned for the operation of the underground mine will not create any additional changes to the environment.

In total, the inventories carried out during summer 2020 made it possible to count 19 different species at the Méquillon deposit site. The terrestrial environment represents the least diversified environment, with the presence of 9 species. The dominant species are the white arctic mountain heather (*Cassiope tetragona*), dwarf willow (*Salix herbacea*), moss and lichens. The lowland fen is characterized by a higher diversity in terms of plant species (18 species). This environment is dominated by moss, sphagnum, polargrass (*Arctagrostis latifolia subsp. latifolia*),

Bigelow's sedge (*Carex bigelowii*) and fragile sedge. Although non-dominant, Fisher's tundra grass, common cottongrass (*Eriophorum angustifolium*) and white cottongrass *(Eriophorum scheuchzeri*) take up a large place in wetlands' characterization stations.

Table 6-11: Surface Area for Each Type of Environment Found in the Méquillon UG1 and UG2 Study Area

Environment	Environment category	Surface area of the study area (ha)
Terrestrial	Anthropogenic	17.38
	Boulder field	25.20
	Polygonal ground with tundra ostioles	2.52
Wetland	Snowbed fen	0.94
	Lowland polygonal fens	6.55
Total		**52.59**

The sectors where the raises and emergency exit #4 and its access road (0.82 ha), in addition to the granular backfill pad for containers storage (2.65 ha), were not inventoried in 2021, the inventories will be carried out there in the summer of 2022. The preliminary location, according to knowledge of the site, probably situate these two sectors in a terrestrial environment (boulder fields or polygonal ground with tundra ostioles). Sectors with the possibility of wetlands have been discarded. A delimitation of the environment types (terrestrial or wet) and the search for at-risk species will be completed in summer, 2022. A report in the form of an addendum to this report will be provided after the 2022 inventories, in addition to a map of the results (Map 6-2).

6.3.1.3 Nanaujaq

On July 8 and 18, 2021, an AECOM team characterized the Nanaujaq site to delimit the various wetlands and carry out vegetation inventories. A second field visit was made on August 6, 2021 to validate the identification of later vegetation, in particular for sedges and grass that had not yet grown or were overgrazed during the first visit to the study area. This second visit also increased the chances of observing at-risk species.

The wetlands identified at the Nanaujaq site extend for 9.44 ha, while terrestrial environments occupy 12.86 ha (12.26 ha in boulder fields and 0.60 ha of anthropogenic environment) of this study area (Map 6-3). The road between the Méquillon site and the Expo site passes inside the study area through the northern section (anthropogenic environment).

Two lowland polygonal fens have been delineated on the north side of the road, in addition to the south of the road, east of the river. These two wetlands (11 inventory stations) are essentially composed of fragile sedge, which occupies on average 50% of the vegetation cover of the characterization stations. The dwarf willow is also present with a vegetation cover of up to 70% depending on the stations. Species such as Fisher's tundra grass (5 to 60%) and moss (25 to 40%) have also been identified in wetlands. Plant diversity is not negligible with 39 species inventoried (Appendix N).

Two boulder field areas to the south of the study area, with total area of 12.26 ha have been delineated (Table 6-12). A total of 16 plant species were inventoried on two characterization stations, specifically the white arctic mountain heather with a percentage of coverage of 20 and 50%. The arctic wintergreen (*Pyrolas grandifolia*) was

also observed on the site with a percentage cover of 30%, in addition to moss of the genus *Racomitrium* (70 and 75% cover).

During characterization, a small-flowered draba (*Draba micropetala*), classified as a species sensitive to be designated as threatened or vulnerable in Quebec, was identified northeast of the Nanaujaq site in a boulder field and is located outside the project footprint (see Map 6-3).

Table 6-12: Surface Area for Each Type of Environment Found in the Nanaujaq Study Area

Environment	Environment category	Total surface area (ha)	Total number of characterization stations
Terrestrial	Boulder field	12.26	3
Wetland	Polygonal lowland fen	9.44	10
Anthropogenic	Road	0.60	-
Total		**22.3**	**13**

The Méquillon-Nanaujaq road was characterized on July 20 and August 12, 2021 to delimit wetlands over a width of 5 m along the road. This delimitation of wetlands and the associated vegetation inventories were necessary before laying a pipe on the ground used to transport contaminated water between the Nanaujaq and Méquillon sites. Since this pipe will be installed along the south side of the road, Table 6-13 presents only the characterization data for this side of the road.

The roadside on the south side is composed of 1.55 ha of wetlands (lowland polygonal fen) and 1.76 ha of terrestrial environment (1.28 in boulder fields and 0.48 of anthropogenic environment).

A total of 15 lowland polygonal fen characterization stations and 9 boulder field stations were characterized. The wetlands bordering the Méquillon-Nanaujaq road are composed of species such as the fragile sedge, which is found at all lowland polygonal fen stations with a percentage cover that can reach up to 90%. The dwarf willow is also present in these wetlands with a percentage of cover varying from 5 to 80% depending on the stations. Sphagnum (*Sphagnum sp.*) (5 to 70% coverage), tufted hairgrass (*Deschampsia cespitosa*) (5 to 50% coverage) and Bigelow's sedge (25 to 60% coverage) were also observed during inventories. A total of 51 species were recorded from the 27 lowland polygonal fen stations (Appendix N). Plants typical of dry, rocky and gravelly environments were found on the boulder field stations, essentially moss of the genus *Racomitrium* (up to 70% cover) and the white arctic mountain heather (5 to 20% coverage). The environments bordering the road between Méquillon and Nanaujaq are mainly impacted by the road's presence. In fact, flying stone, gravel, dust and water accumulation modify and disrupt the vegetation, the soil and the sector's hydrology.

A photographic appendix of the environments inventoried for the Nanaujaq site can be consulted in Appendix O.

Table 6-13: Surface Area for Each Type of Environment Found in the Study Area Alongside the Road Between Méquillon and Nanaujaq

Environment	Environment category	Total surface area south side of the road (ha)	Total number of characterization stations
Terrestrial	Anthropogenic	0.48	0
	Boulder field	1.28	9
Wetland	Polygonal lowland fen	1.55	15
Total		**3.31**	**24**

6.3.1.4 Expo South

The Expo South site was characterized on August 6, 2021 to delimit the different environments present and complete the vegetation inventory. During all the inventories and travels in the study area, an active search for at-risk plant species was carried out and any occasional observation of fauna was noted and georeferenced.

The Expo South site consists solely of a terrestrial environment, i.e., a felsenmeer of 10.17 ha (Table 6-14 and Map 6-5). The vegetation present on the site is mainly composed of white arctic mountain heather with a 1 to 10 percentage of cover depending on the stations. Species such as the moss of the genus *Racomitrium* and the northern woodrush *(Luzula confusa*) are also present on the site with a 5 to 20 percentage cover. In total, 20 different plant species were identified at the four characterization stations (Appendix P). The Expo South site is marked by the passage of construction vehicles, plus roads cross the study area and change the ground's appearance. Appendix Q presents several representative photographs of the site.

In 2010, the CDPNQ mentioned the presence of the Ellesmere Island draba (*Draba subcapitata*) classified as a species sensitive to be designated as threatened or vulnerable in Quebec (MELCC, 2020b) northeast of the Expo mining camp, or 3.7 km from the southern expo study area. No special-status plant species were observed at the Expo South site during the 2021 characterization.

Table 6-14: Surface Area for Each Type of Environment Found in the Expo South Study Area

Environment	Environment category	Total surface area (ha)	Total number of characterization stations
Terrestrial	Felsenmeer	10.17	4

6.3.1.5 Ecological Functions of Wetlands and Water Environments in the Study Areas

Wetlands and water environments play essential roles for the proper functioning of the ecosystems in which they are embedded. These particular functions are also beneficial for humans (Varin, 2013). Section 13.1 of the *Act to affirm the collective nature of water resources and to promote better governance of water and associated environments* (RLRQ, c. C-6.2) lists the main functions associated with wetlands and water environments: filtration and retention of sediment, water level regulation, conservation of biological diversity, survival of the environment, carbon sequestration and mitigation of the impacts of climate change, in addition to the contribution to the landscape's quality (LegisQuébec, 2020). The wetlands' ecological functions will be modified following the construction of the Ivakkak underground mining site, in addition to the Nanaujaq site where wetlands will be affected during construction and mining. No changes are anticipated for the construction and underground mining of the Expo South and Méquillon UG2 sites since no additional wetlands will be affected.

Sediment filtration and retention

Wetlands have a good water retention capacity, which slows down the runoff of water towards the water network. In the northern context, the flow of water is mainly on the surface (<3 m depth) given the presence of continuous permafrost beyond this depth (Smith *et al.*, 2004). The direction of the slope will indicate the direction of water flow. Wetlands are therefore mainly found in depressions or in environments where the relief is flat.

Lowland polygonal fens delimited during inventories sustains lake or watercourse. Therefore, they contribute to sediment retention and water filtration. The destruction of this type of environment, by the construction of mining infrastructures, can therefore alter these functions in addition to being a supplementary contribution of sediment and pollutants. Given that these wetlands are located at a relatively short distance from the lake located to the south of the infrastructures for the Ivakkak site and to the west for the Nanaujaq site, sediment or deposits caused by NNiP activities could reach them when infrastructure is being constructed. The destruction of associated wetlands can reduce their filtration and sediment retention functions, thereby increasing the risk of sedimentation towards the body of water south of the study area. However, implementing mitigation measures can counter these effects and these are addressed in the chapter on impacts (Chapter 7).

Regulation

In northern Quebec, the presence of continuous permafrost affects water flow, which occurs primarily on the surface. This flow can therefore be more or less rapid depending on the slope. The fens presented in the study area are on flat or mid-slope terrain, thus allowing better water retention.

The excellent retention capacity of wetlands allows them to play a role in water regulation, especially in the spring (flood periods) and at the end of summer (severe low water period). The fens present in the study area could therefore play a role in regulating the rate at which water reaches the lakes located near the study area. Stripping a portion of these wetlands in the Ivakkak and Nanaujaq sites will therefore cause a local modification of the regulatory function.

Conservation of Biodiversity

Wetlands are known to harbour a great diversity of flora and fauna. However, this diversity is less than what is found in southern Quebec when compared to the northern environment. However, some at-risk species in Quebec can be found in this type of environment. Although, no at-risk species have been listed in the wetlands to be destroyed at the Ivakkak UG and Nanaujaq sites.

Survival of the Environment

In wetlands, the environment is normally maintained by the root system of plants, which contributes to soil conservation. Riparian vegetation is therefore a key factor in protecting banks against erosion. The flat relief surrounding the watercourses does not encourage erosion in the study area. Since there will be surface stripping in the study area, the environment cannot be maintained in its original state. However, stripping in a wet environment will be done more than 60 m from waterways, allowing this function to be preserved.

Carbon Sequestration and Mitigation of Climate Change Impacts

Wetland vegetation uses carbon dioxide, water and light (photosynthesis) in the air to create its tissue. These carbon compounds are then sequestered in the biomass. Wetlands are among the most efficient in carbon sequestration.

The wetlands that will be destroyed represent a small area of the scale of landscape. This destruction will therefore have minimal impact on the reduction of carbon sequestration.

Landscape Quality

The presence of wetlands makes it possible to preserve an environment's natural aspect. Although this function is crucial in southern Quebec, northern ecosystems are made up of a large portion of wetlands. The extension by underground mining of the Ivakkak and Nanaujaq deposits will therefore have a temporary visual impact in the northern wetlands landscape.

6.3.2 Fauna

In 2006, inventories in the area surrounding the Ivakkak, Méquillon, Expo and Mesamax sites had documented, among others, terrestrial mammals and avian fauna, two components that could be affected by the projects covered by this addendum. Fish fauna is only applicable to projects where bodies of water and watercourses could be affected.

According to data from the 2007 impact study, a dozen species of terrestrial mammals live in the arctic tundra and are likely to use the study area at one time or another during the year (Table 6-15). The homogeneity of the Arctic territory and the harsh winter conditions contribute to the environment's low faunal diversity. In regard to at-risk species, note that there is no population estimate for the wolverine in Quebec due to its rarity. In addition, the Inuit of Salluit and Kangiqsujuaq interviewed during the initial impact study mentioned having never observed a wolverine (GENIVAR, 2007). The least weasel has never been observed and polar bears are very rarely present in the NNiP area.

Table 6-15 : Terrestrial Mammals Likely to Use the NNiP Local Study Area

French name	English name	Latin name	Relative abundance
Campagnol des champs	Meadow vole	*Microtus pennsylvanicus*	Low to high[B]
Lemming d'Ungava	Ungava lemming	*Dicrostonyx hudsonius*	Low to high[B]
Lièvre arctique	Arctic hare	*Lepus arcticus*	Low to average
Caribou	Caribou	*Rangifer tarandus*	Low to high[C]
Boeuf musqué	Muskox	*Ovibos moschatus*	Low
Carcajou[A]	Wolverine	*Gulo*	Rare
Hermine	Ermine	*Mustela erminea*	Average
Belette pygmée[A]	Least weasel	*Mustela nivalis*	Low
Loutre de rivière	River otter	*Lutra canadensis*	Low
Renard arctique	Arctic fox	*Alopex lagopus*	Low to average[B]
Renard roux[D]	Red fox	*Vulpes*	Low
Loup[E]	Wolf	*Canis lupus*	Low
Ours blanc[A]	Polar bear	*Ursus maritimus*	Low

Source : GENIVAR, 2007

[A] At-risk species, see Section 6.3.3

[B] The abundance of these species varies according to an approximate 3 to 5 year cycle.

[C] The abundance of caribou varies throughout the seasons

[D] This species has considerably extended its range north due to global warming

[E] Lone wolf or in a pack

The exhaustive inventory for birds including the Ivakkak, Expo and Méquillon sites has made it possible to list 30 species of birds, including 7 waterfowl, 9 aquatic birds other than waterfowl, 5 birds of prey, 7 passerines, the common raven and rock ptarmigan (Appendix R). Among these species, 23 were considered "breeders" in the study area, of which 8 species were confirmed breeders, 3 were probable breeders and 12 were possible breeders. The breeding period for these species runs from May/June to September, while the migration period generally runs from mid-September to mid-October. However, increased climate change could modify these periods during the life of mining operations. Moreover, the inventories had confirmed the presence of the golden eagle and the peregrine falcon in the study area, i.e., two at-risk species (Section 6.3.3.).

No species of herpetofauna is currently listed in the study area due to the extreme northern latitudes of the NNiP.

Sections 6.3.2.1 to 6.3.2.4 relate the incidental sightings and the specific inventories carried out in 2021.

6.3.2.1 Ivakkak UG

Caribou (*Rangifer tarandus caribou*, migratory ecotype) were observed throughout the inventories, mainly in the area's flat wetlands. In fact, during the vegetation inventory on the Ivakkak site, approximately 200 caribou crossed the study area heading north. Another group of about a hundred caribou remained southeast of the area but did not cross over (see Map 6-1). These observations are coupled with a high abundance of tracks and faeces on the ground. According to the CDPNQ (Appendix S), migratory caribou use the study area as a calving area, but it is not legally delimited at the Ivakkak site. The legal boundary begins several kilometers west of the study area. The status of this species is currently under analysis. The study area is a habitat used by the caribou population, but represents a very small portion of its territory, i.e., 13.45 ha out of 153,400 km² for the recognized calving area. This area therefore represents less than 0.0001% of the territory known for the calving area.

During inventories done in the study area, a pair of rough-legged hawks (*Buteo lagopus*) (bird of prey with no special status) was heard heading northeast towards the future site of the explosives. Moreover, during the second field visit for the identification of plant species on August 13, 2021, a fight between two diurnal raptors were seen more than a kilometer south of the vegetation inventories.

The Canada goose (*Branta canadensis*) is a species occupying the sector each year (one was observed southeast of the study area during inventories). Several faeces were also noticed on the ground along the lakeside located south of the Ivakkak UG deposit.

It is therefore possible that the exploitation of the Ivakkak underground deposit will lead to a disturbance of raptors and geese.

No known spawning grounds have been identified in the area according to the CDPNQ. The three watercourses present in the study area show low spawning habitat potential for the fish present in this sector and very unattractive as a spawning habitat due to the shallow depth and very low flow rate. No fish were observed during the inventories. However, the data from the impact study mention that two species were captured and documented in the large Méquillon-Ivakkak study area, specifically cottids *sp*. (*Cottidae*) and lake trout. Let's remember that the lake herring, arctic char and brook trout (presence unlikely due to the northern limit of its distribution area; GENIVAR, 2007) are fish species potentially present in the Méquillon-Ivakkak study area.

Electrofishing was done in two of the three waterways present bordering the study area and along the shore of the lake located south of the planned infrastructures (Map 6-1). The total area inventoried was 950 m² for a fishing time of nearly 15 min. Fish habitat is considered to have very limited potential due to the shallow water depths encountered and low flow rates, which supports the absence of captured fish in these watercourses.

Benthic macroinvertebrates were inventoried on August 15, 2021 in a watercourse in the study area, i.e., at the same site as during the initial ESIA. This aquatic fauna is dominated by arthropods (78%) of the genus *Tribelo*s (chironomid family), *Beatis* (ephemeroptera family) and *Daphnia* (family crustaceans) (Figure 6-3; Appendix T). A large proportion of annelids are also present with 15.6% of which the genus *Lumbriculus* and *Enchytraeidae* are more abundant. Platyhelminths (5.4%) and nematodes (1.0%) complete the benthic community. The total density is 1533 organisms/m² distributed in 30 different taxons. During the initial impact study, the density recorded was 1927 organisms/m² distributed in 19 different taxons, which is less diversified than what was listed in 2021. However, the density is slightly lower in 2021 compared to 2006. Arthropods were also the most abundant benthic invertebrates in 2006. However, the absence of mayflies was noted in 2006, whereas there were present in great abundance in 2021 (184 organisms/m²).

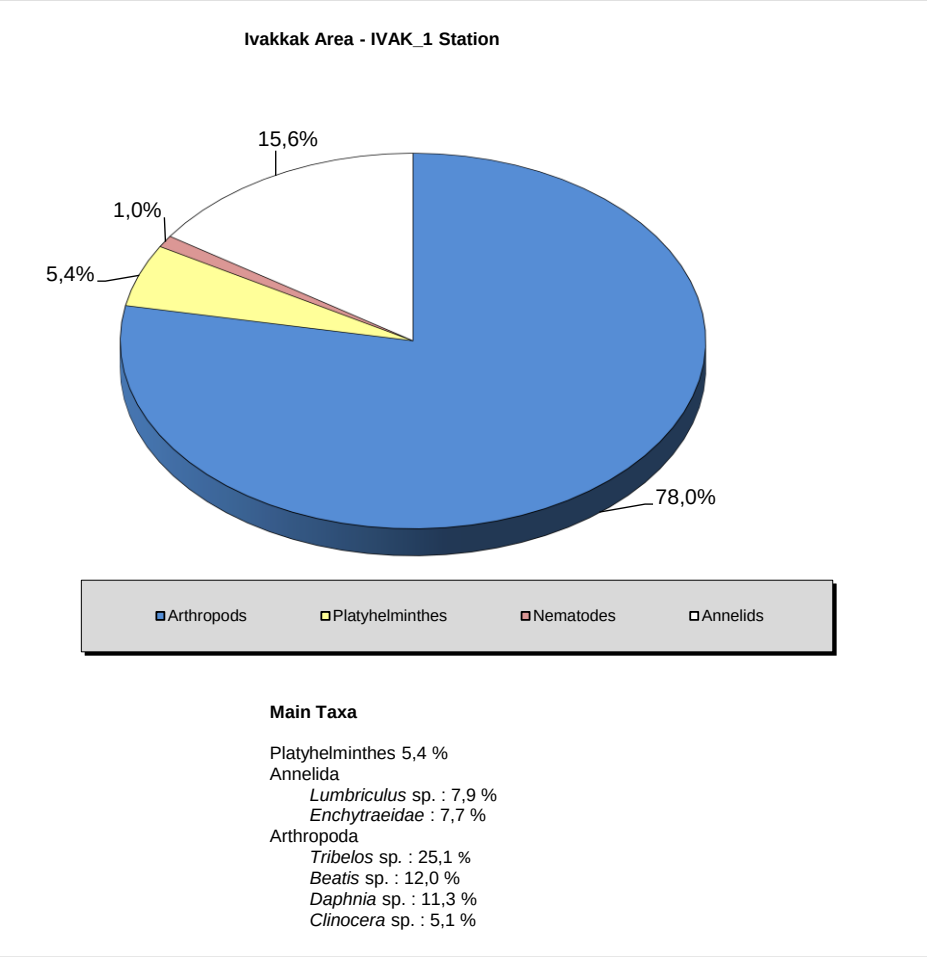


Figure 6-3: Relative Abundance of Benthic Macroinvertebrates Sampled in 2021

6.3.2.2 Méquillon UG2

During the 2020 inventories, several caribou were observed throughout the inventories, mainly in the study area. Since the site of the Méquillon deposit is already in operation, a large area of the study area now corresponds to an anthropogenic environment and vehicle traffic is omnipresent. Mining the Méquillon UG2 deposit will not cause new impacts on the caribou population.

There was a sighting in 2020 of a rock ptarmigan (*Lagopus muta*) at the bottom of the dyke access road inside the study area. According to the WSP study (2018), the area is also frequented by long-tailed duck (*Clangula hyemalis*), Lapland longspur (*Calcarius lapponicus*) and the herring gull (*Larus argentatus*). Canada geese nests have notably been observed along the shores of lakes Mequillon, Fleury and Nº 4.

6.3.2.3 Nanaujaq

Caribou were observed throughout the inventories, mainly in the area's flat wetlands. In fact, during the vegetation inventory on the Nanaujaq site, about 40 caribou were seen north of the study site, in addition to the presence of faeces on the ground. A lemming burrow and nest (*Dicrostonyx sp.*) were also observed in the study area wetland.

An AECOM team completed an inventory of avian fauna by helicopter on July 16 and by transect on July 17 and 19, 2021. Observations made on the birds revealed 11 males, 11 females, 226 individuals of undetermined sex and 3 Canada geese eggs (*Branta canadensis*) (Table 6-16 and Map 6-3). A Canada goose nest was found on an island in the lake north of the Nanaujaq site. In total, 11 different species have been indexed on the Nanaujaq site. The Canada goose is the species most widely observed. The construction work and mining of the Nanaujaq deposit could disturb migratory birds in their use of the territory.

Along the future contaminated water pipe between Nanaujaq and Méquillon, three male snow buntings, Canada geese and a raven were observed during the characterization in 2021. Signs of the presence of caribou and Canada geese such as faeces, tracks and browse were also seen at six characterization stations. In addition, faeces and a lemming nest were observed along the road (see Map 6-4).

6.3.2.4 Expo South

Signs of the presence of caribou were observed on the ground during the vegetation inventory on the Expo South site. In fact, tracks, faeces and hair were found on some vegetation stations. A trace of a rough-legged hawk (Buteo lagopus), a bird of prey with no special status, was also seen about one kilometer east of the study site. The CDPNQ does not mention any at-risk wildlife species on the Expo site (Appendix S).

6.3.3 At-Risk Species

The study from Tremblay *et al*. (2006) mentions 84 different vascular plant species in the NNiP area, more specifically at the Ivakkak, Méquillon and Expo sites. Among these, arctic hairgrass (*Deschampsia brevifolia*), sulphur buttercup (*Ranunculus sulphureus*) and ellesmere Island draba (*Draba subcapitata*) have a status at the provincial level (species likely to be designated threatened or vulnerable). Note that since 2008, *Deschampsia brevifolia* has been removed from the list of status species in Quebec (CDPNQ, 2008). As for the flora, the CDPNQ mentions the presence of species likely to be designated, namely the hooked threadwort (*Cephaloziella uncinata*), the Cayouette's draba (*Draba cayouettei*), the Baffin Bay draba (*Draba corymbosa*), the small-flowered draba (*Draba micropetala*), the ellesmere Island draba, alpine grimmia (*Grimmia sessitana*), sulphur buttercup, and Ross' sandwort (*Sabulina rossii*) near the study area. The sulphur buttercup had been reported in previous studies at the Ivakkak OP site and on the planned road between the Méquillon and Ivakkak sites (Tremblay, 2006; WSP, 2019; Deshaye, 2019 and Nuna Resources, 2020; AECOM, 2020), but no sulfur buttercups were found during the 2021 inventories at the sites studied.

No at-risk fauna or flora species were observed during the inventories at the Ivakkak UG and Expo South sites. A single specimen of small-flowered draba (a species likely to be designated as threatened or vulnerable in Quebec) was listed northeast of the Nanaujaq site (Map 6-5). Table 6-17 presents the distances travelled to search for at-risk plant species.

Table 6-16: Observation of Migratory Birds at the Nanaujaq Site in 2021

Species	Latin name	Male	Female	Sex undetermined	Number of eggs	Total number	Stage	Observation	Habitat
Observations by transect (30 ha inventoried)									
Dunlin	*Calidris alpina*	-	-	-	-	-	-	On the ground	Lowland fens
Herring gull	*Larus argentatus*	-	-	5	-	5	-	In flight	between 600 and 700m south of the lake
Long-tailed duck	*Clangula hyemalis*	1	1	-	-	2	-	At rest	On the lake near southwest of the study area
Snow bunting	*Plectrophenax nivalis*	1	-	-	-	1	-	In flight	Lowland fen
		1	1	-	-	2	-	Perched, in flight and eating	Lowland fen
Lapland bunting	*Calcarius lapponicus*	-	-	1	-	1	-	In flight	Lowland fen
		1	1	-	-	2	-	Eating	Lowland fen
		1	-	-	-	1	-	Perched	Boulder field
		1	1	-	-	2	-	On the ground	Boulder field
Loon	*Gavia immer*	-	-	1	-	1	-	On a watercourse	On the lake near southwest of the study area
Semipalmated plover	*Charadrius semipalmatus*	-	-	1	-	1	-	On the ground and moving	Lowland fen
Helicopter overflight observations (628 ha)									
Dunlin	*Calidris alpina*	-	-	1	-	1	-	-	On the ground
Canada goose	*Branta canadensis*	-	-	45	-	45	molt	-	On the lake shore
		-	-	92	-	92	molt	-	On water
		-	-	28	-	28	molt	-	On water
		-	-	1	-	1	molt	-	On water
		1	1		3	5		Nest present	On the ground
				1		1	molt	-	On the ground
				15		15	molt	-	On water
				13		13	molt	-	On water
				15		15	molt	-	On water
Northern pintail	*Anas acuta*	1	1			2		-	On water
Herring gull	*Larus argentatus*			2		2		-	On a rock in the lake
Long-tailed duck	*Clangula hyemalis*	1	1			2		-	On water
		2	2	1		5		-	On water
			1			1		-	On water
Red-breasted merganser	*Mergus serrator*		1			1		-	On water
Red-throated loon	*Gavia stellata*			1		1		-	On water
				1		1		-	On water
Loon	*Gavia immer*			1		1		-	On water
				1		1		-	On water
Grand total		**11**	**11**	**226**	**3**	**251**			

Table 6-17: Distance Travelled to Search for At-Risk Plant Species in the Study Areas

Study area	Distance travelled (km)
Ivakkak UG	8.4
Expo South	3.2
Nanaujaq UG and alongside the Nanaujaq-Méquillon road	35.1

As for fauna, the CDPNQ mentions a golden eagle (*Aquila chrysaetos*) nest and a peregrine falcon (*Falco peregrinus*) nest more than 10 km east of the Ivakkak site. These two species, which have the vulnerable species status in Quebec, were observed in 2016. As the distance between these nests and the mining site is relatively large, little impact is to be expected for these species.

6.4 Human Environment

The description of the human environment presents the main social and cultural characteristics of the local communities affected by the project, including the Inuit communities, the relationship between these communities and the natural environment, in addition to how they make use of the environment's different elements. This use considers the social, cultural and economic values that the Inuit communities attribute to them, their perceptions of the project, in addition to relevant information in regard to the local population's health.

6.4.1 Nunavik and Communities Present

Nunavik is composed of 14 Inuit villages with hundreds of kilometers between them. They are scattered along the coasts of the Hudson Bay, Hudson Strait and Ungava Bay. An Inuit community is also established in the Cree village of Chisasibi. Kangiqsujuaq, Salluit and Puvirnituq are the villages closest to the study area. Kangiqsujuaq and Salluit are located approximately one hundred kilometers from the NNiP study area, while the village of Puvirnituq is located over 200 km to the west.

6.4.1.1 The James Bay and Northern Quebec Agreement (JBNQA)

The territory of Nunavik is governed by the James Bay and Northern Quebec Agreement (JBNQA) signed in 1975. This Convention, described as the first "modern treaty," redefined the relationships between the province of Quebec, Canada and the Inuit populations of northern Quebec, within the context of the hydroelectric development in James Bay. The terms of this Convention primarily cover land management. The lands of categories I on which the Inuit villages (and Cree) are located, and the surrounding areas are managed exclusively by the latter. The lands of category II are reserved exclusively for hunting, fishing and trapping, while the lands of category III can be the subject of a development, all while maintaining exclusive hunting and gathering rights to the profit of the Inuit (Turcotte, 2019).

The NNiP deposit sites are located on the lands of category III (WSP, 2015) (Map 6-6). The entire site is located north of the Puvirnituq River and the Pingualuit National Park created in 2004 (Proulx, Dubé and Cloutier, 2019).

6.4.2 Governance

Under the terms of the JBNQA, the Nunavik Inuit hold claim to 8,152 square kilometers of land and exercise rights of several hundred thousand square kilometers (Crown-Indigenous Relations and Northern Affairs Canada, 2020).

The JBNQA agreement signed in 1975, solved land claims requests, made room for financial compensation and defined the Nunavik Inuit's rights. Another agreement was signed in 2007 in regard to offshore rights. These agreements now form the basis of the relations that the Inuit maintain with their neighbours and the various levels of federal and provincial government. As for the Cree and the Naskapis, the JBNQA defined harvesting rights, established a resource management system and created the I, II and III land categories. The signing of this agreement also led to the creation of entities such as the Kativik Regional Government (KRG), the Kativik School Board (KSB), the Nunavik Regional Board of Health and Social Services (NRBHSS) as to promote the

Nunavimmiut's development. The Makivik Corporation, created during the JBNQA signing, has a diversified mandate, including to ensure overall compliance with the Agreement, managing financial compensation, creating jobs for the Inuit, promoting socio-economic development, improving their housing conditions, supporting language and culture, etc. (Canadian Geographic, 2021, Société Makivik, 2021a).

Under the JBNQA, the Inuit have opted for a municipal system run on a non-ethnic basis. This governance is structured around two levels. The first level is local and is composed of northern villages. The second level, supra-local, is composed of the Kativik Regional Government (KRG). Northern villages are governed by councils which consist of a mayor and up to six councillors. Elections are held every 3 years. Northern villages essentially have the same powers and jurisdictions as other municipalities in Quebec, e.g., the supply of certain services, including drinking water, waste collection, wastewater treatment, recreation, etc. The KRG is managed by a board of 17 members and an administrative committee of 5 members. The council includes representatives from each of the fourteen northern villages and the Naskapi village of Kawawachikamach (Ministry of Municipal Affairs and Housing of Quebec, 2010).

6.4.3 Socio-Economic and Demographic Situation

6.4.3.1 Demographic

The Nunavik population is very young. Usually, more than 60% of the population is under 30 years of age, which is double to the corresponding proportion in southern Quebec. The population is growing at a rate of 3 to 4 times higher than the Quebec average (Société Makivik, 2021b).

According to Statistics Canada, in 2021, the population of the Kangiqsujuaq, Salluit and Puvirnituq villages totalled 837, 1580 and 2129 people respectively (Statistiques Canada, 2022).

6.4.3.2 Economy and Employment

The Inuit society has changed significantly over the past fifty years. The *Nunavimmiut* have gone from a way of life in close relationship with the territory and its resources, toward a more sedentary way of life focused on paid work. The Nunavik now live under a mixed economic regime based on employment income and traditional means of subsistence (Nunavik Regional Board of Health and Social Services, 2015). In Kangiqsujuaq, the employment rate for the population aged 15 and over was 57.4%, while it was 56.3% for the Salluit in 2015 (Statistiques Canada, 2016 a and b). However, the unemployment rate was higher in Kangiqsujuaq (23.7%) than in Salluit (15.1%). The unemployment rate is higher for the men than for the women in both municipalities.

Usually, the Nunavik economy is much less diversified than the rest of Quebec. In 2012, the public administration, mining and construction sectors accounted for 85% of all activity in the region. The mining sector alone accounted for 40% of economic activity. Although the economic activity combined with the small population of the region resulted in a GDP (which is established on a territorial basis) per capita considerably higher than that of the province as a whole, the disposable income of Nunavik residents was lower than that of the province according to an analysis carried out in 2012. This disparity was explained by the fact that a large part of the mining sector's wages (exploitation and exploration) and construction were paid to workers who didn't live in the region. It was mentioned that this gap tended to decrease over time (Robichaud and Duhaime, 2015).

Composantes du projet / Project component

- Zone d'étude locale (EIES 2007) / Local study area (ESIA 2007)
- Complexe minier – Phase 2a (Expansion souterraine) / Mining complex – Phase 2a (Underground expansion)
- Projet minier autorisé pour exploitation / Deposit authorized for exploitation
- Projet minier autorisé pour exploitation Phase 2a (Expansion souterraine) / Deposit authorized for exploitation Phase 2a (Underground expansion)
- Phase 2a – Nouveau gisement (Souterrain) / Phase 2a – New deposit (Underground)
- Phase 2b – Nouveau projet minier / Phase 2b – New mining project
- Route projetée / Proposed road

* *Demande d'autorisation en cours pour une expansion minière sur un projet minier autorisé / Applications for authorization pending for a mining expansion on a mining project authorized*

Utilisation du territoire / Land use **

- Sentier pédestre / Pedestrian trail
- Sentier de motoneige / Snowmobile trail
- Sentier de motoquad / Quad trail
- Sentier de traîneau à chien / Dog sled trail
- Ligne de piégeage / Trapline

** *Étude d'impact initiale / Initial impact assessment, Génivar, 2007*

Limites / Boundaries

- Aire de mise bas du caribou / Caribou calving area
- Terres de catégorie II / Category II lands

Mesure du bruit / Noise measurement

- Sonométrie / Sonometrics

Archéologie / Archeology

- JlFl-1 — Site archéologique connu avec code Borden (ISAQ) / Known archaeological site with Borden code (ISAQ)
- Site archéologique potentiel / Potential archaeological site
- Esker - Aire à potentiel archéologique / Esker - Area with archaeological potential
- Zone à potentiel archéologique / Area with archaeological potential

Infrastructures / Infrastructure

- Aéroport / Airport
- Campement temporaire / Temporary camp
- Campement permanent / Permanent camp
- Route locale / Local road
- Autre route / Other road

Vers Baie Déception / To Deception Bay

Vers Havre Douglas / To Douglas Harbour

73°40'0" 73°20'0" 73°0'0" 61°46'0" 61°30'0" 61°20'0" 74°40'0" 74°20'0" 74°0'0" 73°40'0" 73°20'0"

Nord-du-Québec (10)
Kativik (AR)
Rivière-Koksoak, NO

Kattiniq
Aéroport de Donaldson / Donaldson Airport
Site A
Site B
Site C
Complexe minier Expo / Expo mining complex
Expo Sud
Mesamax
Allammaq
Puimajuq
Nanaujaq
Méquillon
Méquillon UG2
Delta
Ivakkak
Ivakkak UG
C004-F002
C001-F003
Esker 2

Lac Rinfret, Lac Letendre, Lac de la Tente Déchirée, Lac Mercille, Lac du Bombardier, Lac Renne, Lac Gindeau, Lac Rocbrune, Lac Vicenza, Lac Esker, Lac Fleury, Lac Perkin, Lac Méquillon, Lac du Hibou, Lac Vaillant, Lac Forcier, Lac Gog, Lac Carré, Lac Perron, Lac Saint-Germain, Lac Laflamme, Lac Rouxel, Lac Vergons, Lac Nallusarqituq, Lac Beauparlant

Rivière Déception, Rivière Petite, Rivière de la rivière Puvirnituq, Rivière Vachon

JkFk-1, JkFk-2, JkFk-3, JkFl-1, JjFl-1, JjFl-2, JjFm-1, JjFn-1, JjFn-2, JhFj-1, JhFj-2, JhFj-3, JhFj-4, JhFj-5, JhFj-6, JhFk-1, JhFk-2, JhFk-3

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Savoir traditionnel inuit dans la zone d'étude du PNNi selon l'EIES 2007 et archéologie / Inuit Traditional Knowledge in the NNiP study area according to ESIA 2007 and archeology

(Données actualisées en attente / Pending updated data)

Sources:

BNDT, 1:50, 000, RNCan, 2007
Adresses Québec, MERN Québec, 1er Mai/May 2020
Habitats fauniques/Wildlife habitat, MFFP Québec, 2021
Inventaire des sites archéologiques du Québec / Inventory of archaeological sites in Québec (ISAQ), MCC Québec, Février/February 2021
Données de projet/Project data, Canadian Royalties, 2021

Cartographie/Mapping: AECOM
Fichier/File: 6063-5966_a-tr_c6_7_mil_humain_220531.mxd

0 2,65 5,3 km
UTM, Zone 18, NAD83

Carte / Map 6-7

Juin / June 2022

AECOM — NUNAVIK NICKEL — CANADIAN ROYALTIES INC.

In addition, certain data from the 2017 Aboriginal Peoples Survey was analyzed by researchers to better understand Inuit participation in the wage economy and the resource-based economy (hunting, fishing, trapping and gathering). In 2017, 27% of Nunavik Inuit aged 25 to 54 were inactive and did not participate in the wage economy. Those living in Nunavik were among the most likely to participate in resource-related activities (hunting, fishing, trapping) to supplement their income (35%) when compared to other regions of the Inuit Nunangat. The results of this analysis indicated that conventional measures of labour market activity, combined with participation in resource-related activities such as hunting, fishing, gathering, provided more accurate insight into the complex reality of work in these communities. Public administration, health care and support, educational services and retail trade were among the top sectors of paid employment (Statistiques Canada, 2019).

CRI is committed, within the framework of the Nunavik Nickel Agreement presented in section 3.5, to hire as many Inuit employees as possible, depending on the positions available and the skills required, with the goal of promoting socio-economic benefits in Inuit communities. The recruitment results of Inuit employees are presented to the partners during the Nunavik Nickel Committee meetings. The average number of Inuit employees is presented in Table 5.4. Employees carry out functions within the various departments, according to the interests in which they've expressed. Restrictions related to the Covid-19 pandemic to limit Inuit employee hiring, explain the declines in 2020 and 2021, which still have repercussions to this day in 2022. However, recruitment efforts will continue.

We also note that most of the Inuit employees at the Expo site are male. The same situation is also noted for all employees, since less than 10% of the total number of employees at the Expo site were female between 2020 and 2022. However, the number of female Inuit employees has been increasing since 2020, since their average annual number has increased from 4 to 14.

Table 6-18 : Average Number of NNiP Inuit Employees 2019-2022

Number of Inuit employees	2019	2020	2021	2022*
Average numbers during the year	54	23	41	48
Average proportion compared to the total number of employees	8%	5%	7%	8%
Average number of women	10	4	9	14
Average number of men	44	19	31	34

*Calculated over the period from January to April.
Source: Data provided by CRI

6.4.3.3 Language

The principal spoken language in Nunavik is Inuktitut. However, English is commonly used due to the historical presence of the federal government in the administration.

6.4.4 Land Use by the Inuit

A map created during the completion of the initial impact assessment in 2006 (Map 6-7), indicates the approximate general hunting and fishing areas of the Puvirnituq, Salluit and Kangiqsujuaq Inuit communities. It shows that the Puvirnituq people then practiced their activities west of the local study area, while the Salluit people occupied more of the sectors located north (e.g., Deception Bay) and to the west. As for the Kangiqsujuaq community members, their hunting and fishing[11] activities took place south and east of the local study area. It was specified that they fished near the Pingualuit crater (located in Pingualuit National Park) and at Mequillon lake (GENIVAR, 2007).

[11] According to the initial impact assessment, only one fishing sector was present near the suggested mining sites and it was a fishing site used by the Kangiqsujuaq people, which includes Mequillon lake.

Maps presenting more recent information in regard to the Inuit's use of territory under study were transmitted by the Makivik Corporation (Figures 6-4 to 6-9). They are taken from interviews conducted by the Corporation in the Salluit and Kangiqsujuaq communities during the winter of 2017[12]. These maps illustrate trips across the territory (mainly by snowmobile), camps that were used during these trips and the harvesting sites. For those locations, the resources exploited and the periods of exploitation are not mentioned. However, an interview with a geomatics manager from Makivik revealed that it was primarily a location for harvesting big game, such as caribou. Some locations were also trapping sites (mainly fox), fishing sites and gathering sites, but to a lesser extent. However, it was not possible to know which activity/activities correspond(ed) to the locations identified. In addition, for each of the elements identified on the maps (routes, camps, harvesting sites), it was impossible to know if they were mentioned by more than one person, or if they've been visited on more than one occasion between 2007 and 2017. Therefore, we have no information in regard to what the usage intensity could be. However, these maps do show that recent use by the Inuit of the territory affected by NNiP's Phase 2a are essentially used by the people of Kangiqsujuaq.

The maps provided by the Makivik Corporation identify two routes (probably made by snowmobile) that pass in proximity to the Expo South site, not far from the Nanaujaq and Méquillon sites. However, the routes identified extend quite far north and south of the Ivakkak UG site (Figure 6-4). These routes were done during multiple-day excursions on the territory by the people of Kangiqsujuaq. Overnight stops at the camps were made during these excursions for one or more nights. The routes closest to the suggested mining sites mentioned by the people of Salluit extend for more than a dozen km to the north of the Expo South site (figure 6-5).

The camps shown on the Makivik Corporation maps are relatively far from the suggested mining sites. The closest ones were mentioned by the people of Kangiqsujuaq (Figure 6-6). A few of these camps are located a few km to the west and south-west of the Méquillon site, specifically along the shore of Vaillant lake. A camp is also located south of the Méquillon site, on the Puvirnituq River's southern bank. Four other camps are located more than 15 km south of the Expo South and Méquillon sites, on Saint-Germain lake western shore. The only camp mentioned by the people of Salluit on the territory covered by NNiP's Phase 2a, is on the northern bank of a lake located to the north of Beauparlant lake, more than 20 km to the west of the of Ivakkak UG site (Figure 6-7). According to an official from the Makivik Corporation, the camps reproduced on the maps created by the Makivik Corporation were visited during trips made in the sector (probably by snowmobile in the winter and spring). It is also possible that they were visited during other times of the year by groups travelling by seaplane.

Some harvesting sites on the maps provided by the Makivik Corporation are located not far from the proposed mining sites (Figure 6-8). They were mentioned by the people of Kangiqsujuaq. They are found primarily surrounding the Méquillon site, including five sites located directly on the shore of Mequillon lake. There are also more than a dozen harvesting sites a little further east and southeast, along the shores of Vaillant lake. A harvesting site illustrated is also located near (just to the west) the Nanaujaq site. The harvesting sites closest to the Expo South site are about 5 km to the east. As for the Ivakkak UG site, the closest harvesting site is nearly 10 km to the southeast, on the Puvirnituq River's northern shore. The closest harvesting sites mentioned by the people of Salluit are located around Beauparlant lake, in addition to the Puvirnituq River's north shore, located over 20 km west and southwest and the Ivakkak UG site (Figure 6-9). An official from the Makivik Corporation indicates that, just like the camps, the harvesting sites were probably visited during the trips made in the sector. It is also possible that harvesting sites may have been visited by groups travelling through the territory by seaplane.

[12] These interviews were conducted with land users and covered a 10-year period, from 2007 to 2017. They only focused on the territory's current use and did not collect any historical data from before 2007.

6.4.4.1 Species of Interest Present in the Study Area

Caribou and other land animals

An environmental characterization report produced by the CIMA+ firm (2019) as part of the Delta-Kenty project, identified a protected habitat within the study area, specifically a calving ground for migratory caribou (*Rangifer tarandus*). This information is from MERN's geo-descriptive databases of wildlife habitats from 2011. According to existing regulations, a calving area is defined as a territory characterized by the presence of at least five female caribou per square kilometer, between May 15th and July 1st. The sites affected by this addendum are located outside of the legally protected calving habitat.

Migrating caribou and the Arctic fox (*Alopex lagopus*) are frequently present in the study areas. The presence of wolves was not confirmed, but suspected, since caribou bones were found in the location of the future Delta project and therefore west of the present study area (CIMA+, 2019).

As mentioned in Chapter 3, during the public hearings conducted as part of the 2006 impact assessment, the participants from the Salluit and Kangiqsujuaq communities met had observed that the caribou migration routes had changed since the Nunavik mining activities began (GENIVAR, 2007).

Sites of interest

In the Puimajuq site addendum created in 2015, the presence of two sites deemed of interest by the Inuit of Kangiqsujuaq was mentioned. These were the sectors of *Pingualjait*, meaning "small hills where people trap foxes" and the one named *Misa tammaavitsatua* which means "place where people take shelter in a blizzard" (WSP, 2015: 76, citing M. Lucassie Pilurtuut, pers. comm., 2008). These sites are not impacted by the projects in this addendum.

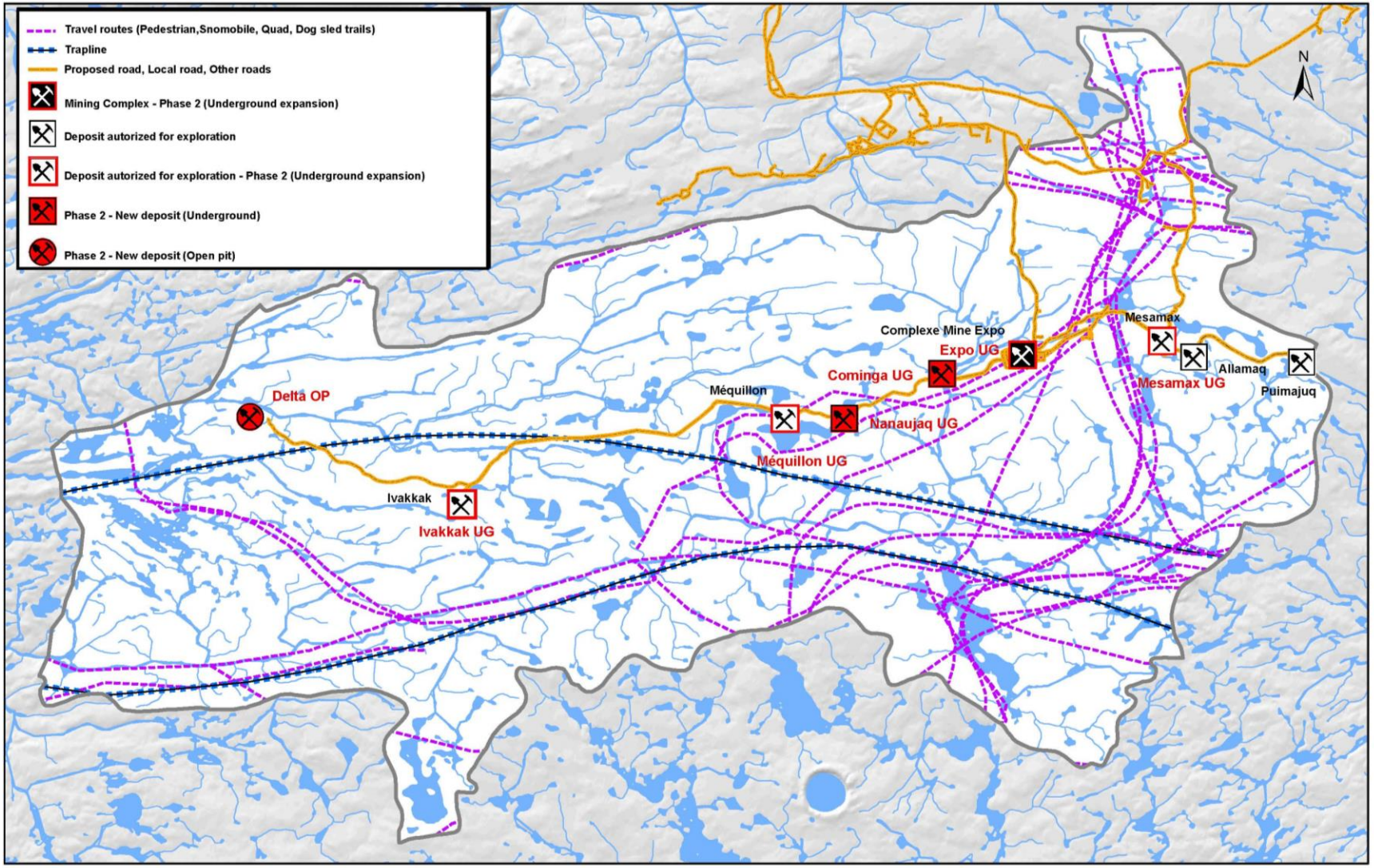


Figure 6-4 : Routes Taken by Inuit Users of Kangiqsujuaq on the Territory Affected by NNiP's Phase 2a, 2007-2017

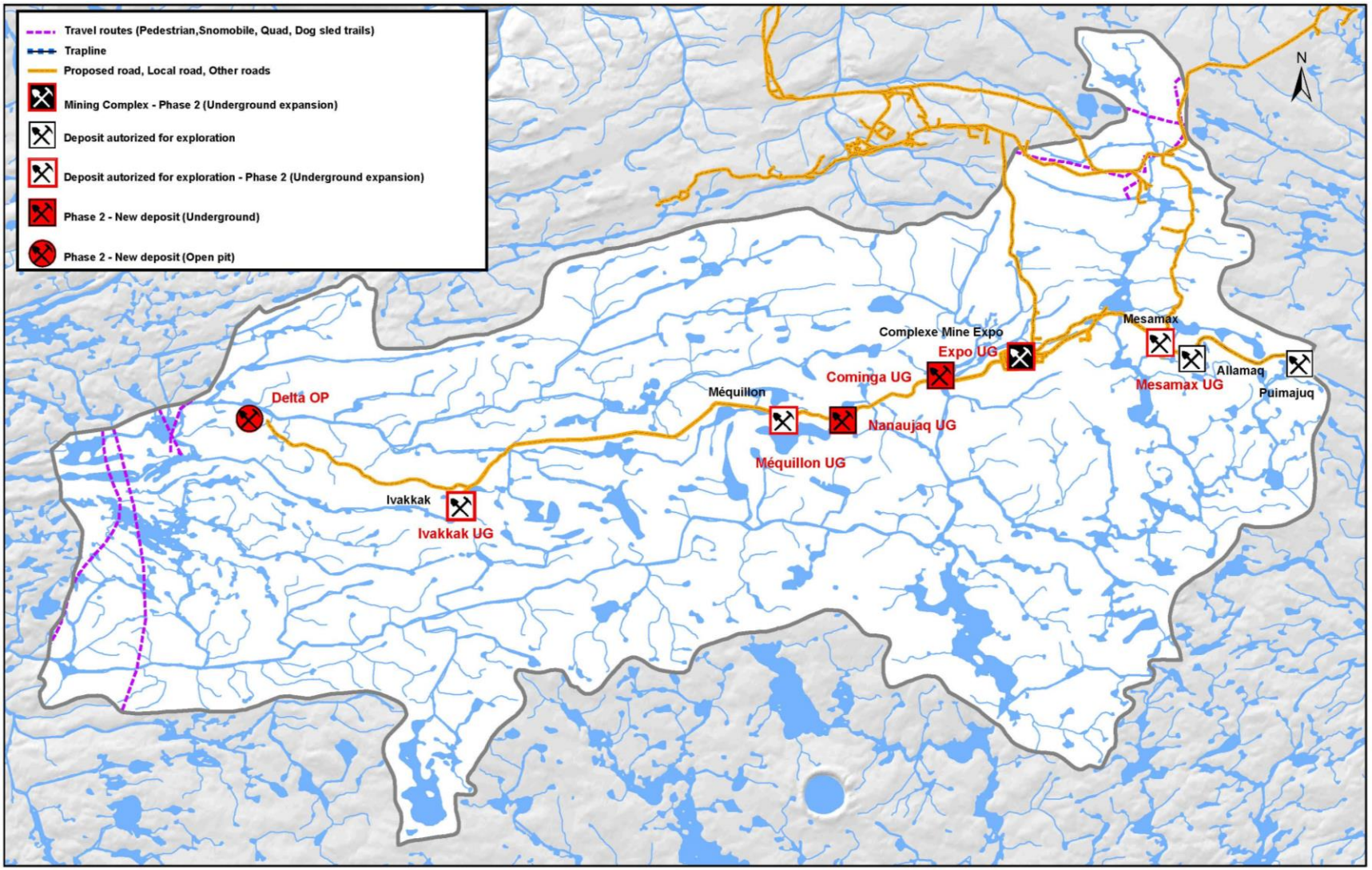


Figure 6-5 : Routes Taken by Inuit Users of Salluit on the Territory Affected by NNiP's Phase 2a, 2007-2017

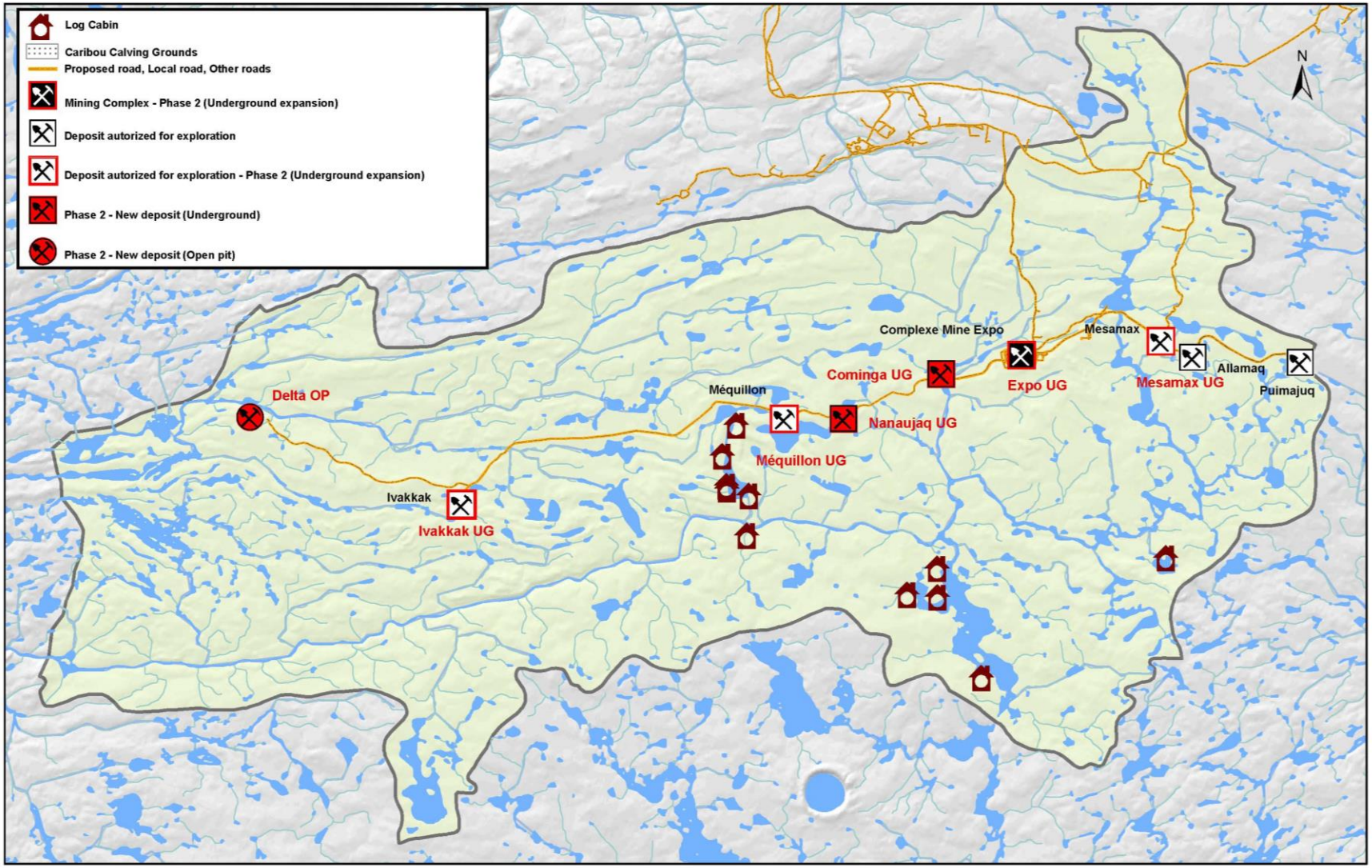


Figure 6-6 : Camps Used by Inuit Users of Kangiqsujuaq on the Territory affected by NNiP's Phase 2a, 2007-2017

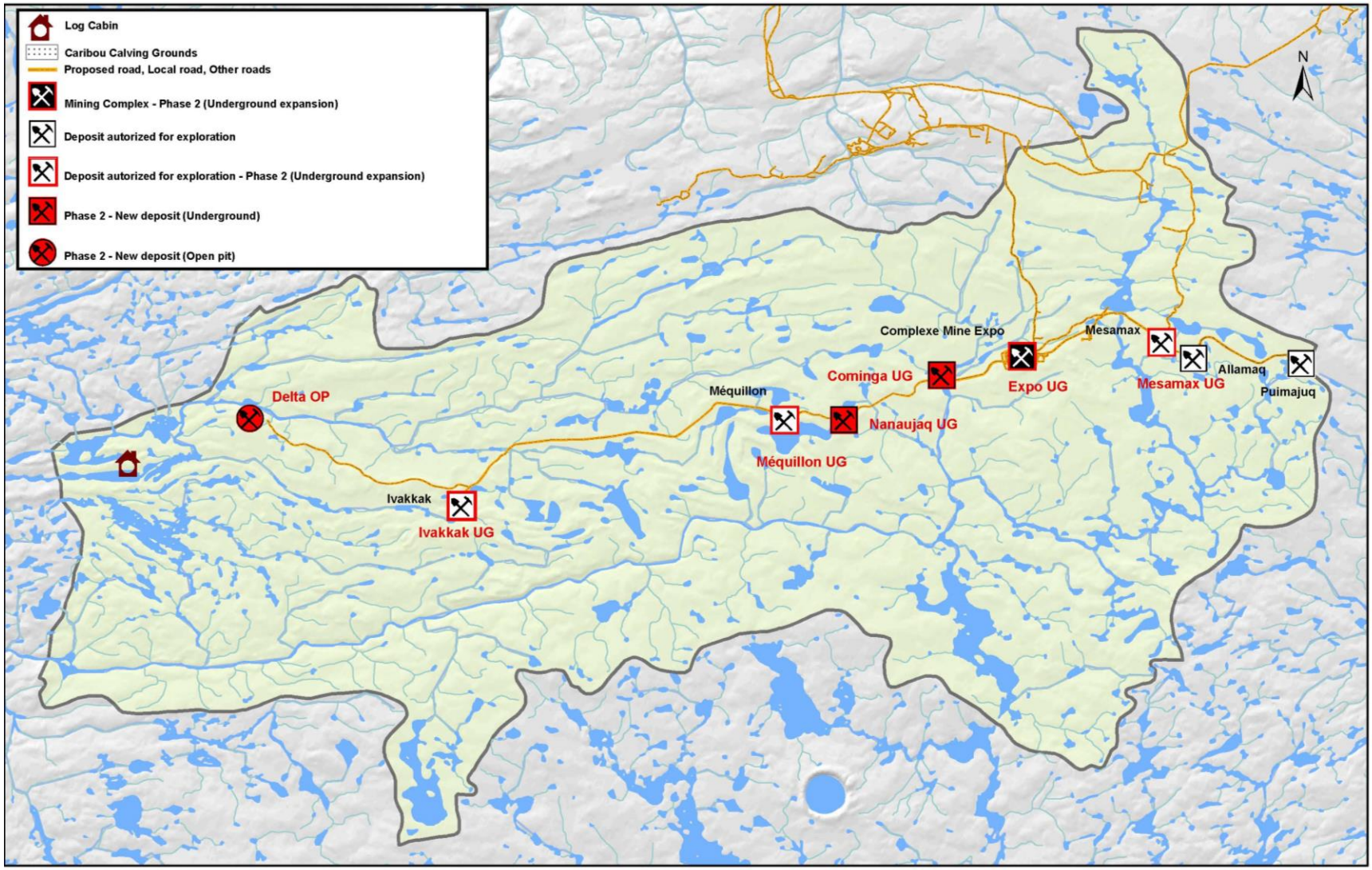


Figure 6-7 : Camps Used by Inuit Users of Salluit on the Territory Affected by NNiP's Phase 2a, 2007-2017

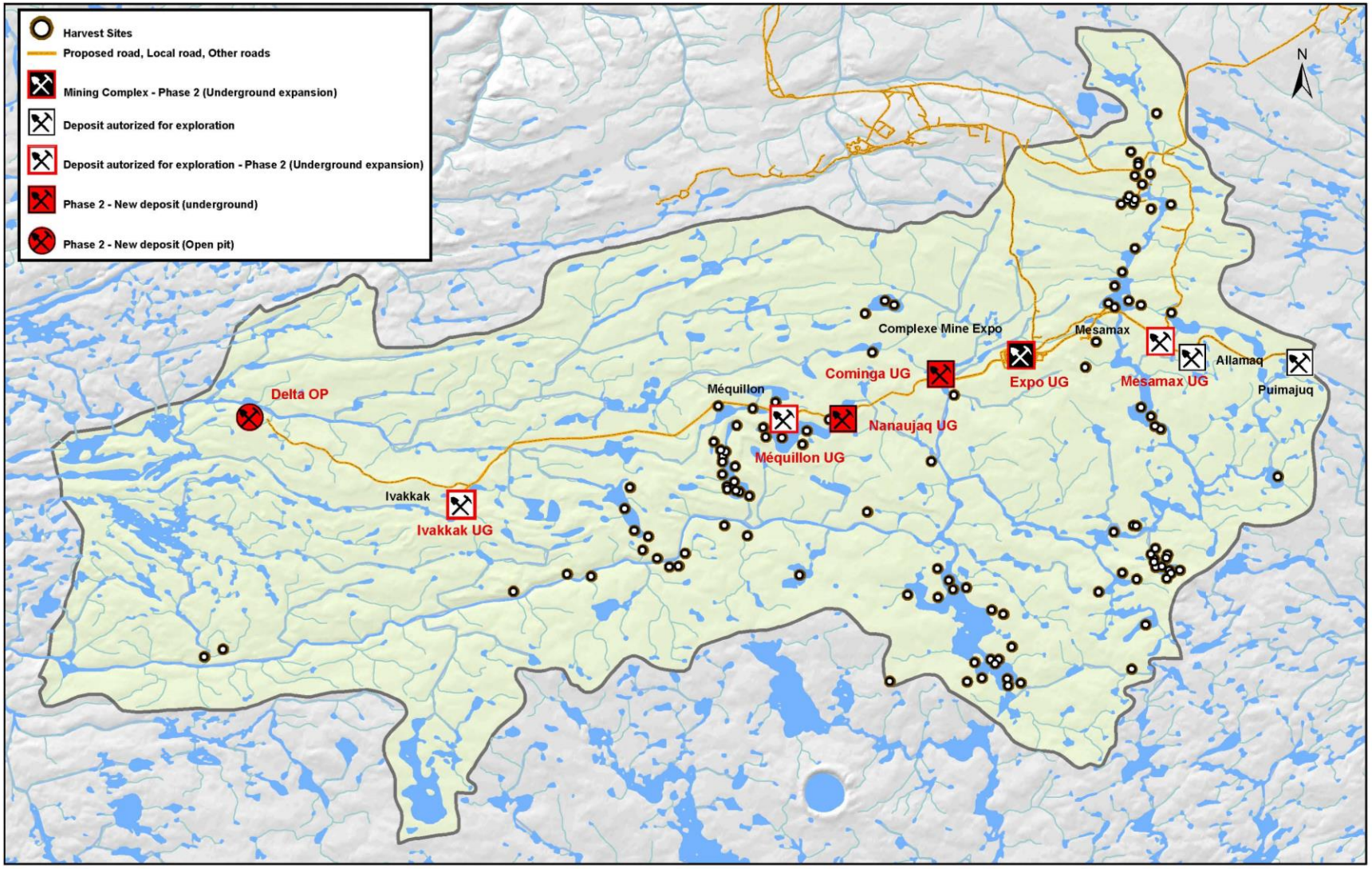


Figure 6-8 : Harvesting Sites Mentioned by Inuit Users of Salluit and Kangiqsujuaq on the Territory Affected by NNiP's Phase 2a, 2007-2017

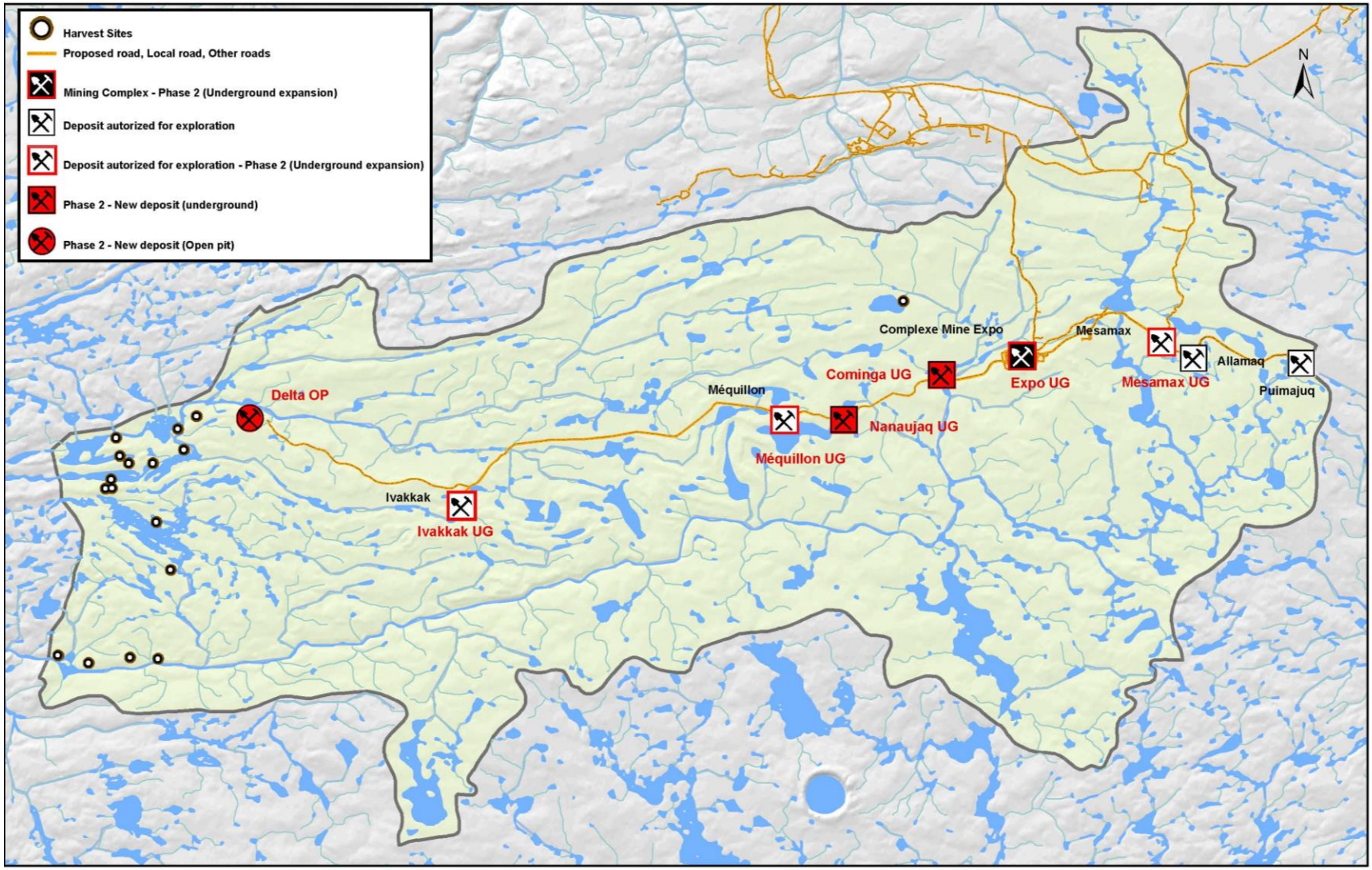


Figure 6-9 : Harvesting Sites Mentioned by Inuit Users of Salluit on the Territory Affected by NNiP's Phase 2a, 2007-2017

6.4.5 Landscape

The landscape affected by the various mining expansion projects affects the northern plateau unit of the Puvirnituq River (GENIVAR, 2007). The landscape of the study area is typical of the “Puvirnituq Hills” sub-unit, which is part of the “Ungava Plateau” natural region. It is made up of a vast undulating plateau formed by low hills surrounded by lakes s (specifically Beauparlant lake, Mequillon lake, Saint-Germain lake, Bombardier lake and Rocbrune lake) and watersheds that are covered with snow for most of the year. The most significant concentration of observers closest to the study area is the village of Kangiqsujuaq. The Pingualuit National Park crater, which is globally recognized as an exceptional geological phenomenon of this northern landscape, is located about 31 km from the Expo industrial complex. Thus, the landscape of the areas affected by this addendum may be frequented by some Inuit who have permanent camps or some Inuit who may build temporary camps nearby for their traditional activities.

The landscape of the study area can be accessed via the roads developed to reach the Expo industrial complex up to the Ivakkak deposit, in addition to the trails used by the Inuit. The future Nanaujaq site is the only landscape with some disruption compared to the other sites (Ivakkak OP, which is authorized, Méquillon and Expo which are already under exploitation). Photos 6-1 to 6-4 present the current visual environments.

Photo 6-2 : View of the Future Ivakkak UG Site and the Future Ivakkak OP Exploitation Site a Little Further Away

Photo 6-3 : View of the Méquillon Site.

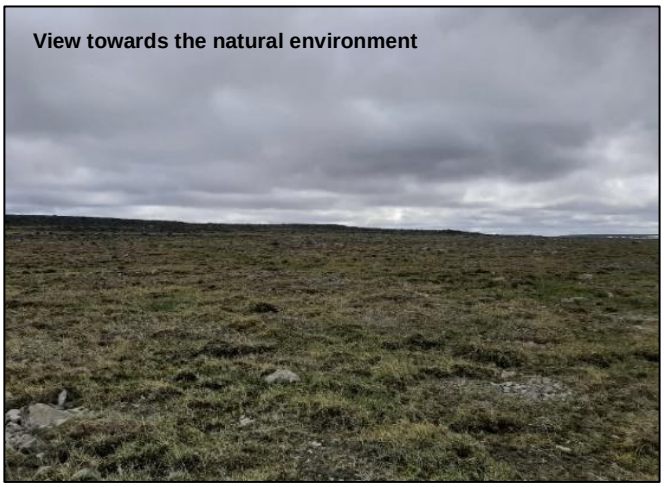


Photo 6-4 : Vue du futur site Nanaujaq

Photo 6-5 : Vue du futur site Expo Sud et du complexe Expo

6.4.6 Study of Archaeological Potential

A theoretical study for archaeological potential was carried out by AECOM in 2021 for the future Ivakkak-Delta road area and the Delta deposit. The detailed study will be presented in the Phase 2b addendum. This section outlines the summary of that study. The potential sites already listed during the initial impact assessment and the new potential sites identified are shown in Map 6-7.

The archaeological potential study uncovered the location of two new archaeological sites on a regional scale and identifies areas with potential for the presence of cultural resources that are archaeological in nature. Within the territory under study, it was possible to observe a distribution of archaeological sites around the shores of the main lakes, along the navigable waterways, more specifically at the Puvirnituq River and in proximity to the caribou crossing areas, caribou being the primary resource sought by the occupants of the inner territory. These locations all present one of the analysis criteria associated with the presence of human occupation on the territory under study. The photo-interpretation and topographical analysis of the projected work area made it possible to target a few locations, which present some of the criteria associated with a human presence within the hinterland. A field examination is scheduled for the summer of 2022 and will complete the potential study, in addition to verifying the presence of cultural remains within the targeted zones and planned work areas.

It should be noted that no obvious remains were observed by the participants within the areas examined during the Phase 2a biological field inventories. The work planning can continue for Phase 2a of the NNiP's development. It is important to keep in mind that in the event where archaeological remains are discovered during work or during any other observations carried out and reported to the site, CRI must absolutely ensure the cultural resource's protection. Subsequently, the *Ministère de la Culture et des Communications du Québec* (MCC) must be informed under the terms of article 74 of the Cultural Heritage Act (L.R.Q., P-9.002, 2011, chap. B 4) which states that "A person who discovers an archaeological property or site must inform the Minister of it without delay." Work may continue only if the archaeological resource is not affected and is protected.

6.4.7 Soundscape

Pursuant to condition 6.11 of the global CA, monitoring of NNiP's noise impacts was implemented. The objective of this monitoring is to assess the sound levels from the Pingualuit National Park's mining complex. Environmental monitoring details can be found in the 2021 EMP report (Canadian Royalties, 2022c). The data from this monitoring makes it possible to document ambient noise in the natural environment outside the NNiP study area's limits.

A Larson Davis Model 831 sound level meter was used to record noise peaks and ambient noise. When the noise measurements were recorded, wind direction and speed are logged, in addition to noting the unnatural noises not originating from the mining facilities.

The results of the equivalent minimum, maximum and continuous noise levels recorded in 2021 are comparable to those of 2019. It should be noted that the values measured in 2021 for ambient noise do not include the noise of helicopter take-offs and landings, as to be representative of the actual conditions observed in the natural environment. The average noise levels (LAeq) recorded in 2021 varied between 32.8 dB and 55.3 dB depending on the times and locations where the measurements were taken (Table 6-19). The environmental technicians remained at the canyon and at Pingualuk lake for some time, as to complete a qualitative assessment of noise that could come from the Méquillon site's installations, which was and is still under exploitation. No noise was perceived, besides those from the natural environment (river current, wind, etc.)

No other specific sound anomaly was reported during the other samplings in the Pingualuit National Park in 2021.

6.4.8 Inuit Communities Information Program

A community information program was implemented in 2011, following condition 7.1 of the global CA. This program is included in CRI's environmental monitoring program (Monitoring 35). This monitoring is to reach the Inuit community populations of Puvirnituq, Salluit and Kangiqsujuaq, to explain the operation and nature of mining activities, the measures implemented to protect the environment and the corrective measures taken to provide solutions to the problems experienced by land users.

Two representatives from the Environmental Department met with the Puvirnituq elected officials on January 22, 2020. They presented the activities and actions taken by CRI to protect the environment and improve its environmental performance. The presentation was given in English and Inuktitut. The results of certain environmental monitoring completed in response to concerns expressed by elected officials were presented. They explained that surface water samples were taken from various locations along the river during helicopter campaigns, between the NNiP study area and the intake for the community drinking water. The results show a metal content below or around the detection limits. The meeting was positive overall and appreciated by the participants (Canadian Royalties, 2021b and 2022c).

Three Nunavik Nickel agreement meetings took place via a virtual platform in 2021. An *ad hoc* meeting was held on March 22nd with the goal of presenting CRI's long-term plans and to implement a sub-committee dedicated to the discussions surrounding Phase II. A regular meeting took place on August 17th to discuss the social, environmental and technical aspects relative to the operations and the administration of the Nunavik Nickel agreement. A presentation addressed, among other things, Inuit employability, specific environmental monitoring, the ESST recognition program and the evolution of NNiP's Phase II. Lastly, the sub-committee's first meeting relating to NNiP's Phase II implemented in March, was held on November 10th. The presentations completed by CRI during these meetings are included in Appendix U.

The employment and training counsellors (EFI) are in regular and frequent contact with local employment officers in northern villages, town hall, landholding corporations and other Inuit organizations. Moreover, they were the spokespeople for the Inuit employees for CRI's operations manager. Several communities were visited to inform and promote the hiring and training opportunities with Canadian Royalties. EFI advisors also participate in the Kautapikkuut and ESUMA committees on a regular basis. Interviews are periodically conducted with EFI advisors by the Environmental Department, to collect any concerns and questions that Inuit employees may have shared with them in terms of NNiP's environmental impacts. The advisers are instructed on how to respond to the concerns and questions raised, when required. The results of these interviews are presented in CRI's annual environmental monitoring report, sent to the MELCC and the Inuit partners.

The information program was impacted by the restrictions related to Covid-19 prevention for most of 2021. After March, 2020, planned visits to the villages had to be cancelled and postponed to a later date due to health risks and conditions decreed by public health.

6.4.9 NNiP Perception and Assessment Plan

The global CA provides, under condition 7.2, for the keeping of a plan for developing the perceptions of the project by the users of the territory. It aims to specifically evaluate the effectiveness of the communication methods for the monitoring results carried out and to receive, if applicable, complaints and comments from the territory's users in connection with the project's activities. This monitoring must be completed every five years according to the established calendar. The results must also be presented in the 2020 environmental monitoring report. The project schedule has been disrupted by the restrictions in connection with Covid-19.

A liaison officer position has been created within the CRI organization to promote constructive dialogue with partners. In 2021, the liaison officer visited certain Inuit communities as to maintain an ongoing dialogue with them. They collected comments relative to CRI's planned developments during these visits. The main concerns related to the water quality in the Puvirnituq River and its tributaries, potential contamination in the event of a spill, poisoning of caribou grazing near the exploited sites, the choice of subcontractors, the number of Inuit employees hired and the origin of the employees (see chapters 35 and 36 from Canadian Royalties, 2022c).

CRI plans to distribute a perception survey based on previous editions to support the development of a perception plan. However, it has been evaluated that it would be wiser to combine the survey's distribution with the community visits, as to ensure the maximum number of people are reached. This distribution will therefore take place when visits to the villages are once again possible in terms of Covid-19 transmission restrictions.

Table 6-19: Maximum and Minimum Sound Levels, Peak and Equivalent Continuous Noise Levels Recorded in the Summer of 2021 in the Pingualuit National Park

Station	Date	Time	Wind[A]			Relative humidity (%)	LASmin (dB)	LASmax (dB)	LApeak max (dB)	LAeq (dB)	Comments
			Speed[A] (m/s)	Average direction	Calm/ moderate						
Pingualuk lake (Crater)	2021-07-22	11:30 a.m.	5.1	Northwest	Moderate	75.5	27.5	70.54	83.4	55.3	It was a cloudy and windy day. No noise from Méquillon while listening for 15 minutes.
	2021-07-22	2:30 p.m.	10.3	Northwest	Moderate with gusts						
	2021-08-15	2:15 p.m.	3.9	Northwest	Moderate	82.5	16.9	68.9	77.8	49.5	Constant moderate breeze but almost inaudible. No gusts while present. Cloudy with no precipitation.
	2021-08-15	5:30 p.m.	5.7	Northwest	Moderate						
Canyon	2021-07-21	11:40 a.m.	2.8	South	Moderate	85.5	36.7	73.2	80.3	46.6	Constant light breeze, but nothing audible to the human ear, no gusts. Only the river next to the canyon was slightly audible.
	2021-07-21	2:40 p.m.	2.5	East	Moderate						
	2021-08-15	8:05 a.m.	1.2	West	Very light breeze	91.2	24.7	59.9	72.9	32.8	No audible wind, no gusts. Light drizzle, cloudy. No one occupies the Park's camp. Increased wind towards the end of the recording.
	2021-08-15	11:35 a.m.	1.9	West	Light breeze						

[A] Average speed measured on-site with an anemometer.

7 Impact Identification and Assessment

7.1 Methodology

The method used for the identification and assessment of impacts is in accordance with the Quebec government's general directive on the execution of impact studies (MDDELCC, 2016). This approach is based on a detailed project description (Chapter 5) and the receiving environment (Chapter 6). The approach is presented in detail in Appendix G and Table 7-1 summarizes the quantification of residual impact after mitigation measures have been applied. The generic mitigation measures established in Annex 7 following the Nunavik Nickel Agreement are monitored by CRI. These measures are added to the specific measures for new projects under study in Phase 2a. These mitigation measures will be the subject of discussions during meetings hosted by the Nunavik Nickel Committee's subcommittee.

Table 7-1: Grid for Determining the Significance of the Overall Impact

Magnitude[a]	Extent[b]	Duration	Significance of the Residual Impact		
			Major	Moderate	Minor
Strong	Regional	Long	×		
		Moderate	×		
		Short	×		
	Local	Long	×		
		Moderate	×		
		Short		×	
	Specific	Long	×		
		Moderate		×	
		Short		×	
Moderate	Regional	Long	×		
		Moderate	×		
		Short		×	
	Local	Long	×		
		Moderate		×	
		Short			×
	Specific	Long		×	
		Moderate			×
		Short			×
Low	Regional	Long		×	
		Moderate		×	
		Short			×
	Local	Long		×	
		Moderate			×
		Short			×
	Specific	Long			×
		Moderate			×
		Short			×

[a]: Magnitude is assessed based on whether or not the component has a cumulative effect. For example, impacts on air and soil quality have a cumulative impact on water quality, since these two components have a potential impact on water quality.

[b]: A specific extend designed an impact limited to the project footprint or limited to a few individuals (animals, plants or human).

The project description makes it possible to identify the impact sources based on the technical characteristics of the structures to be built, as well as the activities, methods and construction and exploitation schedules. The description of the receiving environment makes it possible to understand the environmental and social context in which the project takes place, to identify the issues to be considered and determine the project's most sensitive environmental components. The Inuit's concerns and expectations expressed when the 2007 ESIA was filed and in Monitoring report 35 to the project are taken into consideration.

Note that the environmental assessment is simplified from the project development phase by the integration, from the project development phase, of various environmental optimizations of the project concept, so as to immediately reduce the number and significance of the impacts that could manifest. The various issues targeted when the analysis began are also taken into account for project optimization to increase its environmental and social acceptability.

Lastly, the lessons learned from the implementation of already authorized NNiP projects and the results of certain NNiP environmental monitorings provide relevant data which allow to determine the nature and magnitude of certain impacts associated with this project type, as well as the effectiveness of some mitigation and compensation measures.

Sources of impact and project-sensitive components of the environment are discussed in more detail in the following sections (7.1.1 and 7.1.2). An interrelation grid connects the links between the impact sources and the environmental valued components (section 7.1.3), which makes it possible to predict the project's probable impacts.

An impact can be positive or negative. A positive impact leads to improvement in the environmental component affected by the project, while a negative impact contributes to its deterioration. An impact's significance is assessed using the specific criteria presented in Appendix G. The impact's significance is the result of an overall judgement that affects a project activity regarding a component from the receiving environment, which is based on three main criteria, specifically the impact's magnitude, extent and duration. A residual impact assessment is presented for each of the impacts developed. The residual impact is defined as the impacts remaining after the mitigation measures have been implemented. Three classes of significance are used for this purpose: **Minor**, **moderate** or **major**. Mitigation measures for reducing or eliminating the identified impacts' significance will be developed for each environmental component. Integrating these measures at this stage requires a commitment from CRI to apply them during the construction, operation, closure and restoration phases.

7.1.1 Impact Sources

The detailed project description (chapter 5) provides an overview of all project components that could have an impact on the environment. The impact sources are associated with the project's construction, exploitation and closure and restoration phases (Table 7-2).

Table 7-2: Impact Sources for the Expo South, Ivakkak UG, Méquillon UG2 and Nanaujaq Projects

Impact source	Description
New infrastructure and related project development	
Land preparation	Land preparation activities (stripping overburden, excavation, dynamiting, backfilling and grading) for implementing the surface structures (access roads, gates, ventilation raises, emergency exits, construction site areas, waste rock pile, ore stockpile, main collection pond).
Construction of structures	All construction work
Circulation of machinery	Circulation of the workers, the machinery required for the works, as well as the trucks for material supply and refuelling.
Atmospheric emissions	Atmospheric emissions include exhaust gases emitted by machinery, burning waste and dust emissions.
Production and management of waste and hazardous waste	. The main sources of waste at mine sites are domestic waste, oils, explosives packaging, and mechanical and welding shop waste.
Workforce	Canadian Royalties employees and subcontractors associated with the construction phase.
Deposit exploitation	
New infrastructure presence, maintenance and exploitation	Includes all extraction and maintenance activities carried out on the sites.
Water management and use	Industrial water (drainage ditch network, collection ponds, pumps and berms) and wastewater management.
Atmospheric emissions	Atmospheric emissions include exhaust gases emitted by machinery, burning waste and dust emissions.
Storage and handling of ore and waste rock	Includes all ore and waste rock handling and storage areas (ore stockpiles and waste rock piles).
Machinery traffic	Circulation of the workers, the machinery required for the works, ore transportation trucks, as well as the trucks for material supply and refuelling.
Production and management of waste and hazardous waste	The main sources of waste at mine sites are domestic waste, oils, explosives packaging, and mechanical and welding shop waste.
Workforce	Canadian Royalties employees and subcontractors associated with the deposit exploitation phase.
Site closure and restoration	
Water management	Managing surface water and contaminated water, if any.
Restoration works	Excavation, backfilling and earthwork to restore the site.
Workforce	Canadian Royalties employees and subcontractors associated with the site closure and restoration phase.

7.1.2 Environmental Components

The receiving environment's detailed description (Chapter 6) identifies the components of the physical, biological and human environments that are likely to be affected by one or more potential project impact sources and by the potential interactions between the different sources. The impact evaluation relates to the environmental components presented in Table 7-3.

Table 7-3: Environmental Components Likely to be Modified by the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South Projects and their Associated Projects and Subject to Impact Assessment

Components	Description
Physical Environment	
Air Quality	Physicochemical characteristics of the air, including dust concentration.
Soil Quality	Physicochemical characteristics of the soil
Water and Sediment Quality	Physicochemical characteristics of water and sediments
Hydraulic and sedimentary regime	Surface water runoff
Biological Environment	
Terrestrial Environments	Terrestrial habitats (felsenmeer , polygonal ground with tundra ostioles, eskers and boulder fields) and the plant species which inhabit these environments.
Wetlands	Wetlands (lowland fens, snowbed fens), plant species which inhabit these environments and ecological functions.
Aquatic fauna and their habitats	Fish populations, benthic organisms and their habitats.
Avian fauna and their habitats	All bird species and their habitats.
Caribou and other land mammals	Caribou, other species of mammals and their habitats.
At-risk wildlife and plant species	All at-risk wildlife, plant species and their habitats.
Human Environment	
Economy and employment	Economic benefits associated with new deposit construction and exploitation.
Land use by the Inuit	Land appropriation, occupation, use and development by the Inuit.
Archeology and heritage	Known occupation sites and areas with potential archaeological sites. .
Soundscape	Noise emissions for workers and in the ambient environment.
Landscape	View of exploitation sites from Pingualuit National Park and from sites potentially used by the Inuit.

Several other environmental components were subject to an impact assessment in the context of the NNiP (GENIVAR, 2007), but were not retained in the present impact assessment, since they do not apply to the activities planned within the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South deposit exploitation framework.

We should mention that no watercourse or body of water will be directly affected by the project. Living organisms in the watercourses will not be directly influenced by the work and the only potential impact is on water quality.

7.1.3 Interrelation Between the Impact Sources and Environmental Components

The potential impact sources and environmental components likely to be affected by the project are presented in an interrelation grid (Table 7-4). This matrix makes it possible to determine which project phase (construction, exploitation and closure and restoration Duration) and which specific activities are likely to cause impacts on the various components of the physical, biological and human environments.

A priori, the impact sources likely to affect the greatest number of environmental components are the site preparation (overburden stripping, excavation, blasting, backfilling and grading) and the construction of structures. Indeed, these activities will have a lasting impact on the physical, biological, and human environments. Other activities such as maintenance, deposit exploitation or trucking are likely to have a more targeted impact on certain environmental components.

Table 7-4: Interrelation Grid Between the Impact Sources and Environmental Components

Environmental components / Impact sources	Physical Environment				Biological Environment					Human Environment				
	Air quality	Soil quality	Water and sediment quality	Hydraulic and sedimentary regime	Wetlands and terrestrial environments	Aquatic fauna and their habitats	Avian fauna and their habitats	Caribou and other land mammals	At-risk wildlife and plant species	Economy and employment	Land use by the Inuit	Archeology and heritage	Soundscape	Landscape
Construction phase - New infrastructure and related project development														
Land preparation	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Construction of structures	■	■	■	■	■	■	■	■	■	■	■		■	■
Machinery traffic	■	■	■				■	■		■	■		■	■
Atmospheric emissions	■				■	■			■					■
Production and management of waste and hazardous waste	■	■	■		■	■							■	■
Workforce										■				
Operation phase - Underground deposit exploitation														
New infrastructure presence, maintenance and exploitation	■	■	■	■			■	■		■	■		■	■
Water management and use			■			■								
Atmospheric emissions	■				■	■			■					■
Storage and handling of ore and waste rock	■	■	■		■	■							■	■
Machinery traffic	■	■	■				■	■		■	■		■	■
Production and management of waste and hazardous waste	■	■	■		■	■							■	■
Workforce										■				
Site closure and restoration phase														
Water management			■	■		■							■	
Restoration activities	■	■	■	■	■	■	■	■	■	■	■		■	■
Workforce										■			■	

7.1.4 Maps of Areas Affected

Maps illustrating the impacts on the areas affected by the construction, operation, closure and restoration activities of the four underground mining exploitation projects and their related projects are presented at the end of this chapter. The reader is invited to open them now for future reference while reading. The map order is listed below:

- Map 7-1: Impacts on the natural environment - Ivakkak UG site, portal alternative in the pit;
- Map 7-2: Impacts on the natural environment - Ivakkak UG site, portal alternative outside the pit;
- Map 7-3: Impacts on the natural environment - Méquillon UG2 site;
- Map 7-4: Impacts on the natural environment - Nanaujaq site;
- Map 7-5: Impacts on the natural environment - Nanaujaq effluent line toward the Méquillon WTP;
- Map 7-6: Impacts on the natural environment - Expo South site;

7.2 Impacts on the Physical Environment

7.2.1 Air Quality

7.2.1.1 Construction Phase - New Infrastructures and Related Project Development

During the development phase of the new infrastructure and related projects, the main impacts on air quality will come from dust generation during overburden stripping, excavation, blasting, backfilling and grading, as well as from the operation of quarries authorized in the global CA when required. Construction work will also be likely to emit dust and atmospheric emissions. All machinery used on-site for construction or transporting people and goods will emit dust and exhaust emissions.

The increase in road traffic when the various infrastructures are being constructed can lead to an increase in airborne dust during the repeated passage of vehicles. In fact, dust uplift and dispersion increases in dry and windy weather on the NNiP site. These conditions are observed almost exclusively during the summer period, i.e., only a few weeks at this latitude. This increase in dust clouds can also increase the risk of accidents due to poor visibility. Snow cover and frozen ground in winter does not promote dust dispersal and lifting.

The air quality impacts assessed without mitigation measures during the construction period are deemed to be of moderate magnitude (high probability of occurrence), of local extent (considerable particle dispersion) and short duration, which leads to minor impact significance. However, several mitigation measures make it possible to reduce dust and atmospheric emissions.

7.2.1.2 Operation Phase

Just like the construction phase, dust and exhaust gases will be emitted by the machinery circulating and working on-site, in addition to waste management. Fumes are also likely to be emitted during the new infrastructure maintenance, but to a lesser extent. An increase in mining dust is also likely to occur during the handling and storage of overburden, ore and waste rock. Sources of air quality impact from the operation phase of the project also include the transportation of ore and waste rock, which could generate dust.

Note that the air quality monitoring at the Expo site (Environmental Monitoring #22) indicates that exceedances of the standards were noted in 2019 and 2020 for chromium and nickel, but since 2021, no exceedances for the average concentrations have been recorded (Canadian Royalties, 2022c). Moreover, it should be noted that the nickel standard for the *Clean Air Regulation* went from 0.014 mg/m^3 to 70 mg/m^3 on April 28, 2022 and this standard will be thus applicable for NNiP's Phase 2a. The dust monitoring also seems to indicate that these particles are transported over extended distances (several kilometers) in the Expo sector. In fact, most dust monitoring stations in the Expo sector show an increase in deposition values in summer. However, a reduction was observed for several

stations in winter. A cumulative effect is therefore present with the meteorological hazards encountered during exploitation. If the summer samples measured an increase in deposition values compared to 2020, the winter samples show a decrease for half of the samples, thus in favour of an influence of stronger winds during the summer of 2021 and lower rainfall in July. Dust control mitigation measures will therefore have to be adapted for summer weather. The air quality impacts assessed without mitigation measures during the construction period are considered to be of moderate magnitude (high probability of occurrence), local extent (considerable particle dispersion), and short duration, leading to a minor impact significance. However, several mitigation measures will reduce dust and air emissions.

7.2.1.3 Site Closure and Restoration Phases

The primary sources of atmospheric emissions during the site closure and restoration phases involve dust emissions during infrastructure dismantlement and reworking the soil, as well as the dust emissions by machinery circulating and working on-site.

Therefore, the impacts present are of low magnitude (reduced probability of occurrence), of local extent (reduced dispersion of atmospheric emissions due to site closure) and of short duration, resulting in a minor impact. However, some mitigation measures are applicable and will have an effect on certain impact components.

7.2.1.4 Mitigation Measures

The generic mitigation measures stated in Annex 7 established in consortium with the NNC (Appendix C of this document) will be applied for the project's continuation and are repeated in Table 7-5, the same as the measures specific to Phase 2a, which are also indicated in this table. A grey background indicates the application of a new mitigation measure compared to Annex 7.

7.2.1.5 Residual Impact Significance

Air quality in Nunavik is considered good because the territory is not significantly affected by anthropogenic activities. There are no large cities, the road and air traffic and is low and there are no sources of industrial pollution other than the mining activities. It is therefore unlikely that the work of the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South projects will cause a significant deterioration in air quality. Moreover, the low relief and absence of arborescent vegetation in the study area, combined with very frequent strong winds, contribute to the movement of air, the diffusion of exhaust gases and the dispersion of dust and other atmospheric pollutants. It should be noted that exceedances in atmospheric contaminant concentration standards in the ambient air for nickel and chromium were observed in 2019 and 2020, but not in 2021, when compared to the previous standards for nickel, which were more restrictive. In addition, increasing the application of mitigation measures for airborne dust management over the years should have beneficial effects on air quality.

In addition, applying mitigation measures makes it possible to reduce periods of low visibility attributed to dust, thus minimizing, among other things, the risks of accidents related to poor visibility and therefore ensures worker safety.

The largest impacts on air quality are observed in construction and exploitation (importance of the impact evaluated respectively as moderate and major for the points 7.2.1.1 and 7.2.1.2). The mitigation measures application presented in Table 7-5 makes it possible to reduce the magnitude of the residual impact to low, instead of moderate magnitude and to a site specific and local extent, rather than local and regional.

Table 7-5: Mitigation Measures to Reduce the Impacts on Air Quality

Nº [A]	Mitigation measures
AIR1	Vehicles, to the extent possible, shall not be left running when not in use.
AIR2a	In dry, windy weather, dust reducers (calcium chloride or water) will be sprayed on certain areas. The humidification frequency will be adjusted according to the meteorological conditions and the dust emissions observed. Dust control agents will comply with the BNQ 410-300 standard or will be approved by the *Ministère des Transports du Québec* (MTQ). The choice of dust reducers must take account of the proximity of wetlands or bodies of water.
AIR3	Machinery used must meet Environment and Climate Change Canada's emission standards for on- and off-road vehicles.
AIR4a	Equip the crushers and grinders with dust control agent equipment. See also AIR4b.
AIR4b	The waste rock crusher will be equipped with a dust control system, which will be checked daily and cleaned regularly.
AIR4c	At the Expo ore stockpile, application of dust reducers or watering the road and the machinery operation area (active zone) of the ore storage area (loading zone, up to the concentrator). Watering the loading areas before unloading ore.
AIR4d	Limit handling the Expo ore stockpile during periods of high wind.
AIR5	Use generators with low contaminant emission rates.
AIR6	Prior and regular inspection of machinery will be performed to ensure that it is in good condition and working properly. See also AIR6a.
AIR6a	Apply the mechanical service preventive maintenance program to ensure optimal operation of machinery and that equipment vibrations are reduced to a minimum, as to reduce emissions to a minimum.

[A]The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

Therefore, **the air quality residual impact magnitude is described as minor** for all project stages (Table 7-6).

Table 7-6: Description of the Project's Residual Impact on Air Quality

Project phase	Impact description	Mitigation measures[A]	Magnitude	Scope	Duration	Residual impact significance
Construction, exploitation, closure and restoration	Increase in airborne dust and exhaust emissions	AIR1 to AIR3	Low	Specific	Moderate	Minor
	Atmospheric particles and greenhouse gas emissions	AIR5 to AIR6a	Low	Local	Moderate	Minor
Exploitation	Increase in airborne mining dust	AIR4a to AIR4d	Low	Local	Moderate	Minor

7.2.2 Soil Quality

7.2.2.1 Construction Phase - New Infrastructures and Related Project Development

New infrastructure and related project developments require soil stripping and removing overburden. These works also require the use of machinery and a fuel depot on-site during the construction phase, which can lead to accidentally contaminating the soil with polluting substances. Trucks and heavy machinery contain many hydrocarbon-based systems. Hydrocarbon leaks could occur as a result of machinery or storage tank failure. Lastly, the increase in road transportation to carry out construction work increases the risk of accidental spills during, e.g., a wrong maneuver during machinery maintenance or refuelling.

Without mitigation measures, these impacts are considered to be of moderate magnitude (moderate probability of occurrence), of specific extent (reduced contamination at a specific site) and of long duration (if no decontamination), meaning a moderate impact significance.

7.2.2.2 Operation Phase

The addition of new infrastructure to the ground for new operations and related projects brings with it an increased risk of soil collapse due to warming. This can be attributed to the presence of the added infrastructure itself or to climate change.

As mentioned for the construction phase, the increase in road transport and maneuvers on-site increases the risk of accidental hydrocarbon spills from machinery and the fuel depot and could also cause soil contamination.

Ore handling, use of the Expo tailings disposal site and the storing waste rock in piles can modify the soil quality due to the localized increase in metal concentrations resulting from airborne dust or particles. These impacts are directly related to air quality.

Lastly, additions of new infrastructures for deposit exploitation or related projects, have an overall potential for land use, which can extend over the long term without effective mitigation measures.

Considering these various impacts during the operation phase, and without application of mitigation measures, the magnitude is moderate (moderate probability of occurrence), the local extent (contamination that may extend outside the sites) and long duration (if no decontamination), leading to a major impact.

7.2.2.3 Site Closure and Restoration Phases

As for the construction and operation phases, the primary anticipated impact on soil quality during site closure and restoration corresponds to the risk of hydrocarbon contamination following an accidental spill, resulting from the increased traffic and maneuvers with machinery.

Site closure implies the cessation of the emission of airborne particles into the atmosphere in connection with mining dust that can modify the quality of the soil.

The restoration phase is a mitigation measure. Ground that may have been contaminated during the construction, operation and closure phases will be excavated and decontaminated during mine site restoration activities. The restoration plans will be carried out in accordance with good practices and will be submitted to the *Ministère de l'Énergie et des Ressources Naturelles* (MERN) for approval before their implementation. It should be noted that spill management is included in CRI's Emergency Response Plan (ERP).

Since the restoration phase represents mitigation measures to compensate for spills that would occur during the restoration phase, the impacts are deemed to be nil. The restoration activities will be carried out in accordance with the restoration plans submitted and approved by MERN.

7.2.2.4 Mitigation Measures

The mitigation measures stated in the 2007 ESIA (GENIVAR, 2007) and applicable to this project will be implemented, in addition to new measures (Table 7-7). These measures are essentially intended to reduce the risk of a hydrocarbon leak occurring, as well as containing and cleaning up such a leak, if required.

Double-walled tanks will be used for storing fuel, which are compliant with the requirements of the *Building Act*. Lastly, the project's activities will be included in CRI's ERP.

Table 7-7: Mitigation Measures to Reduce the Impacts on Soil Quality

Nº [A]	Mitigation measures
SOL1	Prior and regular inspection of machinery shall be performed to ensure that it is in good condition and working properly (not leaking hydrocarbons).
SOL1a	Apply the mechanical service preventive maintenance program to ensure optimal operation of machinery (verify there are no hydrocarbon leaks).
SOL2	An emergency kit for recovering petroleum products and hazardous materials shall be readily accessible at all times, construction site machinery shall have absorbent material in order to respond quickly, and polluted soil and wastes shall be disposed of in accordance with applicable legislation and regulations. See also SOL2a.
SOL2a	Apply the spill management procedure "PRO-NENV-1211-01 Response to an Environmental Incident" which ensures the safe, fast, efficient and comprehensive management of a spill as to minimize the environmental impact.
SOL3	Non-acid-generating waste rock shall be used as granular material during the operational phase in order to minimize encroachment upon eskers.
SOL5	To prevent subsidence due to the soil heating, major buildings shall rest on piles and lighter buildings shall be on ventilated foundations.
SOL9	The final cover shall include an impervious membrane and an erosion protection layer.
SOL10	Measures shall be taken when building major civil structures to prevent permafrost from thawing.
SOL12	Remove and dispose of contaminated soils in an authorized location and perform a characterization according to the terms in the *Politique de Protection des Sols et de Réhabilitation des Terrains Contaminés: Plan d'Action 2017-2021* (MDDELCC, 2017) and the *Guide d'intervention – Protection des Sols et Réhabilitation des terrains Contaminés* (Intervention Guide – Soil Protection and Restoration of Contaminated Sites) (Beaulieu, 2021). Apply the procedures presented in the ERP for spills.
SOL13	The PAG waste rock generated by the new exploitations will be returned to the underground mine tunnels.
SOL14	Apply the AIR4a, AIR4b, AIR4c, AIR4d mitigation measures air quality protection relating to mining dust.
SOL15	Use double-walled tanks for storing fuel, compliant with the requirements of the *Building Act*.

[A]The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee.

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

7.2.2.5 Residual Impact Significance

Applying the SOL3 mitigation measure for soil loss allows for reducing the magnitude of the impact to low, the extent stays local and the duration long. These changes make it possible to obtain minor residual impact significance.

The impact risk of soil contamination by hydrocarbons is considered to be low magnitude due to the mitigation measures (SOL1, SOL1a, SOL2, SOL2b and SOL15) and a work management and surveillance plan. The contamination is site specific and of moderate duration since CRI is responsible for the sites' total decontamination. The residual impact's significance is therefore considered minor (Table 7-8).

The risk of soil collapse can be reduced by applying the SOL5 and SOL10 mitigation measures, which decrease the magnitude, extent and duration, thus contributing to the residual impact significance being classified as minor.

The increase in mineral concentrations on the soil's surface is a low magnitude impact taking into account the mitigation measures that will be put in place (SOL9 and SOL14). The extent is site specific since the transport of airborne particles with mitigation measures remains localized near the infrastructures. Lastly, the duration is moderate since the soil that would have been contaminated during the construction and operation phases, will be excavated and decontaminated during the mining site's closure and restoration. The residual impact's significance is therefore considered minor (Table 7-8).

Finally, by applying the SOL12 and SOL13 mitigation measures, site restoration reduces the impact magnitude to low in terms of the environmental liability left over from the modified land rights. With mitigation measures, the extent becomes site specific, however, the duration remains long, leading to a minor significance of the residual impact.

Overall, **the mitigation measures make it possible to maintain a minor significance of residual impact** to soil quality for all phases of the projects in this addendum.

Table 7-8: Description of the Project's Residual Impact on Soil Quality

Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Construction	Loss of soil usable for other purposes	SOL3	Low	Specific	Moderate	Minor
Construction, operation	Risk of soil contamination by hydrocarbons	SOL1, SOL1a, SOL2, SOL2a, SOL15	Low	Specific	Moderate	Minor
Operation	Risk of subsidence	SOL5, SOL10	Low	Specific	Moderate	Minor
	Localized increase in metal concentrations on the soil surface	SOL9 and SOL14	Low	Specific	Moderate	Minor
Operation, closure and restoration	Environmental liability that may affect long-term soil use	SOL12 and SOL13	Low	Specific	Long	Minor

7.2.3 Sediment and Water Quality

7.2.3.1 Construction Phase - New Infrastructures and Related Project Development

During the construction phase, no watercourse or body of water will be directly affected by the soil stripping work for the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South projects. Note that only one watercourse (CEIV2) is included within the Ivakkak site's study area and it will not be affected by the work, since a minimum protection buffer of 60 m is present. The Nanaujaq site is bordered by Lac Mequillon and its outlet. Soil stripping will be done at least 60 m from the watercourse. No culvert construction is required.

At the Méquillon and Expo South sites, the development will be done only on land, while the bodies of water are located very far from the work sites, i.e., at a minimum of 500 m away.

For sites where explosives will be used near watercourses or wetlands connected to a watercourse, a risk of ammonium nitrate dispersion is possible when loading explosives. In fact, surface waters, during rain or snowmelt, can transport this substance into bodies of water, which can then be deposited on sediment.

Moreover, the increase in road transport for all sites and for machinery circulation on the Ivakkak UG and Nanaujaq sites, could modify water quality due to the increased risk of water and sediment contamination by hydrocarbons. These risks are present when vehicles and machinery are being refuelled, if damaged or involved in accidents located near a watercourse, body of water or a hydro-connected wetland.

In the absence of mitigation measures, all of these impacts have a moderate magnitude due to the moderate probability of occurrence for hydrocarbon and ammonium nitrate contamination, a local extent (potential to extend beyond the site due to water contamination) and a long duration (if no decontamination), which leads to a major impact.

7.2.3.2 Operation Phase

Exploiting the various underground deposits entails a risk of water and sediment contamination by hydrocarbons, as documented for the construction phase due to the vehicle traffic on the roads for the four sites under study and during related projects and from machinery at the Ivakkak UG and Nanaujaq sites.

Moreover, surface water drained on-site is loaded either with particles containing PAG minerals, or with NAG particles from the site being exploited and other particles from roads, access roads and areas of disturbed soil. Consequently, the anticipated impacts on water and sediment quality that concern this addendum essentially affect surface drainage water from the Ivakkak UG and Nanaujaq sites. At the Nanaujaq site, surface runoff consists mainly of water from precipitation and from snow melt running off the mining site, specifically onto the waste rock pile, the ore stockpile and the portal area, whereas this is not the case for the Ivakkak site. The Ivakkak site is affected by contact water runoff from the portal and the granular pad (contaminated water) and runoff from the access road (clean water).

Keep in mind that these contaminated water management infrastructures have already been the subject to a request for ministerial authorization for the Ivakkak site and are already approved for the Méquillon and Expo sites.

For all of these impacts, the impact magnitude is deemed to be high (high probability of occurrence and potential effect on aquatic fauna), of local extent (affects several components and leaves the immediate site) and of long duration. This impact's significance is therefore major without mitigation measures.

7.2.3.3 Closure and Restoration Phases

The only impacts associated with closure and restoration for water and sediment quality are the same as those identified during construction relating to vehicles used on the roads and machinery at the Ivakkak UG and Nanaujaq sites.

Without mitigation measures, the impact is considered to be of moderate magnitude (high probability of occurrence), of local extent and of long duration, which leads to the impact's major significance.

7.2.3.4 Mitigation Measures

The mitigation measures defined in Annex 7 applicable to this project, as well as the new proposed mitigation measures will be presented in Table 7-9. The mitigation measures presented here particularly affect the Nanaujaq site, since the measures to maintain water quality have already been subject to an authorization request at the Ivakkak site and are authorized and in operation for the Méquillon and Expo sites.

At the Ivakkak UG site, a ditch for contaminated water is planned, which will subsequently be directed to the MCP (already authorized) for both the portal alternative in the pit (Map 7-1) and the portal alternative in the natural environment (Map 7-2). These two alternatives also include an uncontaminated water ditch that will be diverted into the vegetation (see Maps 7-1 and 7-2).

At the Nanaujaq site, a clean water ditch will be built south of the site on the infrastructure's outskirts and this water will be discharged into the vegetation north of the road (see Map 7-4). Contaminated water from the drainage of the waste rock and ore stockpiles will be diverted by gravity to both ditches. The water from these ditches will then be pumped to the main collection pond. Moreover, mining water from the Nanaujaq site's main collection pond will be routed via a pipeline to the Méquillon water treatment plant. This treatment plant is already operational and approved.

Table 7-9: Mitigation Measures to Reduce the Impacts on Water and Sediment Quality

Nº [A]	Mitigation measures
QES2a	Carry out inspections to ensure that the temporary hydrocarbon storage tanks are in good condition.
QES4	Heavy machinery will only be used within the road right-of-way and borrow pit access roads.
QES5	Excavated material will be disposed of in a way that minimizes the spread of suspended solids.
QES6	Stones removed during grading earthwork will be reused to stabilize banks and hollows.
QES8	Machinery parking, washing and maintenance areas shall be at least 60 m from any watercourse, and machinery shall be refuelled under constant supervision at least 30 m from any watercourse.
QES19	The top of mine tailings and waste rock piles shall be kept at a 1% to 3% gradient to minimize infiltration.
QES22	Temporary ore storage sites would rest on a compacted gravel base surrounded by a collecting ditch to channel drainage water to the sedimentation pond, from which it shall be pumped into the process water tank.
QES25	Special care shall be taken to avoid spilling ammonium nitrate beside blast holes when loading them, an operation always done using equipment to inject the explosives directly into the blast holes.
QES26	Abrasives and de-icing chemicals will only be spread on dangerous locations or during ice-storms.
QES27	Fuel tanks will be surrounded by a berm high enough to contain a spill equal to the largest capacity tank plus 10%.
QES28	Acid-generating waste rock (Méquillon, Expo South and Ivakkak) will be progressively covered with layers of neutral granular material and a waterproof membrane.
QES29	Geomembranes shall be placed beneath mine tailings cells, on dike walls and on the top of tailings and waste rock piles.
QES30	During earthwork on steep slopes, the bottom of ditches shall be progressively stabilized with a cover of well-drained granular material and riprap.
QES34	Apply the mitigation measures SOL1, SOL1a, SOL2, SOL2a and SOL3 to limit the risk of water and sediment contamination.
QES35	Treat the water contained in the collection pond located downstream from the waste rock pile on the Nanaujaq site (it will be sent to the Méquillon WTP for treatment).

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

To restrain the volume of runoff water and limit the watershed area affected, a network of ditches, a dike and a collection pond will be built on the Nanaujaq mining site. This way, any water and clean snow outside the delimited zones will be free from potential contamination and could be directed to the natural receiving water network without prior treatment. Potentially contaminated water will be directed to the Nanaujaq site's main water collection ponds. This collection pond will be accompanied by a dike with a capacity of 25,828 m^3.

The other proposed mitigation measures target the overall protection of water quality for runoff, water bodies, watercourses and wetlands.

7.2.3.5 Residual Impact Significance

After the mitigation measures have been applied, the impact's significance is now minor for all the stages relating to construction, exploitation, closure and restoration (see Table 7-10). Impact magnitude decreased from medium, or from high to low, for all impacts due to decreased probabilities of occurrence. The impact extent remains local, but the duration of the impact varies from short to moderate.

Table 7-10: Description of the Project's Residual Impact on Water and Sediment Quality

Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Construction	Risk of an increase in suspended solids in the water of adjacent watercourses and bodies of water, primarily for the Ivakkak UG and Nanaujaq sites.	QES5, QES6	Low	Local	Short	Minor
	Risk of dispersion of ammonium nitrate during the loading of explosives in surface waters and sediments.	QES25	Low	Local	Short	Minor
Construction, operation, closure and restoration	Risk of water and sediment contamination by hydrocarbons during refuelling, or in the event of damage and an accident along a watercourse or wetland.	QES2a, QES4, QES8, QES27, QES28, QES34	Low	Local	Moderate	Minor
Operation	Possible degradation of water quality by increased sediment downstream of mine drainage discharge points and clean water ditches.	QES19, QES22, QES26, QES29, QES35	Low	Local	Short	Minor
Operation, closure and restoration	Risk of degradation in water quality near roads, access roads and soil disturbance areas.	QES30	Low	Local	Short	Minor

7.2.4 Hydraulic and Sediment Regimes

7.2.4.1 Construction and Operation Phases

The new Nanaujaq underground deposit exploitation will require more surface infrastructure than for the other three projects. In fact, the construction of a collection pond, waste rock and ore piles, as well as drainage and collection ditches will lead to a change in surface runoff pattern. Ditch development at the Ivakkak UG site will have a similar impact, but on a smaller scale. The impact created in the construction phase will continue in the operation phase.

Moreover, this infrastructure development could lead to erosion and sediment transport in watercourses, which has an impact on its sedimentary regime.

The impact's magnitude is considered low since the probability of the hydraulic and sedimentary components being significantly affected is very low. In fact, the affected area is small for Nanaujaq (20.12 ha) compared to the watershed of the watercourse (14.8 km²), as well as for Ivakkak UG (maximum of 8.57 ha compared to a watershed of 7.1 km²). The extent of the impact is still local, and the duration is moderate. The impact's significance is therefore deemed minor, without the need for mitigation measures.

For the closure and restoration phases, there is no impact on this component since the environment will be substantially restored to its pre-project state, as specified in the restoration plan.

7.2.4.2 Mitigation Measures

Although the significance of the impact is considered minor, mitigation measures will be implemented to limit the extent and duration of the impact (Table 7-11). Measure RHS2a aims at minimizing the impact on drainage and adjacent watercourses.

Table 7-11: Mitigation Measures to Minimize Impacts on the Hydraulic and Sedimentary Regime

Nº [A]	Mitigation measures
RHS2a	Interrupt drainage ditches 10 m from the natural high water mark when watercourses or bodies of water are present nearby.
RHS8	Re-use stones removed during grading work to stabilize banks and hollows.

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

7.2.4.3 Residual Impact Significance

Application of mitigation measures reduces the impact's extent and duration (Table 7-12). The residual impact's significance therefore remains minor.

Table 7-12: Description of the Project's Residual Impact on the Water and Sediment Regime

Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Construction and operation	Modification of the surface water flow.	RH2a	Low	Specific	Short	Minor
	Possible increase in erosion and sediment transport in watercourses.	RH8	Low	Specific	Short	Minor

7.3 Impacts on the Biological Environment

7.3.1 Wetlands and Terrestrial Environments

7.3.1.1 Construction and Operation Phases

The projects' construction phase for the four new underground exploitations and their related projects will result in the loss of 21.54 ha of natural land environments and 28.37 ha or 29.98 ha of wetlands depending on the alternative chosen for Ivakkak (Table 7-13). Alternative 2, which considers the installation of the gate in the Ivakkak OP pit, will encroach less significantly on wetlands than Alternative 3, which requires the installation of a gate outside the Ivakkak OP work area (Maps 7-1 and 7-2). Both alternatives cannot be ruled out at this stage. The feasibility will be determined after the pit's exploitation and after examining the walls geotechnical stability. Alternative 3, which was presented in Chapter 5, increases the destruction of wetlands by 1.61 ha. The vegetation of the terrestrial and wetland environments will be destroyed during the stripping of overburden and excavation activities for the development of the various infrastructures. At the end of construction, the areas actually affected in wetlands can be transmitted to the various authorities involved for calculations related to compensation, since projects cannot be moved to terrestrial environments only, although efforts are made to minimize the possible footprint on wetlands as much as possible.

Boulder fields and felsenmeers are the natural terrestrial environments affected by the project. These environments are typical of the region and the vegetation is very sparse. In fact, the soil of the boulder fields and the felsenmeer is mainly composed of rock or boulders with a few terrestrial plants in the loose deposits between the boulders (Photos 7-1 and 7-2).

Photo 7-1: Block Fields at the Nanaujaq Site

Photo 7-2: Felsenmeer at the Expo South Site (in the foreground)

Photo 7-3: Lowland Fens at the Ivakkak UG Site

Photo 7-4: Lowland Fens at the Nanaujaq Site

Wetlands will be destroyed by the Ivakkak UG (6.34[13] or 7.95[13] ha depending on the alternative chosen) and Nanaujaq UG (9.40 ha) project sites (Maps 7-4 and 7-5). No wetland will be affected for the construction and underground exploitation of the Expo South (Map 7-5) and Méquillon UG2 (Map 7-3) sites, nor for the various related projects presented in Chapter 5, with the exception of the waste rock pile expansion at the Expo complex. The addition of infrastructure for the Méquillon UG2 exploitation will take place within the areas already impacted and whose losses have been compiled in the previous NNiP addendum, with the exception of the access road for a ventilation raise and an emergency exit, as well as for the granular backfill pad. These areas have not been specifically surveyed, but photo-interpretation and knowledge of the site indicate that these structures would be installed on land, potentially in boulder fields. A survey is planned in 2022 to validate these assumptions. As for the Expo South site, the areas affected are on land, i.e., in the Felsenmeer (Map 7-6). However, the Expo waste rock pile expansion is considered to be located in a wetland, i.e., in 12.60 ha of lowland fen. Photos 7-3 and 7-4 present the wetlands which will be impacted by the Ivakkak UG and Nanaujaq projects.

[13] This area includes 3.11 ha considered to be a lowland fen according to knowledge of the environment. This area is located under a portion of an additional future road. The inventory will be carried out in the summer of 2022 to confirm the type of environment and the presence/absence of species at risk.

The presence of a water pipe from the Nanaujaq site collection pond to the Méquillon site will have an impact on the ground vegetation. This pipe will be laid on the ground, sometimes in the road's right-of-way (anthropogenic environment) and sometimes on vegetation. Although no soil backfilling or stripping under the water pipe is required, these environments will still be affected by the pipe's presence, which will encroach on the vegetation and prevent it from growing over an area of 0.03 ha. on land and 0.03 ha in wetlands (Table 7-13). The area lost was calculated by assigning a width of 50 cm of effect under the pipe. Note that the pipe will never be placed in bodies of water, it will instead be installed on the culvert to allow it to cross watercourses.

Table 7-13: Surface Area of Land and Wetlands Affected by the Ivakkak UG, Méquillon UG2, Nanaujaq UG and Expo South Projects

Environment type	Surface area lost (ha)							
	Ivakkak UG		Méquillon UG2 - Related projects	Alongside the Nanaujaq-Méquillon road	Nanaujaq UG	Expo South	Total	
	Alternative 2	Alternative 3					Alternative 2	Alternative 3
Land Environments								
Boulder fields	0.62	0.62		0.03	10.72	-	11.37	11.37
Felsenmeer	-	-			-	10.17	10.17	10.17
Subtotal	**0.62**	**0.62**	**2.80[a]**	**0.03**	**10.72**	**10.17**	**21.54**	**21.54**
Wetlands								
Lowland fen	**6.34[b]**	**7.95[b]**	**-**	**0.03**	**9.40**	**12.60**	**28.37**	**29.98**
Total	**6.96**	**8.57**	**2.80**	**0.06**	**20.12**	**22.77**	**49.91**	**51.52**

[a]: The survey in this zone was not completed in 2021 but will be in 2022. According to the photo-interpretation and knowledge of the environment, the area affected by the work would be on land. A search for special-status species will also be carried out there.

[b]: An inventory is planned for the summer of 2022 for the area under the projected access road currently identified as lowland polygonal fen.

Note that at the Nanaujaq site, a specimen of the small-flowered draba, a species likely to be designated as threatened or vulnerable, was identified at the study area's southern limits. The project could thus have an impact on this species at-risk. Without mitigation measures, the impact's magnitude on this specific species is therefore low, the extent site specific and the duration moderate. The impact's significance is then deemed minor, without mitigation measures (see Section 7.3.5. for more information)

All of the areas lost during the construction phase will remain lost during the operation phase.

Unlike terrestrial environments, wetland vegetation is generally dense and diverse. Wetlands play an essential role for ecosystems to function properly in where they are located. The primary functions associated with wetlands are identified in Section 13.1 of the *Act to affirm the collective nature of water resources and to promote better governance of water and associated environments* (RLRQ, c. C-6.2) and are written in detail in Section 6.3.1.5 of the present document. A loss of wetland ecological functions will occur as a result of the destruction of 28.37 or 29.98 ha of wetlands, depending on which option is chosen. Wetlands in Nunavik are of considerable importance to mammals, including caribou, as well as to avian fauna.

The vegetation of the natural environments around the work areas could be trampled by personnel or machinery during the construction and operation phases. The land and wetlands surrounding the work area could also be negatively impacted by the deposition of dust and/or contaminants emitted during the various phases of construction and exploitation work. Dust could lead to a decrease in the productivity of these environments since it could

potentially modify certain phytological processes, such as photosynthesis, flowering or pollination. There is an increased risk of hydrocarbon contamination of the surrounding terrestrial and wetland environments due to increased traffic on the site as well as fuel storage.

Given the important role of wetlands in the ecosystem, the magnitude of the impact is considered moderate (very small area lost compared to the unaffected territory), the extent site specific and the duration long. This impact's significance is therefore moderate without mitigation measures.

7.3.1.2 Closure and Restoration Phases

As with the construction and operation phases, trampling, dust and the risk of contamination could have an impact on the surrounding natural and wetland terrestrial environments.

Natural environments will be partially restored during the site closure and restoration phase through excavation, backfilling and earthworks. Vegetation may recolonize the sites following restoration. The restoration will be carried out according to the plan submitted and accepted by the ministries.

The magnitude of the impact is considered low, the extent site specific and the duration moderate if there is contamination during the closure and restoration phase.

7.3.1.3 Mitigation Measures

The mitigation measures stated in the 2007 ESIA (GENIVAR, 2007) and applicable to this project will be implemented (Table 7-14), in addition to new proposed measures. These measures aim to limit the footprint of the construction work to a strict minimum, i.e., to the perimeter planned for the construction of the surface facilities (VEG1). Moreover, the specimen with at-risk status found in the Nanaujaq study area was excluded from the work area or its influence (VEG1a) (Map 7-4). Traffic throughout the project's operating life will be confined to the mine site work area (VEG2). Another measure aimed at limiting dust and the risk of habitat contamination by accidental spills will be implemented (VEG4). Lastly, since the loss of wetlands will not be preventable, financial compensation will be paid into the PEIIC fund, a program approved by the MELCC and intended for environmental improvement in Inuit communities.

Table 7-14: Mitigation Measures to Reduce the Impacts on Terrestrial Environments and Wetlands

Nº [A]	Mitigation measures
VEG1	Machinery must not circulate outside work area boundaries (unless otherwise authorized).
VEG1a	The small-flowered draba species were identified on the Nanaujaq site were excluded from the work area. The sector where a small-flowered draba was seen will be visited again prior to the installation of construction work at the Nanaujaq site. A biologist or a technician trained in identification will check if the species are still present there and, if necessary, the location will be marked by visual cues and protected.
VEG2	Habitats next to jobsites must be protected (particularly close to stream banks).
VEG3	Compensation for wetland areas lost through contributions to the PEIIC (Program for Environmental Improvement in Inuit Communities).
VEG4	Apply the mitigation measures VEG1, AIR3, SOL1, SOL1a, SOL2, SOL2a, and SOL3.

[A]The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

7.3.1.4 Residual Impact Significance

Infrastructure development will result in the destruction of 21.54 ha of natural terrestrial environments and 28.37 or 29.98 ha of wetlands, as well as the functions associated with the affected wetlands. Since the surface area of wetlands that will be destroyed is negligible in the northern landscape, the destruction of these environments will

not affect the functioning of wetlands at the local extent, only site specific. Although CRI is responsible for restoring the site when the deposit is depleted, it will not regain the exact same functions as it had in its original state. Moreover, this restoration will take place in a few years, which attributes a long duration to this impact. Considering the different mitigation measures, the impact's magnitude is therefore low, the extent is site specific and long duration. The significance of this residual impact is considered minor (Table 7-15).

Table 7-15: Description of the Project's Residual Impact Significance on Terrestrial Environments and Wetlands

Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Construction, operation, closure and restoration	Loss of surface area in terrestrial environments (21.54 ha) and wetlands (28.37 ha or 29.98 ha depending on the alternative selected) for the Ivakkak UG, Méquillon UG2, Expo South and Nanaujaq projects, and loss of ecological functions for wetlands.	VEG1 to VEG3	Low	Specific	Long	Minor
	Potential loss of at-risk plants at the Nanaujaq site.	VEG1 and VEG1a	Low	Specific	Moderate	Minor
	Risk of trampling of vegetation by personnel or machinery, dust deposits and risk of contamination to natural environments.	VEG4	Low	Specific	Moderate	Minor

The risk of trampling on the natural vegetation around the sites by personnel or machinery is minimal since the habitats bordering the work sites will be protected and traffic will be prohibited there. These activities increase the risks of hydrocarbon contamination of the surrounding terrestrial and wetland environments, but low in relation to the mitigation measures applied. Therefore, these impacts are considered to have a low magnitude, a specific extent, a moderate duration leading to a residual impact of minor significance.

Since the small-flowered draba specimen is excluded from the impact zone of the construction and exploitation of the Nanaujaq site, there is no residual impact on this species.

7.3.2 Aquatic Fauna and their Habitats

7.3.2.1 All Activities

No watercourse or body of water will be directly affected by the work for the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South projects. Only one watercourse (CEIV) is included within the Ivakkak site's study area, and it will not be affected by the work. Consequently, the project's anticipated impacts on aquatic fauna and their habitats essentially involve a risk for the health of fish and other aquatic organisms following a possible deterioration in the water quality the in the bodies of water and watercourses located near the Nanaujaq and Ivakkak UG sites. As mentioned in Section 7.2.3.1, the anticipated impacts on water and sediment quality that concern this addendum essentially affect surface drainage water from the Nanaujaq site and contamination risks from hydrocarbons and atmospheric sources.

Without mitigation measures, the impact magnitude is deemed to be high (high probability of occurrence and specific extent on aquatic fauna), of local extent (affects several components and leaves the immediate site) and of long duration. This impact's significance is therefore major without mitigation measures.

7.3.2.2 Mitigation Measures

The mitigation measures are the same as those set out in the sections on air quality, soil quality and water and sediment quality. They aim to maintain good water quality and thus reduce the potential project impacts on the health of aquatic communities (Table 7-16).

Table 7-16: Mitigation Measures to Reduce the Impacts on Aquatic Fauna and their Habitats

Nº [A]	Mitigation measures
FAQ59	Apply mitigation measures for air, soil, water and sediment quality.

[A]The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

7.3.2.3 Residual Impact Significance

The impact magnitude of possible harm to the health of aquatic communities in the project's watersheds is assessed as low, given the application of mitigation measures aimed at ensuring good water and sediment quality (FAQ59). The impact extent is site specific and the duration short since the water quality may vary over time and not be attributable to the effects of exploitation. The significance of this residual impact is considered minor (Table 7-17).

Table 7-17: Description of the Project's Residual Impact Significance on Aquatic Fauna and their Habitats

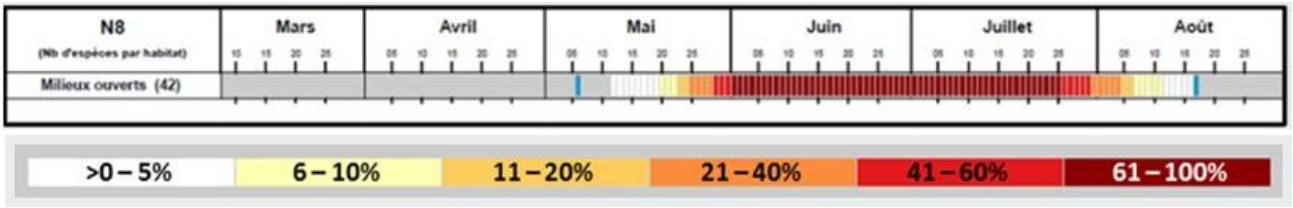
Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Construction, operation, closure and restoration	Possible damage to aquatic organisms in watercourses and bodies of water located near the various activities.	FAQ59	Low	Specific	Short	Minor

7.3.3 Avian Fauna and their Habitats

7.3.3.1 Construction Phase - New Infrastructure Development and Related Project Development

As mentioned in Section 7.3.1.1, the project's construction phase will result in the loss of 21.54 ha of natural terrestrial environments and 28.37 or 29.98 ha of wetlands, which represents a loss of bird nesting and feeding habitats. Terrestrial environments such as boulder fields may be used by some birds such as the Lapland longspur, but wetlands are generally favoured by a wider range of species. It should be noted that the Canada goose is very abundant in the fens on all the NNiP sites. In fact, individuals, faeces and traces of Canada goose grazing are regularly observed in the fens' characterization stations.

As many species of birds were observed during the inventories, including a Canada goose nest at the Nanaujaq site (see section 6.3.2.3), it is possible that the construction work will lead to the abandonment and the destruction of nests present in the work area. Except for the cormorants and pelicans, all marine and aquatic birds usually present in Canada are protected under the terms of the *Migratory Birds Convention Act* (ECCC, 2022a). This law prohibits killing, injuring or possessing migratory birds, their nests or their eggs. The area under study is located in the N8 nesting area. For this sector, the general nesting period (which covers egg laying and the presence of chicks in the nest) extends from May 12th to August 17th (ECCC, 2022b; Figure 7-1). However, the intensive nesting period is over at the end of July. Carrying out the work after August 17th would therefore have no perceptible impact on the breeding period and young being born throughout the year.



Note: The number of species in percentage. The blue indicators show the extreme dates predicted.

Figure 7-1: Migratory Birds Nesting Period in the Arctic Plains Zone in Quebec (taken from ECCC, 2022b)

The noise, movement and dust from all construction activities may disturb nesting pairs and migrating birds present near construction sites and along roads. The dust that would settle on the surrounding wetlands could have a small-scale impact on waterfowl's food source.

Without mitigation measures, the impact magnitude is deemed to be high (high probability of occurrence), of specific extent (at disrupted sites) and of long duration. The impact's significance is therefore deemed major.

7.3.3.2 Operation Phase

The anticipated impacts on birds from the deposits' mining phase of implicate the disturbance of birds present near the sites due to the increase in activities and traffic. Even in the absence of mitigation measures, the impact during operation will have a moderate magnitude since the birds will not be disturbed during their nesting, as the site is already under operation. Birds will nest in the least disturbed areas where noise is reduced. The extent of the impact is site specific, as it is limited to the disturbed areas and the impact duration is long. This impact's significance is therefore moderate before the mitigation measures are applied.

7.3.3.3 Closure and Restoration Phases

As for the two previous phases, the restoration and closure activities of the sites may disturb nesting pairs and migrating birds present near construction sites and along roads. However, the natural environments will be partly restored during the site closure phase, and this could restore some of the lost habitats.

In the restoration phase, the impact significance, before mitigation measures, is considered low, of specific extent and of short duration, for a minor impact significance.

7.3.3.4 Mitigation Measures

The mitigation measures that will be applied to minimize the impacts on birds and their habitats are presented in Table 7-18. Some of the measures applied during the construction phase (FAV1 and FAV2) are the same as those in section 7.3.1.3 for terrestrial and wetland environments. The goal is to limit the destruction of natural habitats as much as possible.

Since migratory birds are present in the study area, special attention must be paid to their nesting period during the construction phase. Measures will be taken to ensure that no migratory bird nests are destroyed during construction work (FAV5; Table 7-18).

The purpose of the FAV4 measure is to minimize the disturbance of peregrine falcon and golden eagles nesting pairs near the Méquillon site.

Table 7-18: Mitigation Measures to Reduce the Impacts on Birds and their Habitats

N°[A]	Mitigation measures
FAV1	Traffic must be limited to work areas
FAV2	Habitats next to jobsites will be protected
FAV4	It is prohibited to fly over the cliffs southwest of Méquillon from June to September (peregrine falcon and golden eagle nesting period).
FAV5	Apply the fauna and flora protection plan

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

7.3.3.5 Residual Impact Significance

The loss of nesting and foraging habitats during construction for birds is an impact of low magnitude and specific extent given the very small areas involved at the local and regional level. Birds will easily be able to use the nearby untouched habitats, which makes up the majority in the Nunavik regional landscape. Although CRI is responsible for restoring the site when the deposit is exhausted, it will not regain the exact same functions as it had in its original state. Moreover, this restoration will take place in a few years, which attributes a long duration to this impact. The significance of this residual impact is considered minor (Table 7-19).

Given the mitigation measures aimed at limiting disturbance during the construction phase (Table 7-19), including the implementation of a fauna and flora protection plan[14], it is unlikely that a migratory bird's nest will be destroyed during construction. The magnitude of this impact is considered to be low, its extent is site specific and its duration short. Therefore, the residual impact's significance for nest abandonment or destruction during the construction phase is minor (Table 7-19).

Birds are mobile animals capable of temporarily avoiding the disrupted areas. They can move as soon as disturbing elements are nearby the areas in which they frequent. They then return soon after the disturbance and are usually unaffected. Considering these facts and the mitigation measures, the impact's magnitude for disrupting birds around the infrastructure during the operation, closure and restoration phases is considered low. The extent is site specific, the duration is long, and the significance of the residual impact is considered minor (Table 7-19).

Table 7-19: Description of the Project's Residual Impact Significance on Birds and their Habitats

Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Construction	Loss of accessible habitat for birds (loss of 21.54 ha in land and 28.37 or 29.98 ha in wetlands depending on the alternative selected).	FAV1	Low	Specific	Long	Minor
	Disturbance of breeding pairs and migrating birds near construction sites and along roads leads to a risk of nest abandonment. Potential destruction of nests.	FAV2 and FAV5	Low	Specific	Short	Minor
Operation, closure and restoration	Disturbance of nesting pairs and migrating birds present on the outskirts of infrastructures.	FAV1, FAV2, FAV4 and FAV5	Low	Specific	Long	Minor

[14] The fauna and flora protection plan is currently being drafted. It will be submitted to the authorities and the NNC during the summer of 2022.

7.3.4 Caribou and Other Land Mammals

7.3.4.1 All Activities

Construction, operation, closure and restoration activities have a high potential to disturb caribou and other land mammals. The increase in road traffic for transporting equipment and during the site construction increases the risk of collision with a vehicle. Pursuant to the planning in section 10.3 of the ESIA submitted by CRI in 2007 (GENIVAR, 2007), monitoring must be performed to document the collisions between caribou and the trucks driving on the roads, including the road that connects the Expo complex to Deception Bay. No collision or incident was reported in 2021. Several caribou were observed on the throughways between CRI, Glencore and Deception Bay. An increase in the presence of individual species is generally noted throughout July due to their migration; individual species can usually be observed until the end August. The caribou legal calving habitat is not affected by the current underground exploitation projects or related projects.

The natural environment is also used by other mammals such as the lemming and the arctic fox. However, no lemming or arctic fox burrows have been recorded inside the future impacted areas.

Considering the small area affected for mammals and the intensive use of the environment by caribou, the impact magnitude is considered medium, the extent local and the duration medium. The impact's significance before mitigation measures is therefore moderate.

7.3.4.2 Mitigation Measures

To reduce the disturbance of mammals using nearby natural environments, machinery must be inspected before use and circulation must be limited to the work areas. (Table 7-20).

Table 7-20: Mitigation Measures to Reduce the Impacts on Caribou and Other Land Mammals

Nº[A]	Mitigation measures
MTR1	Prior and regular inspection of machinery shall be performed to ensure that it is in good condition and working properly (minimizing noise).
MTR2	Machine circulation will be limited to work areas.
MTR6	Apply the fauna and flora protection plan.

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

7.3.4.3 Residual Impact Significance

The implementation of a protection plan will aim to reduce the stress and injuries to the caribou that use the territory in which the NNiP is located as much as possible. Limiting traffic to work areas and inspecting machinery to prevent excessive noise helps reduce impacts on caribou. Moreover, no caribou were hit in 2021 on the various routes and access roads in the NNiP study area.

Thus, the proposed mitigation measures contribute to reducing the impact's magnitude and its extent. The impact's significance is therefore considered minor (Table 7-20).

Table 7-21: Description of the Project's Residual Impact Significance on Caribou and Other Land Mammals

Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Construction, operation, closure and restoration	Disrupting several species by noise, i.e., caribou. Possibility of hurting or killing an animal during road transport.	MTR1, MTR2 and MTR6	Low	Specific	Moderate	Minor

7.3.5 At-risk Wildlife and Plant Species

7.3.5.1 All Activities

No impact is to be expected on at-risk wildlife species since the only mentions involves a golden eagle nest and a peregrine falcon nest (vulnerable species in Quebec) which are located more than 10 km east from the Ivakkak site.

Regarding at-risk plant species, the species most likely to be found in the work area or nearby are the sulphur buttercup, ellesmere Island draba, Cayouette's draba, the flat-top draba and the small-flowered draba (see Section 7.3.3). Note that only one occurrence was confirmed on the sites during field inventories. It was small-flowered draba specimen (species likely to be designated as threatened or vulnerable), which was observed in the southeast sector of the Nanaujaq site study area. According to current plans, the specimen's location is not on a planned construction area (Map 7-4), but approximately 40 m south of the proposed clean water ditch. Overall, the probability of destruction of rare plants is very low since no other at-risk floral specimens were seen during the field searches, despite a search carried out over 46.7 km.

During the project's three phases, the dust produced by road transport and traffic could be deposited on the natural environments around the work sites. It could lead to a decrease in the productivity of these environments since it could potentially modify certain phytological processes, such as photosynthesis, flowering or spreading pollen. The potential loss of draba plants which are part of at-risk species can thus be considered, although it is unlikely since these are species that colonize exposed environments (e.g., rocky cliffs), which are therefore continually affected by the strong winds.

Without mitigation measures, the impact's magnitude for at-risk species is therefore low, the extent site specific and the duration moderate. The impact's significance is considered minor.

7.3.5.2 Mitigation Measures

The area where a small-flowered draba was seen will be visited again prior to the construction work at the Nanaujaq site. A biologist or a technician trained in identification will check if the species are still present there and, if necessary, the location will be marked by visual cues and protected (ESP1; Table 7-22).

The other measures (ESP2) aim to limit the project's impact on the habitat of at-risk plant species, i.e., the same measures as those in section 7.3.1.3 for terrestrial and wetland environments.

Lastly, monitoring of at-risk draba colonies is underway as part of the NNiP (Canadian Royalties Inc., 2022) to precisely measure the actual potential effects of mining activities on these plants. Several colonies spread over the various mining sites are being monitored. CRI must add new mitigation measures if the NNiP activities show a degradation of the draba colonies.

Table 7-22: Mitigation Measures to Reduce the Impacts on Flora and Fauna with At-risk Status

N°[A]	Mitigation measures
ESP1	Apply VEG1 and VEG1a.
ESP2	Apply VEG4.

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

7.3.5.3 Residual Impact Significance

The risk of at-risk plant specimen destruction is rather improbable since only a single specimen was observed during field inventories only at the Nanaujaq site. The position of this specimen has been noted and it will be protected during development work (ESP1 mitigation measure). The magnitude of the impact is considered low on this component since the destruction of a specimen is unlikely. The extent is site specific since it would affect a few species at most and the duration is long since the destruction of a plant is considered permanent. The significance of this residual impact is considered minor (Table 7-23).

The impact of the degradation of the habitat of at-risk plant species in the vicinity of the mine sites is of low magnitude because the terrestrial environments preferred by the drabas are exposed and swept by strong winds, and therefore less sensitive to dust, and several mitigation measures will be applied (ESP2 measure which includes several mitigation measures on vegetation; Table 7-23). The extent is local and the duration moderate. The project's impact on at-risk plants species habitat is of minor significance (Table 7-23).

Table 7-23: Description of the Project's Residual Impact Significance for At-risk Flora and Fauna Species

Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Construction, operation, closure and restoration	Potential loss of at-risk plants at the Nanaujaq site.	ESP1	Low	Specific	Long	Minor
	Habitat degradation of at-risk plant species due to dust or trampling.	ESP2	Low	Specific	Moderate	Minor

7.4 Impacts on the Human Environment

7.4.1 Economy and Employment

7.4.1.1 All Activities

Phase 2a will make it possible to maintain the jobs currently held by Inuit on the NNiP site. The projects will also allow to create new jobs within the Nunavik Inuit communities. Table 7-24 presents the number of employees required to carry out the various projects. Thus, without mitigation measures, the impact is all the same positive, its magnitude is strong, its extent regional (jobs available for people located outside the proximal communities) and its duration moderate, thereby producing a major positive impact significance for the economy and employment.

Moreover, although it is beneficial from a monetary point of view, job creation within the Inuit communities will also lead to changes in Inuit lifestyles who work on the various mining sites of NNiP's Phase 2a. This impact can be perceived negatively and can be irreversible. The impact's magnitude is therefore low (very small part of the community will be affected due to the reduced number of workers involved), the extent site specific (limited to the workers) and of long duration, giving minor significance to the impact. Mitigation measures are therefore required.

Table 7-24: Number of Employees Required for the Construction, Operation and Closure Phases of Underground Mining Projects, As Well as Associated Related Projects

Project	Number of employees required
Construction and operation for the Ivakkak UG mine	About fifteen employees
Construction and operation for the Méquillon UG2 mine	About fifty employees
Construction and operation for the Nanaujaq mine	About twenty employees
Construction and operation for the Expo South mine	About twenty employees
Modification of the tailings disposal site	About fifteen employees
Expansion of the Expo camp	About forty employees
Expansion of the LEMN by adding a landfill cell	About 5 employees

7.4.1.2 Mitigation Measures

Implementing improvement measures will make it possible to maximize the positive economic benefits for the Inuit communities, primarily generated by the construction, operation and eventual closure of the mining sites proposed for NNiP's Phase 2a.

Moreover, mitigation measures will be implemented to minimize the impact on the Inuit workers' lifestyles who will be hired during the construction, operation and closure of the various mining sites of NNiP's Phase 2a (Table 7-25).

Table 7-25: Mitigation Measures Aimed at Fostering Economic Benefits and Employment Within the Nunavik Inuit Communities

N°[A]	Mitigation measures
ECO1	Hiring will give preference to Inuit workers.
ECO2	Maintain the information and recruitment program in the Inuit villages.
ECO3	Maintain the training program intended and adapted for future Inuit workers.
ECO4	Encourage Nunavik-based companies with the skills for the tasks requested in the call for bids procedure, before undertaking requests to companies based in Abitibi, elsewhere in Quebec or abroad.
ECO5	A sales outlet for Inuit handcrafted goods will be established on the Expo industrial complex.
ECO7	Promote the integration of Inuit workers hired for construction into the operation phase.
ECO9	Respect the updated Nunavik Nickel Agreement policies related to the hiring of Inuit workers as well as royalties.
MOE1 to MOE10	Integrate new workers by explaining the different living conditions and regulations on the NNiP site, as well as the different programs available. All of these measures can be found in Annex 7 of the Nunavik Nickel Agreement.

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

7.4.1.3 Residual Impact Significance

In terms of job creation and local and regional economic benefits, these impacts will be felt during the construction, operation and closure of the various mining sites of NNiP's Phase 2a. The duration will be therefore long. The impact's extent will be regional, as several Inuit communities will be affected. The impact magnitude is moderate. The impact of job creation and local and regional economic benefits is therefore considered major and positive.

In terms of the changes of the Inuit workers' lifestyles, the extent will remain long, due to the work's duration (several years). Fewer people will be affected since this impact will only affect the workers directly involved and not for all communities. In addition, mitigation measures will be implemented to facilitate worker integration into their new work environment. The extent will therefore be site specific (impacts only on workers) and the magnitude low. The impact's significance is therefore considered minor.

Table 7-26: Description of the Project's Residual Impact on the Economy and Employment

Component	Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Social environment - Economy and employment	Construction, operation, closure and restoration	Job creation and local and regional economic benefits.	ECO1 to ECO7, ECO9	Moderate	Regional	Long	Major (positive)
		Labor mobility and change in the Inuit employees' lifestyle.	MOE1 to MOE10	Low	Specific	Long	Minor

7.4.2 Land Use by the Inuit

7.4.2.1 All Activities

In WSP's ESIA addendum regarding the Puimajuq site, it was mentioned that the new mining activities (open pit mining) in this sector were unlikely to have an impact on traditional Inuit activities since the latter were located in an axis far from the site, near the Bombardier and Rocbrune lakes. It was therefore estimated that at such a distance, interference between mining activities and traditional Inuit travel or activities would therefore be limited (WSP, 2015: 75). However, more recent data provided by the Makivik Corporation show that activities were carried out between 2007 and 2017 by people from Salluit and Kangiqsujuaq near the sites proposed for CRI's Phase 2a project.

As noted in section 6.4.4, trips were made, possibly by snowmobile, by people from the two communities near the Expo South site, then not far from the Nanaujaq and Méquillon sites. Camps used as resting areas and places to stay during these various trips are also located a few kilometers to the west and south-west of the Méquillon site, in particular on the shore of Lac Vaillant. Other camps used are a little further from the proposed sites, located specifically on the Puvirnituq River's south shore (a little more than 5 km south of the Méquillon site), as well as on the west shore of Lac Saint-Germain (more than 15 km south of the Expo South and Méquillon sites). In addition, harvesting sites (mostly big game harvesting sites, but also fox trapping, fishing and, to a lesser extent, gathering sites) are located near the Méquillon site. These sites are located on the shore of Lac Méquillon and along the edge of Lac Vaillant, just west of the Nanaujaq site, and east of the Expo South site. These camps were visited during trips in the area (probably by snowmobile in winter and spring). It is also possible that they were visited during other times of the year by groups travelling by seaplane. It was not possible to know if they were visited more than once, or if they were mentioned by more than one informant who participated in the interviews conducted by the Makivik Corporation.

Although partial, the information available regarding the current use of the territory concerned by Phase 2a shows that Inuit visited there between 2007 and 2017, frequenting places located not far from the proposed sites, in particular those of Méquillon, Nanaujaq and Expo South. The noise, dust and vibrations caused by the construction of new mining infrastructures, their operation and possibly their closure could therefore be seen by Inuit users visiting the area, contributing to a disturbance of the site's tranquillity, as well as a possible decrease in the quality of hunting, fishing, trapping and gathering in the sectors affected. The construction and operation of Phase 2a sites could also cause a temporary or permanent access interruption to certain sites frequented by the Inuit, or even lead to the partial or total loss of certain sites used. The construction, operation and closure of the sites proposed for NNiP's Phase 2a could also temporarily or permanently hinder travel routes used by the Inuit in the territory affected. To this intent, the safety of Inuit users travelling there could be affected by the circulation of vehicles or machinery used during operations carried out by CRI (construction, operation and closure), particularly along roads or access roads, snowmobile crossings, ATV or other means of land travel routes found in the territory affected by Phase 2a.

Furthermore, the practice of fishing activities by non-Inuit CRI employees could also lead to increased pressure on available resources and lead to a decline in the quality of the territories concerned in the eyes of Inuit users. However, the practice of sport fishing is regulated and monitored as part of monitoring 15 of the EMP (Canadian Royalties, 2022a). The objective of this monitoring is to avoid over-exploitation of lake trout and Arctic char populations in the bodies of water near the NNiP site. The program, which specifies in particular the number of

catches authorized for the entire season and per angler, the size of the specimens authorized, and the type of hook used, is submitted to the MFFP. They jointly review it with the joint Hunting, Fishing and Trapping Coordinating Committee (HFTCC), which is an expert organization composed of Inuit representatives and governmental representatives from Quebec and Canada. It has decision-making power with the responsible governments and under the *James Bay and Northern Quebec Agreement,* it is the privileged and exclusive assembly at which the Inuits and the governments jointly create the regulations and oversee the administration and management of the hunting, fishing and trapping regime. Following this joint review by the MFFP and the HFTCC, the program is approved if it meets their requirements and modified, if necessary, to apply some of their recommendations. Thus, no impact is anticipated on the decline in the quality of the sampling for the fish resource since the sampling has been authorized beforehand. It should be noted that harvesting by hunting for allochthonous employees is not authorized.

Lastly, the creation of new jobs in the Nunavik Inuit communities in connection with NNiP's Phase 2a could indirectly lead to a decrease in the practice of activities on the territory among Inuit workers. It is in fact possible that Inuit employees working on the construction, operation and closure of the sites proposed for Phase 2a will have less time to devote to their land use activities due to their presence at the CRI operated sites, rather than in their community.

In the absence of mitigation measures, the impact's significance is negative and major for the use of the territory by the Inuit. In fact, the magnitude is high since the impact could affect a large part of the population, the extent could be regional (would minimally affect the Salluit and Kangiqsujuaq communities) and the duration varying from moderate to long depending on the site under exploitation.

7.4.2.2 Mitigation Measures

The implementation of mitigation measures will reduce the impacts of NNiP's Phase 2a on the use of the territory by the Inuit, specifically:

- By informing the people of the Salluit and Kangiqsujuaq communities of the work carried out on the territory affected by NNiP's Phase 2a;
- By maintaining access and circulation as much as possible on the territory affected;
- By ensuring the safety of Inuit users frequenting the territory affected;
- And by limiting the frequentation and use of the territory by allochthonous CRI workers.

Table 7-27 describes all suggested mitigation measures.

Table 7-27: Mitigation Measures to Reduce the Impacts on Land Use by the Inuit

N°[A]	Mitigation measures
ORS1a	Possibility for Inuit workers to do a shorter work rotation (two weeks on, followed by two weeks off), so they can spend more time in their community.
TRC1	Mark new access roads and post traffic signs where snowmobile and all-terrain vehicle trails intersect these roads or the main road when required.
TRC11	Install signs mentioning the presence of traffic lanes or work/operation areas in proximity to inform Inuit users who may travel through or practice activities in the sector.
URT1	No measures will be taken to facilitate sports fishing by the workers (e.g., transportation by helicopter).
URT2a	Prohibit the possession of firearms at CRI sites (except with special authorization for protection against polar bears), as to limit sport hunting activities practiced by employees.
URT3	Prior and regular inspection of machinery will be performed to ensure that it is in good condition and working properly (to avoid producing excessive noise).
URT4	Lakes used by the residents of Salluit and Kangiqsujuaq will remain accessible.
URT6	Continue to set up fishing programs governing this activity in the targeted bodies of water.
URT10	In the event that traffic must be temporarily or permanently impeded on trails used by Inuit users, provide bypasses or new safe travel routes together with the Salluit and Kangiqsujuaq communities. Inform the population of the Salluit and Kangiqsujuaq communities of the bypassing routes or new travel routes.
URT11	Regularly inform the Salluit and Kangiqsujuaq communities of the work carried out on the NNiP territory affected (nature of the work/operations, location of the work/operations, schedule, potential dangers for Inuit users).
URT12	Regularly inform CRI workers of the potential presence of Inuit users in the territory concerned by NNiP's Phase 2a.
SON2	Machine circulation will be limited to work areas.
SON3	If possible, isolate the main sources of noise with a sound-absorbing material, when possible.

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Note: A grey background indicates a new mitigation measure since Annex 7 or a modification to an existing mitigation measure.

7.4.2.3 Residual Impact Significance

Implementing mitigation measures will reduce the impacts of NNiP's Phase 2a on the use of the territory by the Inuit. These measures will make it possible to inform the communities affected, to maintain - as much as possible - the continuity of traffic and access to the territory affected by the NNiP, to ensure the safety of users moving there and to limit the pressure on resources that could be induced by allochthonous CRI workers

However, the NNiP's Phase 2a construction and operation will still lead to a partial or total loss of territories likely to be frequented by the Inuit. This loss will be permanent, or at least continue for the duration of the construction and operation of the proposed mine sites. Furthermore, the noise and vibrations caused by the construction, operation and closure of the proposed sites could also be seen by Inuit users, moving, staying or practicing activities not far from the proposed mining sites or near the access road that connects them. Noise and vibrations, but also the dust produced (construction, operation and closure of the proposed mining sites, traffic along the access road), could also affect the resources present in the surrounding territory (wildlife species, plant species, water), which would result in a decrease in the quality of activities for Inuit users. Once again, these impacts will be felt for the entire duration of the construction, operation and closure of the proposed mining sites. The impact on Inuit land use will therefore be long in duration. Although it is difficult to decide on the magnitude of the impact after mitigation measures regarding the Inuit use of the territory covered by NNiP's Phase 2a, given the place there. This territory's extent is vast. It is therefore possible that, despite mitigation measures being implemented, certain activities carried out by the Inuit will be affected at one time or another during construction, operation or closure. The extent of this impact will therefore be local. However, the Inuit will have the option of moving their activities to other locations if

they feel that the territory covered by NNiP's Phase 2a no longer meets their needs. Note that measures will be taken to maintain access and circulation of users on the territory as much as possible, as well as to ensure their safety. The magnitude of this impact is considered to be low. Therefore, the residual impact's significance on the use of the territory is considered moderate.

Table 7-28: Description of the Project's Residual Impact Significance on Land Use by Inuit

Component	Project phase	Impact description	Mitigation measures	Magnitude	Extent	Period	Residual impact significance
Human environment - Land use by the Inuit	Construction, operation, closure and restoration	Disruption of traditional Inuit activities within the NNiP territory.	ORS1a TRC1 and TRC11 URT1 to URT6 URT10 to URT12 SON2 and SON3	Low	Local	Long	Moderate

7.4.3 Archeology and Heritage

7.4.3.1 Construction Phase

Soil stripping and disturbance can destroy archaeological sites.

No obvious remains were observed by the participants within the areas examined during the Phase 2a biological field inventories. The work planning can continue for NNiP's Phase 2a development. It is important to keep in mind that in the event where archaeological remains are discovered during work or during any other observations carried out and reported to the site, CRI must absolutely ensure the cultural resource's protection. Subsequently, the *Ministère de la Culture et des Communications du Québec* (MCC) must be informed under the terms of article 74 of the Cultural Heritage Act (L.R.Q., P-9.002, 2011, chap. B 4) which states that *"A person who discovers an archaeological property or site must inform the Minister of it without delay."* Work may continue only if the archaeological resource is not affected and is protected.

It should be noted that inventories by an archaeologist are planned for 2022 at the sites where stripping and soil disturbance work is planned for Phase 2a to validate the absence of archaeological remains.

7.4.3.2 Mitigation Measures

In the event that remains of interest are discovered during the work and they have not been listed during the 2022 inventories, the ARC1 mitigation measure would be applied (Table 7-29).

Table 7-29: Mitigation Measures to Reduce the Impacts on Archeology and Heritage

Nº[A]	Mitigation measures
ARC1	If remains of importance are discovered, the site supervisor shall be informed immediately and measures taken to protect the site.

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

7.4.3.3 Residual Impact Significance

The application of the mitigation measure and survey completion prior to the work, aim to protect and conserve archaeological sites of interest. These actions contribute to reducing and completely eliminating the impact on this component (Table 7-30).

Table 7-30: Description of the Project's Residual Impact on Archaeology and Heritage

Component	Project phase	Impact description	Mitigation measures	Magnitude	Extent	Period	Residual impact significance
Human environment - Archaeology and heritage	Construction	Discovery of archaeological or historic remains during construction	ARC1	Impact eliminated			

7.4.4 Soundscape

7.4.4.1 All Activities

Construction, operation, closure and restoration activities will produce an increase in noise at the local level due to the use of noisy machinery and industrial activities. Table 7-31 shows an example of the type of mobile machinery that can be used on site or on the road. The level of noise produced by the machinery is very high in proximity, which can cause damage to workers' hearing protection devices (Table 7-31).

The sound monitoring carried out in Pingualuit National Park seems to indicate the absence of noise impact in this area's natural environment, which was the sensitive component identified during the initial impact assessment. Thus, the increase in noise at the local level will be felt mainly in the disturbance of land animals. So far, no return of noise disturbance in nearby natural sites used for hunting or fishing or in temporary camps has been brought to CRI'S attention.

When mitigation measures are absent, the impact's magnitude will be high for the workers and medium for the surrounding fauna and the environment's users, the extent site specific and the duration long if there are aftereffects for workers and short for animals (can move quickly to escape the noise) and users (move to a quieter place if an effect is felt). The impact's significance is therefore major for workers and minor for wildlife and users, when no mitigation measures are applied.

Table 7-31: Sound Level Produced by Machinery Regularly Used Outdoors on the NNiP Site (GENIVAR, 2007)

Mobile equipment	Sound level (dB (A))	Equipment distance
Drilling machine air compressor	110-115	1 m
	95	26 m
Rotary drill	72 to 100	Operator's position
Diesel truck	74 to 109	Driver's cabin
	88	26 m
Loader	84-107	Driver's cabin
	87	26 m
Grader	76-104	Driver's cabin
Excavator	78-101	Driver's cabin

7.4.4.2 Mitigation Measures

To ensure that the workers' physical integrity is protected, it is essential that they apply the SON4 measure (Table 7-32), as well as site visitors if they travel into environments where the decibels require hearing protection devices to be worn. The SON 1, SON 2 and SON3 mitigation measures aim to restrict the extent and range of noise outside the local sites where the machinery is being used.

Table 7-32: Mitigation Measures to Reduce the Impacts of the Soundscape

N°[A]	Mitigation measures
SON1	Preliminary and regular inspections of the machinery to ensure it is in good condition and working properly (so no excess noise is generated)
SON2	Machine circulation will be limited to work areas.
SON3	If possible, isolate the primary sound sources with absorbent material
SON4	It shall be mandatory for workers to wear hearing protection devices when inside noisy buildings (e.g., crushing and grinding unit)

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

7.4.4.3 Residual Impact Significance

The mitigation measures set out above lead to a low impact magnitude, a specific extent and moderate duration. The residual impact's significance is then minor for all the components affected by noise (Table 7-33).

Table 7-33: Description of the Project's Residual Impact on the Soundscape.

Component	Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Human Environment - Soundscape	Construction, operation, closure and restoration	Increase in the noise level around the site.	SON1 to SON4	Low	Specific	Moderate	Minor

7.4.5 Landscape

All of the construction, operation and closure activities will lead to the landscape's occasional modification with the insertion of anthropogenic structures. However, this impact is part of an environment that seems little frequented by the population of the surrounding Inuit villages. During the initial impact assessment, the issue identified was mainly a change in the natural landscape's appearance for users of Pingualuit National Park. This issue proved to be low since after the Expo Complex and Méquillon site were built, the visual impact from this park is negligible (Photo 7-5).

It seems that the change in view for the landscape’s extent affected for the sector's occasional users was not of great importance. After the various infrastructures are implemented, there does not seem to have been any complaints to this effect from the Inuit communities.

In addition, the environments are completely restored and all buildings or other traces of mining use are removed when the various projects are complete. Thus, no residual impact on the landscape will remain in the long term. It will still take some time after the restoration for the vegetation to regain its place in the areas where it can grow.

The impact's significance for the construction, operation and closure phase on the landscape is therefore minor without mitigation measures, due to its low magnitude, its local extent and its moderate duration.

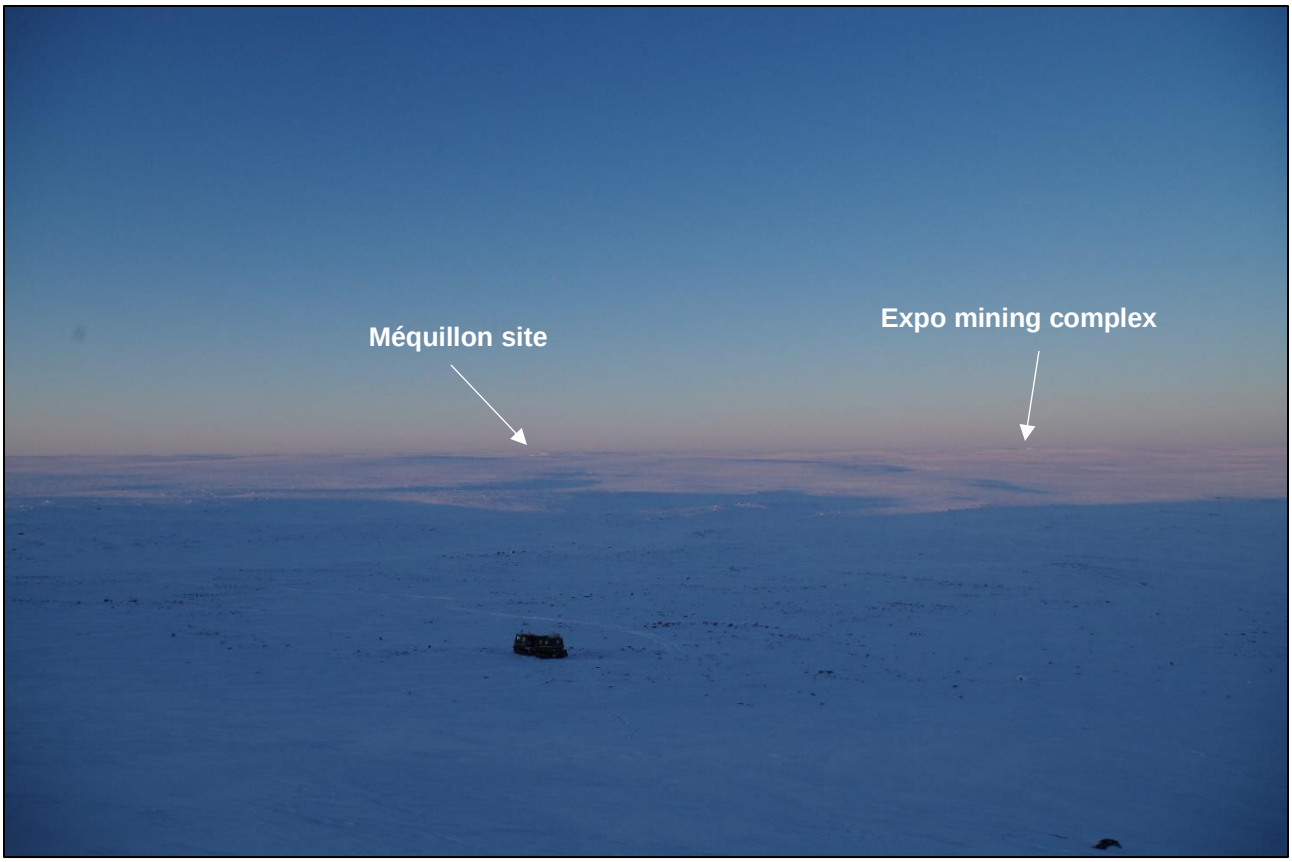


Photo 7-5: View of the Expo Mining Complex and the Méquillon Site Facilities from Pingualuit National Park.

Nevertheless, some mitigation measures will be implemented to limit the effects on the landscape and are presented in Table 7-34. The mitigation measures make it possible to reduce the impact's extent, but the residual impact's significance remains minor for the construction, operation and closure phase and while the impact will no longer be perceivable on the landscape after closure (Table 7-35).

Table 7-34: Mitigation Measures to Reduce the Impacts on the Quality of Life

N°[A]	Mitigation measures
PAY1	Minimize stripping, clearing, excavation, backfilling and grading to maintain the natural topography as much as possible.
PAY2	When construction is completed, work areas shall be rehabilitated and restored so that they blend in as much as possible with the natural landscape (regrowth of vegetation).
PAY5	Installation of directional sodium lighting to limit the light dispersion around the mining complex

[A] The mitigation measure number refers to Annex 7 established by the Nunavik Nickel Committee (see Appendix C).

Table 7-35: Description of the Project's Residual Impact Significance on the Landscape

Component	Project phase	Impact description	Mitigation measures	Magnitude	Extent	Duration	Residual impact significance
Human Environment - Landscape	Construction, operation, closure	Deterioration of surrounding scenery. It is more pronounced on the Nanaujaq side because only one road is currently present.	PAY1 and PAY5	Low	Local	Moderate	Minor
	Restoration	Site restoration	PAY2	No residual impact after vegetation regrowth			

7.5 Assessment of the Impacts, Mitigation Measures and the Residual Effect

Table 7-36 presents the impact assessments associated with Phase 2a, i.e., for the construction, operation, closure and restoration of the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South sites, as well as the related projects associated with them.

Table 7-36: Assessment of Potential Impacts and Mitigation Measures for the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South Underground Mining Projects and Associated Related Projects.

Component	Project phase[A]	Impact source (additional compared to the 2007 ESIA)	Impact description	Source	Mitigation measures		Residual impact significance	Monitoring
					Nº	Description		
Air Quality	Construction and operation	Increase in road transport and machinery traffic on the sites, presence of soil stripping, extraction of materials in authorized quarries, removal of specific structures during closure, soil reworking during restoration.	Increase in airborne dust and exhaust fumes.	IA: p. 324, 327	AIR1	Vehicles, to the extent possible, shall not be left running when not in use.	Minor	General surveillance and monitoring during construction, operation, closure and restoration, dust emissions monitoring
					AIR2a	In dry, windy weather, dust reducers (calcium chloride or water) will be sprayed on certain areas. The humidification frequency will be adjusted according to the meteorological conditions and the dust emissions observed. Dust control agents will comply with the BNQ 410-300 standard or will be approved by the *Ministère des Transports du Québec* (MTQ). The choice of dust reducers must take account of the proximity of wetlands or bodies of water.		
				IA: p. 324	AIR3	Machinery used must meet Environment and Climate Change Canada's emission standards for on- and off-road vehicles.		
		Increased energy production through satellite generators, increased burning of waste materials.	Atmospheric particles and greenhouse gas emissions	IA: p. 327	AIR5	Use generators with low contaminant emission rates.	Minor	
					AIR6	Prior and regular inspection of machinery will be performed to ensure that it is in good condition and working properly. See also AIR6a.		
					AIR6a	Apply the mechanical service preventive maintenance program to ensure optimal operation of machinery and that equipment vibrations are reduced to a minimum, as to reduce emissions to a minimum.		
	Operation	Expansion of ore and waste rock storage areas resulting in waste rock and ore stockpiling activities. Crushing waste rock for backfilling underground.	Increase in airborne mining dust.		AIR4a	Equip the crushers and grinders with dust control agent equipment. See also AIR4b.	Minor	
					AIR4a	The waste rock crusher will be equipped with a dust control system, which will be checked daily and cleaned regularly.		
					AIR4b	At the Expo ore stockpile, application of dust reducers or watering the road and the machinery operation area (active zone) of the ore storage area (loading zone, up to the concentrator). Watering the loading areas before unloading ore.		
					AIR4c	Limit handling the Expo ore stockpile during periods of high wind.		
Ground Quality	Construction	Soil stripping and using quarries and eskers.	Localized soil loss, soil remodeling.	IA: p. 340-341	SOL3	Non-acid-generating waste rock shall be used as granular material during the operational phase in order to minimize encroachment upon eskers.	Minor	General surveillance and monitoring during construction, operation, closure and restoration, dust emissions monitoring
	Construction and operation	Increase in road transport, machinery traffic, underground mining activities, number of fuel storage pad on the ground and increase in waste incineration.	Risk of soil contamination by hydrocarbons.	IA: p.340-341	SOL1	Prior and regular inspection of machinery shall be performed to ensure that it is in good condition and working properly (not leaking hydrocarbons).	Minor	
					SOL1a	Apply the mechanical service preventive maintenance program to ensure optimal operation of machinery (verify there are no hydrocarbon leaks).		
				IA: p.340-341	SOL2	An emergency kit for recovering petroleum products and hazardous materials shall be readily accessible at all times, construction site machinery shall have absorbent material in order to respond quickly, and polluted soil and wastes shall be disposed of in accordance with applicable legislation and regulations. See also SOL2a.		
					SOL2a	Apply the spill management procedure "PRO-NENV-1211-01 Response to an Environmental Incident" which ensures the safe, fast, efficient and comprehensive management of a spill as to minimize the environmental impact.		
					SOL15	Use double-walled tanks for storing fuel, compliant with the requirements of the *Building Act*.		
	Operation	Addition of new surface infrastructures and access roads.	Risk of subsidence.	IA: p.343-344	SOL5	To prevent subsidence due to the soil heating, major buildings shall rest on piles and lighter buildings shall be on ventilated foundations.	Minor	
					SOL10	Measures shall be taken when building major civil structures to prevent permafrost from thawing.		
			Environmental liability that may affect long-term soil use.		SOL12	Remove and dispose of contaminated soils in an authorized location and perform a characterization according to the terms in the *Politique de Protection des Sols et de Réhabilitation des Terrains Contaminés: Plan d'Action 2017-2021* (MDDELCC, 2017) and the *Guide d'intervention – Protection des Sols et Réhabilitation des terrains Contaminés* (Intervention Guide – Soil Protection and Restoration of Contaminated Sites) (Beaulieu, 2021). Apply the procedures presented in the ERP for spills.		
					SOL13	The PAG waste rock generated by the new exploitations will be returned to the underground mine tunnels.		
		Transportation of ore, use of the tailings disposal site at Expo and storage of waste rock in the dumps.	Localized increase in metal concentrations on the soil surface.	IA: p.343-344	SOL9	The final cover shall include an impervious membrane and an erosion protection layer.		
					SOL14	Apply the AIR4a, AIR4b, AIR4c, AIR4d mitigation measures air quality protection relating to mining dust.		

[A] The operation phase includes the closure and restoration phases when applicable.

Note: A grey background indicates a new measure since Annex 7 established with the Nunavik Nickel Committee.

Source: IA = Impact assessment (GENIVAR, 2007).

Table 7-36: Assessment of Potential Impacts and Mitigation Measures for the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South Underground Mining Projects and Associated Related Projects (cont.)

Component	Project phase[A]	Impact source (additional compared to the 2007 ESIA)	Impact description	Source	Mitigation measures		Residual impact significance	Monitoring
					Nº	Description		
Sediment and water quality	Construction	Soil stripping	Risk of an increase in suspended solids in the water of adjacent watercourses and bodies of water.	IA: p.363-365	QES5	Excavated material will be disposed of in a way that minimizes the spread of suspended solids.	Minor	General monitoring and surveillance during construction
					QES6	Stones removed during grading earthwork will be reused to stabilize banks and hollows.		
		Use surface explosives if required.	Risk of ammonium nitrate dispersal when explosives are loaded in surface water and sediment.	IA: p.369-371	QES25	Special care shall be taken to avoid spilling ammonium nitrate beside blast holes when loading them, an operation always done using equipment to inject the explosives directly into the blast holes.	Minor	General monitoring and surveillance during construction
	Construction and operation	Increase in road transport, machinery traffic, underground mining activities and refuelling.	Risk of water and sediment contamination by hydrocarbons during refuelling, or in the event of damage and an accident along a watercourse or wetland.		QES2a	Carry out inspections to ensure that the temporary hydrocarbon storage tanks are in good condition.	Minor	General surveillance and monitoring during construction, operation, closure and restoration.
				IA: p.369-371	QES4	Heavy machinery will only be used within the road right-of-way and borrow pit access roads.		
					QES8	Machinery parking, washing and maintenance areas shall be at least 60 m from any watercourse, and machinery shall be refuelled under constant supervision at least 30 m from any watercourse.		
					QES27	Fuel tanks will be surrounded by a berm high enough to contain a spill equal to the largest capacity tank plus 10%.		
					QES28	Acid-generating waste rock (Méquillon, Expo South and Ivakkak) will be progressively covered with layers of neutral granular material and a waterproof membrane.		
					QES34	Apply the mitigation measures SOL1, SOL1a, SOL2, SOL2a and SOL3 to limit the risk of water and sediment contamination.		
	Operation	Water from drainage ditches, tailings disposal site, waste rock and ore piles.	Possible degradation of water quality by increased sediment downstream of mine drainage discharge points and clean water ditches.	IA: p.369-371	QES19	The top of mine tailings and waste rock piles shall be kept at a 1% to 3% gradient to minimize infiltration.	Minor	Comprehensive environmental monitoring program affecting discharged water, surface water, runoff and ditches.
					QES35	Treat the water contained in the collection pond located downstream from the waste rock pile on the Nanaujaq site (it will be sent to the Méquillon WTP for treatment).		
				IA: p.369-371	QES22	Temporary ore storage sites would rest on a compacted gravel base surrounded by a collecting ditch to channel drainage water to the sedimentation pond, from which it shall be pumped into the process water tank.		
					QES26	Abrasives and de-icing chemicals will only be spread on dangerous locations or during ice-storms.		
					QES29	Geomembranes shall be placed beneath mine tailings cells, on dike walls and on the top of tailings and waste rock piles.		
		Runoff water from roads, access roads and disturbed soil areas.	Risk of degradation in water quality near roads, access roads and soil disturbance areas.	IA: p.369-371	QES30	During earthwork on steep slopes, the bottom of ditches shall be progressively stabilized with a cover of well-drained granular material and riprap.	Minor	
Water and sediment regime	Construction and operation	In fact, the construction of a collection pond, waste rock and ore piles, as well as drainage and collection ditches at the Nanaujaq site. Development of two ditches at the Ivakkak UG site.	Modification of the surface water flow pattern.		RHS2a	Interrupt drainage ditches 10 m from the natural high water mark when watercourses or bodies of water are present nearby.	Minor	General monitoring and surveillance during operation
			Possible increase in erosion and sediment transport in watercourses.	IA: p.351-352	RHS8	Re-use stones removed during grading work to stabilize banks and hollows.		
Vegetation	Construction and operation	Presence of surface infrastructure (access road, cement slurry plant, portal, ditches, storage pad, ventilation raise, collection pond, waste rock and ore piles, administrative infrastructure, powder magazines, etc.).	Loss of surface area in terrestrial environments (21.54 ha) and wetlands (28.37 or 29.98 ha depending on the alternative selected) for the Ivakkak UG, Méquillon UG2, Expo South and Nanaujaq projects, and loss of ecological functions for wetlands.	IA: p.401	VEG1	Machinery must not circulate outside work area boundaries (unless otherwise authorized).	Minor	General surveillance and monitoring during construction, operation, closure and restoration.
					VEG2	Habitats next to jobsites must be protected (particularly close to stream banks).		
					VEG3	Compensation for wetland areas lost through contributions to PEIIC (Program for Environmental Improvement in Inuit Communities).		
			Potential loss of at-risk plants species at the Nanaujaq site.	IA: p.401	VEG1	Machinery must not circulate outside work area boundaries (unless otherwise authorized).	Minor	
					VEG1a	The small-flowered draba species were identified on the Nanaujaq site were excluded from the work area. The sector where a small-flowered draba was seen will be visited again prior to the installation of construction work at the Nanaujaq site. A biologist or a technician trained in identification will check if the species are still present there and, if necessary, the location will be marked by visual cues and protected.		
		Circulation of machinery and employees.	Risk of trampling of vegetation by personnel or machinery, deposit of dust and risk of contamination to natural environments.		VEG4	Apply the mitigation measures VEG1, AIR3, SOL1, SOL1a, SOL2, SOL2a, and SOL3.	Minor	

[A] The operation phase includes the closure and restoration phases when applicable.
Note: A grey background indicates a new measure since Annex 7 established with the Nunavik Nickel Committee.
IA = Impact assessment (GENIVAR, 2007).

Table 7-36: Assessment of Potential Impacts and Mitigation Measures for the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South Underground Mining Projects and Associated Related Projects (cont.)

Component	Project phase[A]	Impact source (additional compared to the 2007 ESIA)	Impact description	Source	Mitigation measures		Residual impact significance	Monitoring
					Nº	Description		
Aquatic wildlife and their habitats	Construction and operation	All activities of the four underground mining projects and their related projects.	Possible damage to aquatic organisms located in watercourses and bodies of water near the various activities.		FAQ59	Apply mitigation measures for air, soil, water and sediment quality.	Minor	General surveillance and monitoring during construction, operation, closure and restoration.
Birds and their habitats	Construction	All construction activities of the four underground mining projects and their related projects.	Loss of accessible habitat for birds (loss of 21.54 ha in land and 28.3754 or 29.98 ha in wetlands depending on the alternative selected).	IA: p.441 IAAC.E2	FAV1	Traffic must be limited to work areas	Minor	General surveillance and monitoring during construction, operation, closure and restoration.
			Disturbance of breeding pairs and migrating birds near construction sites and along roads leads to a risk of nest abandonment. Potential destruction of nests.	IA: p.441 IAAC.E2	FAV2	Habitats next to jobsites will be protected	Minor	
					FAV5	Apply the fauna and flora protection plan		
	Operation	All operation, closure and restoration activities of the four underground mining projects and their related projects.	Disturbance of breeding pairs and migrating birds near facilities	IA: p.443-444	FAV1	Traffic must be limited to work areas	Minor	
					FAV2	Habitats next to jobsites will be protected		
					FAV4	It is prohibited to fly over the cliffs southwest of Méquillon from June to September (peregrine falcon and golden eagle nesting period).		
					FAV5	Apply the fauna and flora protection plan.		
Caribou and other land mammals	Construction and operation	All activities.	Disrupting several species by noise, i.e., caribou. Possibility of hurting or killing an animal during road transport.	IA: p.430-431, 436-437	MTR1	Prior and regular inspection of machinery shall be performed to ensure that it is in good condition and working properly (minimizing noise).	Minor	General surveillance and monitoring during construction, operation, closure and restoration. Collisions with caribou monitoring
					MTR2	Machine circulation will be limited to work areas.		
					MTR6	Apply the fauna and flora protection plan.		
At-risk wildlife and plant species	Construction and operation	Presence of surface infrastructure (access road, cement slurry plant, portal, ditches, storage pad, ventilation raise, collection pond, waste rock and ore piles, administrative infrastructure, powder magazines, etc.) and other related projects.	Potential loss of at-risk plants species at the Nanaujaq site.		ESP1	VEG1 and VEG1a.	Minor	General surveillance and monitoring during construction, operation, closure and restoration.
					ESP2	Apply VEG4.		
Human environment - Economy and employment	Construction and operation	All activities from the various mining sites.	Job creation and local and regional economic benefits.	IA: p. 448-449	ECO1	Hiring will give preference to Inuit workers.	Major (positive impact)	Continue the monitoring regarding the Inuit communities information program.
					ECO2	Maintain the information and recruitment program in the Inuit villages.		
					ECO3	Maintain the training program intended and adapted for future Inuit workers.		
					ECO4	Encourage Nunavik-based companies with the skills for the tasks requested in the call for bids procedure, before undertaking requests to companies based in Abitibi, elsewhere in Quebec or abroad.		
					ECO5	A sales outlet for Inuit handcrafted goods will be established on the Expo industrial complex.		
				IA: p.452	ECO7	Promote the integration of Inuit workers hired for construction into the operation phase.		
					ECO9	Respect the updated Nunavik Nickel Agreement policies related to the hiring of Inuit workers as well as royalties.		
			Substantial workforce mobility and lifestyle changes at the Expo mining complex.	IA: p. 454-455	MOE1 to MOE10	Integrate new workers by explaining the different living conditions and regulations on the NNiP site, as well as the different programs available. All of these measures can be found in Annex 7 of the Nunavik Nickel Agreement.	Minor	

[A] The operation phase includes the closure and restoration phases when applicable.

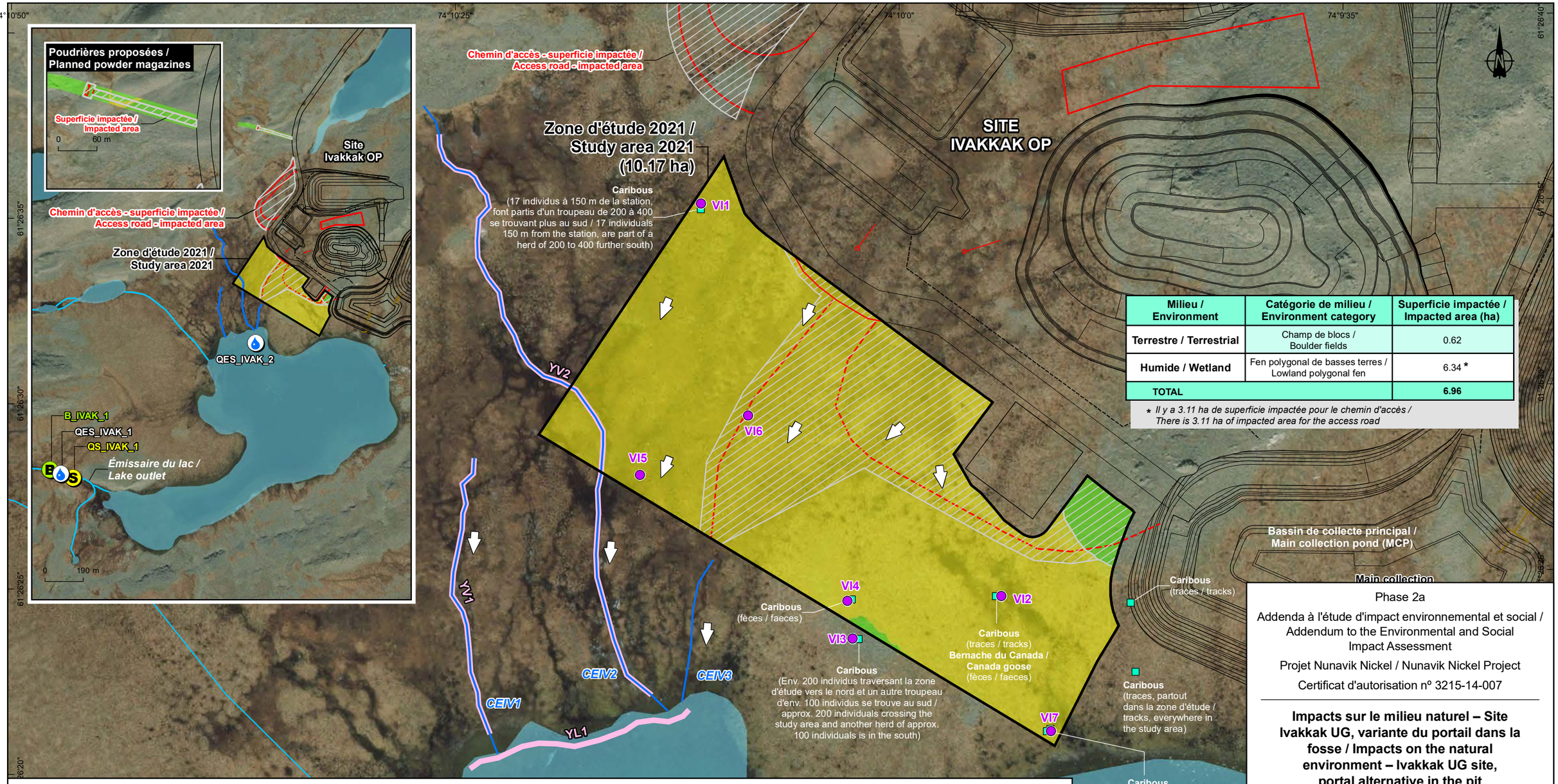
Note: A grey background indicates a new measure since Annex 7 established with the Nunavik Nickel Committee.
IA = Impact assessment (GENIVAR, 2007).
IAAC2= 2nd response document to the Impact Assessment Agency of Canada (February 2008).

Table 7-36: Assessment of Potential Impacts and Mitigation Measures for the Ivakkak UG, Méquillon UG2, Nanaujaq and Expo South Underground Mining Projects and Associated Related Projects (cont.)

Component	Project phase[A]	Impact source (additional compared to the 2007 ESIA)	Impact description	Source	Mitigation measures		Residual impact significance	Monitoring
					Nº	Description		
Human environment - Land use by the Inuit	Construction, operation, closure and restoration	All activities from the various mining sites.	Disruption of traditional Inuit activities within the NNiP territory.	IA: p.470	ORS1a	Possibility for Inuit workers to do a shorter work rotation (two weeks on, followed by two weeks off), so they can spend more time in their community.	Moderate	General monitoring and surveillance during operation
				IA: p.473	TRC1	Mark new access roads and post traffic signs where snowmobile and all-terrain vehicle trails intersect these roads or the main road when required.		General monitoring and surveillance during operation
					TRC11	Install signs mentioning the presence of traffic lanes or work/operation areas in proximity to inform Inuit users who may travel through or practice activities in the sector.		
				IA: p.487-488	URT1	No measures will be taken to facilitate sports fishing by the workers (e.g., transportation by helicopter).		General surveillance and monitoring during construction, operation, closure and restoration. Monitoring continuation regarding the plan for evaluating NNiP perceptions and sport fishing monitoring.
					URT2a	Prohibit the possession of firearms at CRI sites (except with special authorization for protection against polar bears), as to limit sport hunting activities practiced by employees.		
				IA: p.487-488	URT3	Prior and regular inspection of machinery will be performed to ensure that it is in good condition and working properly (to avoid producing excessive noise).		
				Navigation (p.65)	URT4	Lakes used by the residents of Salluit and Kangiqsujuaq will remain accessible.		
				Navigation (p.65)	URT6	Continue to set up fishing programs governing this activity in the targeted bodies of water.		
					URT10	In the event that traffic must be temporarily or permanently impeded on trails used by Inuit users, provide bypasses or new safe travel routes together with the Salluit and Kangiqsujuaq communities. Inform the population of the Salluit and Kangiqsujuaq communities of the bypassing routes or new travel routes.		
					URT11	Regularly inform the Salluit and Kangiqsujuaq communities of the work carried out on the NNiP territory affected (nature of the work/operations, location of the work/operations, schedule, potential dangers for Inuit users).		
					URT12	Regularly inform CRI workers of the potential presence of Inuit users in the territory concerned by NNiP's Phase 2a.		
				IA: p.494-495	SON2	Machine circulation will be limited to work areas.		Continue the sound monitoring in the Pingualuit National Park.
					SON3	If possible, isolate the main sources of noise with a sound-absorbing material, when possible.		
Human environment - Archaeology and heritage	Construction	All construction activities for the four underground mining extension projects and their related projects.	Discovery of archaeological or historic remains during construction	IA: p.492	ARC1	If remains of importance are discovered, the site supervisor shall be informed immediately and measures taken to protect the site.	Minor	General monitoring and surveillance during construction.
Human Environment - Soundscape	Construction and operation	All activities from the various mining sites.	Increase noise level around the construction site and mining activities.	IA: p.494-495	SON1	Preliminary and regular inspections of the machinery to ensure it is in good condition and working properly (so no excess noise is generated)	Minor	Continue the sound monitoring in the Pingualuit National Park.
					SON2	Machine circulation will be limited to work areas.		
					SON3	If possible, isolate the primary sound sources with absorbent material		
					SON4	It shall be mandatory for workers to wear hearing protection devices when inside noisy buildings (e.g., crushing and grinding unit)		
Human Environment - Landscape	Construction, operation and closure	All construction, operation and closure activities for the four underground mining extension projects and their related projects.	Deterioration of surrounding scenery	IA: p.499	PAY1	Minimize stripping, clearing, excavation, backfilling and grading to maintain the natural topography as much as possible.	Minor	Monitoring continuation regarding the plan for evaluating NNiP perceptions and general monitoring during activities.
				IA: p. 501 KRG	PAY5	Installation of directional sodium lighting to limit the light dispersion around the mining complex		
	Restoration	Activities related to site restoration after closure.	Site restoration	IA: p.499	PAY2	When construction is completed, work areas shall be rehabilitated and restored so that they blend in as much as possible with the natural landscape (regrowth of vegetation).	None	

[A] The operation phase includes the closure and restoration phases when applicable.

Note: A grey background indicates a new measure since Annex 7 established with the Nunavik Nickel Committee.
IA = Impact assessment (GENIVAR, 2007).
KRG = Response document to the Regional Administration Kativik (March, 2008).



Milieu / Environment	Catégorie de milieu / Environment category	Superficie impactée / Impacted area (ha)
Terrestre / Terrestrial	Champ de blocs / Boulder fields	0.62
Humide / Wetland	Fen polygonal de basses terres / Lowland polygonal fen	6.34 *
TOTAL		6.96

* *Il y a 3.11 ha de superficie impactée pour le chemin d'accès / There is 3.11 ha of impacted area for the access road*

Composantes du projet / Project components

- Zone d'étude 2021 / Study area 2021 (Ivakkak UG)
- Infrastructure projetée / Planned infrastructure
- Superficie impactée / Area impacted

Faune / Wildlife

- Observation fortuite / Casual observation

Ichtyofaune / Fish fauna

- YV1 Transect de pêche à l'électricité / Electric fishing transect

Stations d'inventaire / Survey stations

- B Échantillonnage du benthos / Benthos sampling
- Échantillonnage de l'eau de surface / Surface water sampling
- S Échantillonnage de sédiments / Sediment sampling

Végétation / Vegetation

- VI1 Station de caractérisation de la végétation / Vegetation characterization station

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Végétation (suite) **/ Vegetation** (continued)

Milieu terrestre / Terrestrial environment

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

- Cours d'eau permanent inventorié / Inventoried permanent watercourse
- Cours d'eau permanent / Permanent watercourse
- Drainage général du site sans lit d'écoulement défini / General drainage of the site without a defined flow bed
- Plan d'eau / Waterbody

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Impacts sur le milieu naturel – Site Ivakkak UG, variante du portail dans la fosse / Impacts on the natural environment – Ivakkak UG site, portal alternative in the pit

Sources:

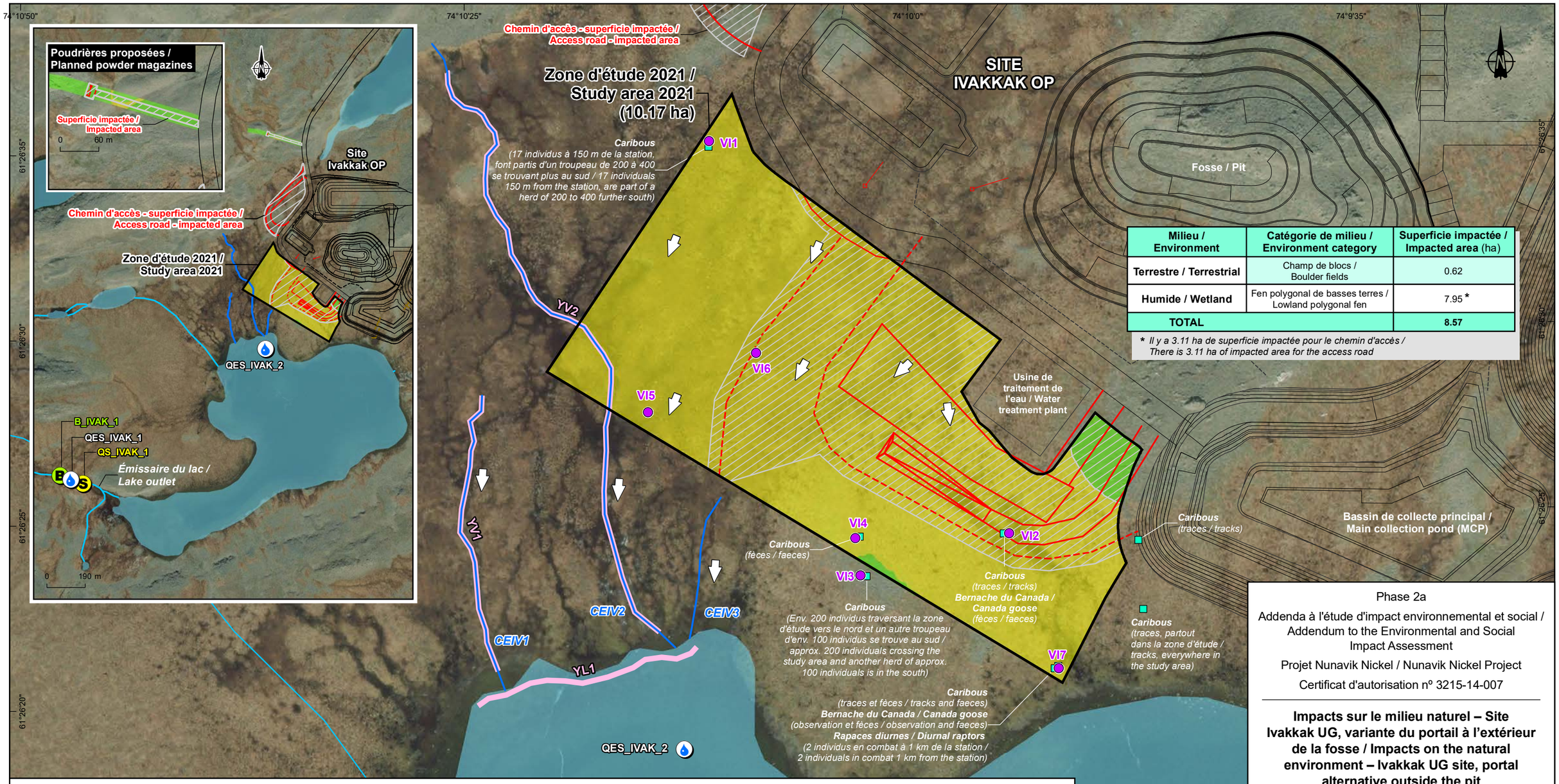
Imagerie/Imagery: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1:50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, Mars/March 2022
Inventaire et cartographie/ Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c7_1_IvakUG_220531.mxd

0 32 64 m
UTM, Zone 18, NAD83

Carte / Map 7-1

Juin / June 2022

AECOM · NUNAVIK NICKEL · CANADIAN ROYALTIES INC.



Milieu / Environment	Catégorie de milieu / Environment category	Superficie impactée / Impacted area (ha)
Terrestre / Terrestrial	Champ de blocs / Boulder fields	0.62
Humide / Wetland	Fen polygonal de basses terres / Lowland polygonal fen	7.95 *
TOTAL		8.57

* *Il y a 3.11 ha de superficie impactée pour le chemin d'accès / There is 3.11 ha of impacted area for the access road*

Composantes du projet / Project components

- Zone d'étude 2021 / Study area 2021 (Ivakkak UG)
- Infrastructure projetée / Planned infrastructure
- Superficie impactée / Area impacted

Faune / Wildlife

- Observation fortuite / Casual observation

Ichtyofaune / Fish fauna

- YV1 Transect de pêche à l'électricité / Electric fishing transect

Stations d'inventaire / Survey stations

- B Échantillonnage du benthos / Benthos sampling
- Échantillonnage de l'eau de surface / Surface water sampling
- S Échantillonnage de sédiments / Sediment sampling

Végétation / Vegetation

- VI1 Station de caractérisation de la végétation / Vegetation characterization station

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Végétation (suite) **/ Vegetation** (continued)

Milieu terrestre / Terrestrial environment

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

- Cours d'eau permanent inventorié / Inventoried permanent watercourse
- Cours d'eau permanent / Permanent watercourse
- Drainage général du site sans lit d'écoulement défini / General drainage of the site without a defined flow bed
- Plan d'eau / Waterbody

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Impacts sur le milieu naturel – Site Ivakkak UG, variante du portail à l'extérieur de la fosse / Impacts on the natural environment – Ivakkak UG site, portal alternative outside the pit

Sources:

Imagerie/Imagery: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1:50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, Mars/March 2022
Inventaire et cartographie/ Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c7_2_IvakUG_220531.mxd

0 32 64 m
UTM, Zone 18, NAD83

Carte / Map 7-2

Juin / June 2022

AECOM · NUNAVIK NICKEL · CANADIAN ROYALTIES INC.

73°47'0" 73°46'0" 73°45'0" 73°44'0" 73°43'0" 73°42'0"

61°31'30" 61°31'10"

QES_MEQ_2
QS_MEQ_2

Lac Fleury

Milieu / Environment	Catégorie de milieu / Environment category	Superficie impactée / Impacted area (ha)
Terrestre / Terrestrial	Champ de blocs / Boulder fields	2.80
TOTAL		2.80 *

* *Perte en milieu terrestre probable (inventaires à venir en 2022) / Probable loss in terrestrial environment (inventories to come in 2022)*

Vers le site projeté Ivakkak / To planned Ivakkak site

Plateforme de remblai granulaire pour l'entreposage de conteneurs / Granular backfill pad for container storage (2,65 ha)

Vers le site EXPO / To Expo site

Lac nº3

QS_MEQ_3 QES_MEQ_3

Cheminée de ventilation et sortie d'urgence / Ventilation raise and emergency exit #4 (0,15 ha)

Conduite de rejet projetée / Planned discharge pipeline

Conduite de rejet / Discharge pipeline

Prolongement Méquillon UG2 (localisation approximative) / **Méquillon UG2 extension** (approximate location)

QES_MEQ_1
QS_MEQ_1
QES_MEQ_4

Lac Mequillon

73°46'0" 73°45'0" 73°44'0"

Composantes du projet / Project components

- Bail minier / Mining lease
- Halde à minerai existante / Existing ore stockpile
- Expansion de la halde à minerai / Ore stockpile expansion
- Superficie impactée / Area impacted
- Infrastructures pour la mine Méquillon / Infrastructures for the Méquillon mine
- Infrastructures projetées / Planned infrastructures

Végétation / Vegetation

Milieux humides / Wetlands

- Fen de combe à neige / Snowbed fen
- Fen polygonal de basses terres / Lowland polygonal fen

Milieux terrestres / Terrestrial environments

- Champ de blocs / Boulder fields
- Sol polygonal à ostioles de toundra / Polygonal ground with tundra ostioles

Stations d'inventaire / Survey stations

- Échantillonnage de l'eau de surface / Surface water sampling
- Échantillonnage de sédiments / Sediment sampling

Hydrographie / Hydrography

- Cours d'eau permanent / Permanent watercourse
- Cours d'eau intermittent / Intermittent watercourse
- Plan d'eau / Waterbody (GRHQ)
- Milieu anthropique / Anthropogenic environment

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Impacts sur le milieu naturel – Site Méquillon UG2 / Impacts on the natural environment – Méquillon UG2 site

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Géobase du réseau hydrographique du Québec (GRHQ), MERN Québec, nov. 2019
Données de projet/Project data, Canadian Royalties, Avril/April 2022
Inventaire et cartographie/Inventory and mapping: AECOM
Fichier/File: 6063-5966_a-tr_c7_3_MeqUG2_220531.mxd

0 150 300 m
UTM, Zone 18, NAD83

Carte / Map 7-3

Juin / June 2022

AECOM NUNAVIK NICKEL CANADIAN ROYALTIES INC.

73°41'0"
73°40'30"
73°40'0"
73°39'30"
61°30'45"

Vers le site EXPO / To the EXPO site

Conduite de rejet projetéet / Planned discharge pipeline

Vers le site MEQUILLON / To the MEQUILLON site

Bernache du Canada / Canada goose (fèces / faeces)

Caribous (fèces et environ 40 individus / faeces and approx. 40 individuals)

Caribous (plus d'une centaine d'individus observés du côté nord de la route Expo jusqu'à ce point / more than a hundred individuals observed from the north side of the road Expo up to this point)

Zone d'étude 2021 / Study area 2021 (22.29 ha)

Pluvier semi-palmé / Semipalmated plover

QS_NAN_1

Lemming sp. (terrier / burrow)

Plectrophane des neiges / Snow bunting

Caribous (traces / tracks)

Plongeon huard / Common loon

Lemming sp. (nid d'hiver / winter nest)

Plectrophane lapon / Lapland longspur

Draba micropetala

Lac Mequillon

VN1 VN2 VN3 VN4 VN5 VN6 VN7 VN8 VN9 VN10 VN11 VN12 VN13 VN14

Milieu / Environment	Catégorie de milieu / Environment category	Superficie impactée / Impacted area (ha)
Terrestre / Terrestrial	Champ de blocs / Boulder fields	10.72
Humide / Wetland	Fen polygonal de basses terres / Lowland polygonal fen	9.40
TOTAL		20.12

Composantes du projet / Project components

- Zone d'étude / Study area
- Infrastructure de surface projetée / Planned surface infrastructure
- Superficie impactée / Area impacted

Faune / Wildlife

- Observation de sauvagine et d'oiseaux aquatiques / Waterfowl and waterbird observation (1) nbre d'individus / (1) number of individuals
- Observation fortuite / Casual observation
- Parcelle d'inventaire de la sauvagine et des oiseaux aquatiques / Waterfowl and waterbird inventory plot

Stations d'inventaire / Survey stations

- Échantillonnage de l'eau de surface / Surface water sampling
- Échantillonnage de sédiments / Sediment sampling

Végétation / Vegetation

- VN1 Station d'inventaire de la végétation / Vegetation inventory station
- Espèce floristique à statut précaire / Plant species at risk

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Milieu terrestre / Terrestrial environment

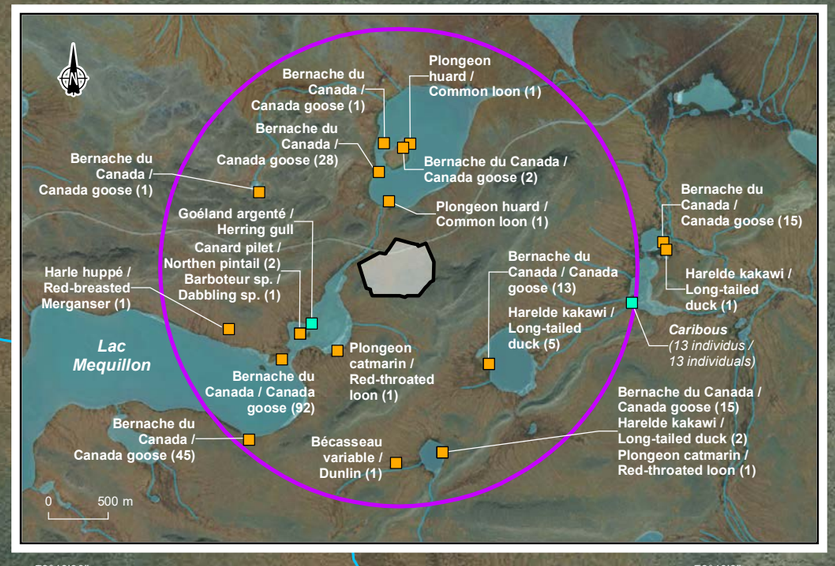
- Champ de blocs / Boulder fields

Hydrographie / Hydrography

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

Milieu anthropique / Anthropogenic environment

- Route / Road



Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Impacts sur le milieu naturel – Site Nanaujaq / Impacts on the natural environment – Nanaujaq site

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1:50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, 2022
Conduit traitement des eaux vers MQ 19 avril.dxf
Nanaujuaq-Aménagement surface (19 avril 2022).dxf

Inventaire et cartographie/Inventory and mapping: AECOM
Fichier/File: 6063-5966_a-tr_c7_4_Nanau_220531.mxd

0 40 64 m
UTM, Zone 18, NAD83

Carte / Map 7-4

Juin / June 2022

AECOM · Nunavik Nickel · Canadian Royalties Inc.

Milieu / Environment	Catégorie de milieu / Environment category	Superficie impactée / Impacted area (m²)
Terrestre / Terrestrial	Champ de blocs / Boulder fields	311.47
Humide / Wetland	Fen polygonal de basses terres / Lowland polygonal fen	287.39
TOTAL		598.86

Composantes du projet / Project components

- Zone d'étude / Study area
- Conduite de rejet projetée / Planned discharge pipeline

Faune / Wildlife

- Observation de sauvagine / Waterfowl observation
- Observation fortuite / Casual observation

Végétation / Vegetation

- VR01 Station de caractérisation de la végétation / Vegetation characterization station

Milieu humide / Wetland

- Fen polygonal de basses terres / Lowland polygonal fen

Milieux terrestres / Terrestrial environments

- Champ de blocs / Boulder fields

Hydrographie / Hydrography

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

- Milieu anthropique / Anthropogenic environment

VR19 VR20 VR21 VR22 VR23 VR24

Conduite de rejet projetée / Planned discharge pipeline

Zone d'étude de la route en 2021 / Study area of the road in 2021 (3.31 ha)

Pluvier semi-palmé / Semipalmated plover

Lemming sp. (terrier / burrow)

Plectrophane des neiges / Snow bunting

Plectrophane des neiges / Snow bunting

Zone d'étude Nanaujaq / Nanaujaq study area

Caribous (traces / tracks)

Plongeon huard / Common loon

Lemming sp. (nid d'hiver / winter nest)

Corbeau d'Amérique / Common raven

Bernache du Canada / Canada goose (1 individu observé / 1 individual observed)

Bernache du Canada / Canada goose (fèces, pas d'observation directe, faeces, no direct observation)

Zone d'étude de la route en 2021 / Study area of the road in 2021 (3.31 ha)

Bernache du Canada / Canada goose (fèces, brout et traces / faeces, grazing and tracks)

Plectrophane des neiges / Snow bunting (1 mâle observé / 1 male observed)

VR01 VR02 VR03 VR04 VR05 VR06 VR07 VR08 VR09 VR10 VR11 VR12 VR13 VR14 VR15 VR16 VR17 VR18 VR19

Plateforme de services / Service pad

Conduite de rejet projetée / Planned discharge pipeline

Plectrophane des neiges / Snow bunting (1 mâle observé / 1 male observed)

Lemming sp. (fèces / faeces)

Bernache du Canada / Canada goose (fèces, pas d'observation directe / faeces, no direct observation)

Caribous (fèces et traces / faeces and tracks)

Lemming sp. (fèces / faeces)

Bernache du Canada / Canada goose (observation directe / direct observation)

Bernache du Canada / Canada goose (fèces, pas d'observation directe / faeces, no direct observation)

Bernache du Canada / Canada goose (fèces, pas d'observation directe / faeces, no direct observation)

Plectrophane des neiges / Snow bunting (1 mâle observé / 1 male observed)

Lemming sp. (nid / nest)

Limicole à collier / Collared wader

Plectrophane des neiges / Snow bunring (1 mâle observé / 1 male observed)

Bernache du Canada / Canada goose (fèces, pas d'observation directe / faeces, no direct observation)

Méquillon (Bail minier / Mining lease)

73°42'30" 73°42'0" 73°41'30" 73°41'0" 73°40'30" 61°31'0" 61°30'45"

73°43'30" 73°43'0" 73°42'30" 73°44'0" 61°31'0"

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Impacts sur le milieu naturel – Conduite de rejet Nanaujaq vers l'UTE Méquillon / Impacts on the natural environment – Nanaujaq effluent line toward the Méquillon WTP

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CanVec, 1;50,000, RNCan, 2019
Données de projet/Project data, Canadian Royalties, Avril/April 2022

Inventaire et cartographie/Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c7_5_Nan_Meq_rte_220531.mxd

0 48 96 m
UTM, Zone 18, NAD83

Carte / Map 7-5

Juin / June 2022

AECOM NUNAVIK NICKEL CANADIAN ROYALTIES INC.

73°28'0"
73°27'0"
73°26'0"
61°33'40"
61°33'20"

Halde à stériles existante à régulariser / Existing waste rock pile to be regularized

125 950 m²

Halde à stériles autorisée au CA global initial / Waste rock pile authorized at initial global CA

199 960 m²

COMPLEXE EXPO / EXPO COMPLEX

Halde à minerai autorisée au CA global initial / Ore stockpile authorized at initial global CA

23 162 m²

Halde à minerai existante à régulariser / Existing ore stockpile to be regularized

74 951 m²

Conduite d'effluent de la mine Expo / Discharge pipeline of the Expo mine

Station météorologique / Weather station

Vers le site MEQUILLON / To the MEQUILLON site

EXPO OUEST

Buse pattue / Hawk
(1 individu en vol à env. 1 km de la station / 1 individual in flight at approx. 1 km from the resort)

Caribous
(traces et poils / tracks and hairs)

Caribous
(fèces / faeces)

V01
V02
V03
V04

Zone d'étude 2021 EXPO SUD / Study area 2021 EXPO SOUTH (10.17 ha)

Bail minier demandé / Mining lease requested

Milieu / Environment	Catégorie de milieu / Environment category	Superficie impactée / Impacted area (ha)
Terrestre / Terrestrial	Felsenmeer / Felsenmeer	10.17
Humide / Wetland	Fen polygonal de basses terres / Lowland polygonal fen	12.60 *
TOTAL		22.77

* *Superficie considérée en milieu humide pour l'agrandissement de la halde à stériles. / Area considered to be a wetland for the expansion of the waste rock pile.*

Composantes du projet / Project components

- Zone d'étude 2021 / Study area 2021
- Halde utilisée / Existing stockpile
- Infrastructure projetée / Planned infrastructure
- Superficie impactée / Area impacted
- Conduite de rejet de l'effluent / Discharge pipeline

Faune / Wildlife

- Observation fortuite / Casual observation

Végétation / Vegetation

- V01 Station de caractérisation de la végétation / Vegetation characterization station

Milieu terrestre / Terrestrial environment

- Felsenmeer / Felsenmeer
- Milieu anthropique / Anthropogenic environment
- Station météorologique / Weather station

Lieu d'enfouissement en milieu nordique / Northen landfill (LEMN)

Phase 2a

Addenda à l'étude d'impact environnemental et social / Addendum to the Environmental and Social Impact Assessment

Projet Nunavik Nickel / Nunavik Nickel Project

Certificat d'autorisation nº 3215-14-007

Impacts sur le milieu naturel – Site Expo Sud / Impacts on the natural environment – Expo South site

Sources:

Imagerie/Imagery, Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Géobase du réseau hydrographique du Québec (GRHQ), MERN Québec, nov. 2019
Données de projet/Project data, Canadian Royalties 2022

Inventaire et cartographie/ Inventory and mapping: AECOM
Fichier / File: 6063-5966_a-tr_c7_6_ExpoSud_220531.mxd

0 70 140 m
UTM, Zone 18, NAD83

Carte / Map 7-6

Juin / June 2022

AECOM
NUNAVIK NICKEL
CANADIAN ROYALTIES INC.

8 Climate Change and Greenhouse Gases

8.1 Climate Change Resilience and Adaptation Assessment for Phase 2a

8.1.1 Context of the Project

This study focuses on its analysis only of the expansion of underground mining operations at the Expo South, Méquillon UG2, Ivakkak UG deposits and the new Nanaujaq underground mine. It is important to note that this mining project is subject to taking into account the perspective of climate change in the environmental authorization regime for projects. Indeed, the project and its components must be located, designed and operated by considering the risks generated by the current and anticipated effects of climate change. Otherwise, the integrity or efficiency of the infrastructures under study could be affected, environmental risks could be amplified, or new environmental risks could arise. In this context, the general objective of this mandate is to assess the climate resilience of the exploitation of these mining deposits and all of their components for the entire duration of their exploitation until the restoration of the sites and to propose adaptation measures to reduce the risks that have been identified.

8.1.2 Methodology

The resilience and adaptation to climate change for this project have been assessed by respecting the ISO 31000 standard (Canadian Standards Association, 2018) in risk management to ensure that the requirements described in the guide for project initiators of the MELCC (MELCC, 2021). Thus, a risk is defined as a probability of occurrence of a dangerous event combined with the severity of the harm that may result.

8.1.2.1 Climatic Hazards that Have Affected the Territory in the Past

The territory of Nunavik is an environment sensitive to natural and catastrophic events such as river floods, coastal flooding, ice jams, ice break-ups, floods, slope movements (landslides, gelifluction, avalanche, etc.), periglacial phenomena and extreme meteorological phenomena (windstorms, blizzards, droughts, etc.). Many events have occurred since 1935, including the avalanche in Kangiqsualujjuaq (in 1981, 1982, 1986, 1993 and 1999), the avalanche of wet snow in Deception Bay (L'Hérault, 2005) and landslides in Salluit (Herault, 2005).

8.1.2.2 Climate

Climate data analysis was performed using temperature and precipitation data collected from the Canadian Center for Climate Services (CCCS) at weather stations[15] in the territory of Nunavik, which also includes the climatic averages during the period 1980-2004. Two scenarios for the evolution of GHG emissions of human origin in the future (RCP) have been selected. The first represents a scenario with high global GHG emissions, because few emission restrictions have been put in place (RCP 8.5), which causes the most pronounced warming. For its part, the second scenario reflects a situation of moderate emissions, since it assumes that global carbon emissions will be stabilized by the end of the century (RCP 4.5). Since the lifespan for the operation phase of a mine is generally 20 to 30 years, climate projections were analyzed up to 2064, using the 2040-2064 projection period described in the *Bioclimatic Portrait of Nunavik* (Mailhot and Chaumond, 2017).

8.1.2.3 Infrastructure

Design documents and drawings were reviewed to understand future infrastructure with the goal of selecting components that could potentially be affected by climate change. The five (5) project components that guided the evaluation are as follows:

[15] 22 sites have been identified by project collaborators based on issues for impact studies and adaptation to climate change. The majority of these sites correspond to villages (Kuujjuaq, Salluit)

1. Paths and access roads;
2. Water management (collection ponds, ditches and dike at Lac Bombardier);
3. Storage areas (ore and waste rock piles, Expo pit tailings management);
4. Surface buildings;
5. The people (mining employees).

The vulnerability of these components to climate change was determined using climate indicators. The latter represent a certain climatic condition or type of event (e.g., number of hot days), defined by a threshold above which the assessed infrastructure would experience an impact such as loss of productivity, damage to infrastructure or the implementation of a more intensive maintenance plan. Using information and data from the *Bioclimatic Portrait of Nunavik,* eight indicators were identified based on their relevance to the infrastructure studied (Table 8-1). Table 8-2 presents the variation of each climate indicator between historical data and the period from 2040 to 2064 for the RCP4.5 and RCP8.5 scenarios as well as the rate of change for each indicator.

Table 8-1: Description of Climate Indicators According to Mailhot and Chaumont (2017)

Climate indicators	Definition
Average annual temperature (º C)	Annual average of daily average temperatures.
Hot days (days)	Annual number of days with a maximum daily temperature above 15 º C (Mailhot and Chaumont, 2017).
Length of frost-free season (days)	Number of days between the end and start date of the frost-free season.
Freeze-Thaw (days)	Annual number of days on which, for the same day, the daily minimum temperature is below 0 °C and the daily maximum temperature above 0 °C.
Total annual precipitation (mm)	Annual total precipitation.
Days with very heavy precipitation (days)	Annual number of days with precipitation more intense than the 95th percentile of the wet day precipitation distribution (more than 1 mm) over the reference period.
Annual solid precipitation (mm)	Annual total precipitation in solid form.
Duration of snow cover (days)	Number of days in a year between the beginning and the end of the snow cover (first day when the thickness of the snow accumulated on the ground is below a given threshold after March 1) where the thickness of the accumulated snow on the ground is greater than or equal to 2 cm.

Table 8-2: Variation and Rate of Change for the Eight Climate Indicators and Future Projections

Climate indicators	History (1980-2004)	Future RCP 4.5	Future RCP 8.5	Future RCP 4.5	Future RCP 8.5
		Variation (2040-2064)		Rate of change	
Average annual temperature (°C)	-5.8	+3.3	+4.5	+57%	+78%
Hot days (days)	42	+18	+30	+43%	+71%
Length of frost-free season (days)	111	+22	+32	+20%	+29%
Freeze-Thaw (days)	63	-2	-5	-3%	-8%
Total annual precipitation (mm)	616	+120	+140	+19%	+23%
Very heavy precipitation days (days)	5.5	+2.3	+3.4	42%	+62%
Annual solid precipitation (mm)	350	+1	-5	0%	-1%
Duration of snow cover (days)	244	-21	-31	-9%	-13%

8.1.2.4 Probability of Occurrence (Likelihood)

In order to determine the climate-related risks for the project, the relevant climate indicators were examined for the reference period/initial conditions (1980-2004) and in the context of climate change for the period 2040-2064. The probability of occurrence rating used is described in Table 8-3.

First, using variation, the rate of change for each climate indicator was calculated for the RCP4.5 and RCP8.5 scenarios as described in Table 8-2. Subsequently, the rate of change was used to determine a probability of occurrence rating varying between 1 and 5 using Table 8-3. These ratings are based on a scale ranging from 1 to 5, where 3 represents baseline climatic conditions and a stable frequency of occurrence relative to baseline conditions. For example, the average temperature shows a 57% increase for RCP4.5 (Table 8-2). Using Table 8-3, a probability rating of 5 can be assigned to this climate indicator, as the increase is between 50% and 100%. This logic applies to all climate indicators, to the two-time horizons (1980-2004), (2040-2064) and to the two RCPs (4.5 and 8.5). Table 8-4 presents the probability of occurrence ratings that can be assigned for each climate indicator considered for the baseline conditions and the RCP4.5 and RCP8.5 climate scenarios for the 2040-2064 time horizon.

8.1.2.5 Severity of Consequences

The severity of the consequences of the 8 indicators on the 5 project components was assessed using a scale from 1 (very low) to 5 (very high) which was defined based on the relevant literature (Table 8 -5).

8.1.2.6 Risks

According to the CAN/CSA-31000 standard, a risk (R) is defined as being the product of the probability of occurrence (P) and the severity of the consequences (G). Table 8-6 presents the scoring of the risk assessment matrix.

Table 8-3: Description of the Probability of Occurrence Rating According to the *High Level Screening Guide* from the Public Infrastructure Engineering Vulnerability Committee (PIEVC, 2021)

Probability rating of occurrence	Tendency	Occurrence	Definition
1	↑	Likely to occur less frequently than current climate	50-100% reduction in frequency or intensity with reference to baseline mean
2			10-50% reduction in frequency or intensity with reference to baseline mean
3	Current climate reference by parameter	Likely to occur as frequently as in current climate	Baseline average conditions or +/- 10% change in frequency or intensity with reference to baseline mean
4	↓		10-50% increase in frequency or intensity with reference to baseline mean
5		Likely to occur more frequently than in current climate	50-100% increase in frequency or intensity with reference to baseline mean

Table 8-4: Probability of Occurrence Score for Eight Climate Indicators Based on Current and Future Conditions

	Climate indicators	Definitions	Probability of Occurrence Rating		
			Current Basic Conditions [16]	2040-2064 (RCP 4.5)	2040-2064 (RCP 8.5)
Temperature	Average annual temperature (°C)	Annual average of daily average temperatures.	3	5	5
	Hot days (days)	Annual number of days with maximum daily temperature above 15 ºC.	3	4	5
	Length of frost-free season (days)	Number of days between the end and start date of the frost-free season.	3	4	4
	Freeze-Thaw (days)	Annual number of days on which, for the same day, the daily minimum temperature is below 0 °C and the daily maximum temperature is above 0 °C.	3	3	3
Precipitation	Annual total precipitation	Annual total precipitation.	3	4	4
	Very heavy precipitation days (days)	Annual number of days with precipitation more intense than the 95th percentile of the wet day precipitation distribution (more than 1 mm) over the reference period.	3	4	5
Solid Precipitation	Annual solid precipitation	Annual total precipitation in solid form.	3	3	3
	Duration of snow cover (days)	Number of days in a year centered on winter (August-July) when the depth of snow accumulated on the ground is greater than or equal to 2 cm.	3	3	2

[16] Same as historical conditions in Table 8-2

Table 8-5: Impact Severity Index and Impact Categories

		Impact Category			
Impact Severity Index	**Consequences**	**Health and Security**	**Infrastructure Health**	**Operational Impact**	**Costs**
1	**Very weak**	First aid in case of injury	Very low damage; immediately repairable maintenance cost	Operation closed for less than 24 hours (loss of service)	Minor cost increase
2	**Weak**	Medical treatment for a minor injury	Slight increase in infrastructure construction efforts, low investments required preventively	Operation closed for 24 hours to 72 hours (loss of service)	Investments required to adapt facilities
3	**Moderate**	Bodily injury / Illness with work restrictions	Moderate damage to the materials making up the structure; slow deterioration of the materials of certain essential components; investments required to maintain infrastructure stability	Closure from 72 hours to 1 week (loss of service) ; disruptions to operations; interruption of certain works for short periods	Minor investments required for corrective work and possible work interruption
4	**High**	Permanent disabling injury or accident affecting several people	Causes additional costs and high logistical difficulties leading to difficulties in finding suitable sites for construction	Closure of the mining site for 1 week to 1 month (loss of service); disruptions to operations; temporary interruption of work; significant cost increase	Major investments required for corrective work and possible work interruption
5	**Very high**	Death or significant irreversible disability	Significant increase in construction and maintenance costs; risks to infrastructure stability.	Closure of the mining site for more than 1 month (loss of service) ; frequent interruptions of work which can go as far as the impossibility of carrying them out during the summer, major increase in costs	Additional costs significant enough to consider abandoning the project

Table 8-6: Risk Matrix

			Severity of Consequences (G)				
			Very weak	Weak	Moderate	High	Very high
		Rating	1	2	3	4	5
Probability of Occurrence (P)	Very high	5	5	10	15	20	25
	High	4	4	8	12	16	20
	Moderate	3	3	6	9	12	15
	Weak	2	2	4	6	8	10
	Very weak	1	1	2	3	4	5

To quickly identify the elements to be managed on a priority basis, the risks have been grouped into four categories (table 8-7).

Table 8-7: Risk Assessment Scale

Risk (R) = Likelihood (L) x Gravity of consequences (G)	Risk Treatment
Low risk: < 6	Controls probably not required.
Moderate risk: 7 < R < 16	Some controls required to reduce risk to lower levels.
High risk: R > 20	High priority control measures required.
Risk = 5 (special case)	Interactions giving rise to a risk rated “5” are considered special cases and are considered in the risk evaluation, as these can either be interactions with very low likelihood but very high severity or interactions with high likelihood and very low severity. While the former case may have very severe impacts, the latter case can trigger a slow deterioration of project components due to the high likelihood of the climate condition.

For the period from 2040 to 2064 and an RCP of 4.5, the 40 risk-component interactions were assessed as follows:

- 14 interactions result in low risk;
- 26 interactions result in moderate risk;
- 0 interaction results in high risk;
- 0 special case.

For the time period from 2040 to 2064 and an RCP of 8.5, the 40 interactions resulted in the following risk levels:

- 15 interactions result in low risk;
- 25 interactions carry a moderate risk;
- 0 interaction results in high risk;
- 0 special case.

The summary of the risk analysis of the 40 interactions can be found in table 2-10 of the sector report on climate change (Appendix B).

8.1.3 Identified Control Measures

Adaptation measures already implemented by CRI have been identified for most of the 25 interactions that result in a moderate risk for RCP 8.5 (worst case scenario) based on the following three types of measures:

- **Design**: Measures to be incorporated during the design phase of assets for these to be resilient to future climate risks and to prevent costly revamps.
- **Operation and maintenance (O&M)**: Measures to be incorporated over the lifespan of the assets during operation and maintenance to ensure resiliency.
- **Policy**: Measures to ensure and maintain safe and healthy working conditions.

It has been established that all interactions presenting a moderate risk must be mitigated by adaptation measures for a project to be considered resilient to climate change. To this end, below are some of the measures already implemented by CRI, which contribute to the resilience of Phase 2a:

Design Measures:

- Design of mining facilities (water management structures, tailings and waste rock and ore piles), by the firm Golder, considering the impacts of climate change. Examples include the detailed design reports for the Puimajuq and Ivakkak surface mining sites (Golder 2020 et 2021; section 2.3 of each report) as well as the Expo in pit tailings disposal study (Golder, 2022a; section 4 of this report can be consulted in Appendix F).
- Carrying out capacity studies for drainage systems to install systems with adequate capacity
- Waterproofing, by covering with a membrane during the restoration phase, waste rock piles with acidogenic potential to prevent water and oxygen from entering the contact soils (measure also protecting surface water and groundwater).
- Participation in scientific research to revegetate bare areas as part of NNiP mining projects via the PEIIC.

Measures Related to Operations and Maintenance (O&M):

- Increased monitoring and inspection following precipitation events and heavy precipitation days to ensure road and access road integrity is not compromised.
- Use of dust suppressants to minimize dust raised by vehicles.
- Water quality and water level monitoring in facilities such as collection ponds, ditches, tailing cells and the Bombardier Lake dike.
- Inspection of facilities such as collection ponds, ditches and the dike of Bombardier lake to check for sediment accumulation and possible damage to the embankments, in particular by erosion.
- Regular verification of the performance, condition and safety of mining facilities, including water management works and report thereon. This verification is provided for within the framework of the current procedure for monitoring mining installations. This procedure also includes an inspection, at least once a year, by an engineer specializing in geotechnics.
- Regular inspection of buildings to validate their condition and thus identify areas affected by ground subsidence and repair cracks where water could infiltrate.

Policy-Related Measures:

- Implementation of an emergency warning system when the basins approach their capacity. This system is based on a regular survey of water levels.

8.1.4 Conclusion

The study was carried out in accordance with the requirements concerning adaptation to climate change described in the guide for MELCC project initiators. No specific high-level risk has been identified concerning climatic hazards on underground mining extension projects or new underground mining projects. Considering that the interactions resulting in a moderate risk are mitigated, for the most part, by measures already implemented by CRI, the main recommendation of the evaluation of the resilience to climate change of the NNiP and of Phase 2a consists in the development a climate change adaptation plan. This plan will enhance the measures already implemented by CRI and thus rigorously address all the moderate risks encountered in this study.

8.2 Greenhouse Gas Emissions Under Phase 2a

8.2.1 Context

This report presents the assessment of GHG emissions related to Phase 2a of the NNiP. It should be noted that since the NNiP is located outside the Hydro-Québec network, the energy required for all of its activities relies on diesel.

8.2.2 Methodology

The assessment of GHGs emitted during Phase 2a of the NNiP, i.e., during the construction and operation of the Expo South, Ivakkak UG, Méquillon UG2 and Nanaujaq underground mines, which includes related projects attached thereto, was carried out in order to respond to the elements related to GHGs presented in the document "*Climate change and environmental assessment – Guide for project proponents*". This guide indicates a set of parameters applicable to the project to be taken into account, such as the GHGs considered, the emission sources and the quantification methods.

These settings are detailed in the following sections.

8.2.2.1 GHG Considered

The global warming potentials (GWPs) of the GHGs considered in this assessment are presented in Table 8-8.

Table 8-8: GHG Considered

GHG	PRP
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Oxide nitrous (N_2O)	298

Source: GIEC Fourth Assessment Report (Gouvernement du Canada, 2022d).

These GHGs are generally emitted during the combustion of fossil fuels that are used by heavy equipment and transport trucks, as well as generators present on industrial and port complexes, as well as mining sites.

In accordance with the *Guide for the quantification of greenhouse gas emissions* from the MELCC, the potentials considered are those of the AR4 report of the Intergovernmental Group of Experts on the evolution of the climate (IPCC). These potentials make it possible to convert GHG emissions into tonnes of CO_2 -equivalent (CO_2 eq).

8.2.2.2 Scope of Analysis

The operational limits of this assessment are limited to the construction, operation and closure activities of the sites used during Phase 2a of the NNiP. They include direct GHG emissions by:

- Fixed equipment and mobile equipment used on the NNiP Phase 2a deposits;
- Heavy trucks transporting the ore to the concentrator located at the Expo Complex and the concentrate to the port of Deception Bay for export to customers;
- Generators supplying electricity to the mining sites, to the Deception Bay port facilities and to the Expo Complex.

However, other sources have been excluded:

- As the project takes place in the Canadian Far North, emissions related to deforestation were not considered;
- Indirect emissions related to the consumption of electricity from an electrical network were also excluded, since the sites are only supplied with electricity by generators;
- Based on the GHG emissions report reported by CRI in 2020 under the *Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere* (RDOCECA), explosives represent less than 1% of total GHG emissions during one year of operation. Considering that Phase 2a should not lead to a significant increase in the use of explosives, it is considered that this source of GHG emissions is negligible.

8.2.2.3 Sources of GHG Emissions

The list of GHG emission sources considered in this assessment is presented in Table 8-9 for the Project preparation, operation and closure phases.

Table 8-9: GHG Sources Taken into Account

Activities	Source	CO_2	CH_4	N_2O
Extension of the LEMN	Mobile combustion systems	✓	✓	✓
Preparation of mine sites	Stationary combustion systems	✓	✓	✓
	Mobile combustion systems	✓	✓	✓
mining sites	Stationary combustion systems	✓	✓	✓
	Mobile combustion systems	✓	✓	✓
mine sites	Stationary combustion systems	✓	✓	✓
	Mobile combustion systems	✓	✓	✓
Closing of the Expo pit	Mobile combustion systems	✓	✓	✓

8.2.3 GHG Quantification Method

This section presents, for each emission source identified in Table 8-2, the method for quantifying GHG emissions based on the document *Guide to quantifying greenhouse gas emissions* published in 2019 by the MELCC.

8.2.3.1 Construction Phase

8.2.3.1.1 Mobile Combustion Systems

GHG emissions from mobile combustion systems are estimated based on the fossil fuel consumption of heavy equipment and transport vehicles used during the construction phase of Phase 2a of the NNiP. All of the equipment considered consumes diesel fuel.

This consumption is then combined with the GHG emission factors presented in Table 8-10, according to Equation 1.

$$GHG\ Emission = \sum_{i=1}^{i=n} Amount\ of\ fuel\ i\ used\ \times Emission\ factor_i \qquad (1)$$

Table 8-10: Emission Factors Associated with Mobile Combustion Systems

Combustible	gCO_2 / L	g CH_4 /L	g N_2O / L	g CO_2 eq./L
Diesel fuel	2,681	0.11	0.151	2,729
Diesel off-road vehicle	2,681	0.073	0.022	2,689

Source : National Inventory Report (RIN) 1990-2019 (ECCC, 2021)

Based on the experience of Phase 1 of the NNiP, it was assumed that the preparations of the mine sites Ivakkak UG, Expo South and Nanaujaq require a development period of one year, a period which is independent of the size of the deposits targeted. However, for the Méquillon UG2 site, this phase has already been carried out during the preparation of the Méquillon UG1 site and will not be taken into account in this assessment. The duration of the work for increasing the capacity of the LEMN is considered equal to one (1) week.

In order to take into account the northern climate of the Project, the fuel consumption rates are estimated from data collected by CRI on heavy equipment in service during Phase 1. When the rate of equipment is not available, an average value is estimated from the literature [17].

The list of heavy equipment used and the number of hours required are presented in Table 8-11.

In total, it is estimated that the mobile equipment used during the construction phase will consume 1,210,357 liters of diesel.

8.2.3.1.2 Stationary Combustion Systems

In the same way as for the mobile combustion systems, the list of fixed equipment required during the construction phase of the three mining sites is presented in Table 8-12. All of the stationary equipment consumes diesel fuel and according to the information available at the time of this study, no use of stationary combustion equipment is planned during the LEMN expansion work.

[17]https://wheelercat.com/company/resources/cat-performance-handbook/

Table 8-11: Consumption of Mobile Equipment During the Construction Phase

Construction Activity	Equipment	Number	Rate (L/h)	Hours of Use	Consumption Total (L)
Preparation of mine sites	Nutrunner	1	4	13,140	54,090
	30 t production truck	2	23	26,280	604 440
	70 t production truck	1	31	288	8,928
	Charger of ANFO	1	10	144	1,440
	Loader-commuter	1	27	13,140	353,466
	Elevator	1	3	4,380	14,016
	Surface drill	2	70	2016	141 120
	Jumbo drill	1	2	13,140	26,280
Addition of a second burial cell	Excavator	1	10	84	874
	Truck	2	31	84	5,208
	Tractor	1	6	84	496
TOTAL					**1,210,357**

Table 8-12: Consumption of Fixed Equipment During the Construction Phase

Construction Activity	Equipment	Number	Consumption Rate (L/h)	Hours of Use	Consumption Total (L)
Site preparation	Compressor	1	6	4,380	26,280
	heating unit	1	12	18,000	216,000
	Generator	2	150	13,140	3,942,000
TOTAL					**4,184,280**

In total, diesel fuel consumption by fixed equipment during the construction phase is estimated at 4,184,280 L. The GHG emission factor used for fixed equipment is presented in Table 8 -13.

Table 8-13: Emission Factors Associated with Stationary Combustion Systems

Combustible	$gCO_2/_L$	g CH_4 /L	$gN_2O_/$ L	g CO_2 eq./L
Diesel	2,663	0.133	0.4	2,786

Source: Table 1-3. *Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere* (RDOCECA)

8.2.3.2 Operation Phase

8.2.3.2.1 Mobile Combustion Systems

Mining Sites

Once the preparation of the mining sites is complete, the exploitation of the ore can begin. Based on the fleet of mobile equipment (Table 8-14) which, in 2020 for the Allammaq site, consumed 819,468 liters of diesel fuel for the extraction of 412,000 t of ore, a rate fuel consumption during the mining phase is estimated at 1.99 L diesel/t ore.

Table 8-14: List of Mobile Equipment Used During the Operation of the Allammaq Ug Mine Site in 2020

Equipment	Number	Consumption Rate (L diesel / t ore)
Nutrunner	1	**1.99**
Production truck - 30 T	4	
Emulsion truck	1	
Boom truck	1	
S/T refueling truck	1	
Van	3	
Van underground	4	
Charger	1	
Charger of ANFO (explosive)	1	
Shuttle loader - scoop type	2	
Elevator in chisel	1	
Jumbo drill	1	
Long hole drilling rig	1	
Grader s/t	1	
Backhoe	1	

Based on the ore deposits estimated for each of the NNiP Phase 2a mining sites, an overall consumption of mobile equipment during the operating phase is estimated and presented in Table 8-15.

Diesel fuel consumption by mobile equipment during the eleven years of the operating phase is thus estimated at 7,774,247 L.

Table 8-15: Consumption of Mobile Equipment During the Operational Phase

Site	Ore Deposit (t)	Consumption (L)
Nanaujaq	1,370,509	2,725,942
Ivakkak UG	410,682	816 846
Mequillon UG2	1,446,727	2,877,540
Expo South	680 703	1,353,918
TOTAL		**7,774,247**

Transportation of Ore and Concentrate

The extracted ore is then transported to the concentrator located at the Expo Complex, then the concentrated product is again transported for export to the port located at Deception Bay.

GHG emissions from the transportation of ore and concentrate are calculated based on the estimated diesel consumption of heavy trucks. This estimate is obtained from the distance traveled by the trucks and the diesel consumption rate calculated from the fleet of heavy trucks currently used by CRI.

To determine the total distance traveled by heavy trucks during the operation phase of Phase 2a of the NNiP, the following assumptions were made:

- Truck capacity for ore transport: 110 tons;
- Truck capacity for transporting concentrate: 40 tons;
- Distance Expo South – Expo Complex: 3 km;
- Distance Nanaujaq Mine – Expo Complex: 13 km;
- Distance Ivakkak UG Mine – Expo Complex: 46 km;
- Distance Mine Méquillon UG2 – Expo complex: 20 km;
- Distance Expo Complex – Port to Deception Bay: 120 km.

Using odometers and invoices related to filling heavy truck fuel tanks in 2020, a diesel fuel consumption rate of 2 L/km is estimated.

Table 8-16 presents the estimate of the total distance traveled by the transport trucks during the operation phase as well as the associated diesel fuel consumption.

Diesel fuel consumption by transport trucks during the operation phase is thus estimated at 5,845,576 L.

Table 8-16: Estimated Diesel Fuel Consumption by Heavy Trucks

Site	Material	Quantity (t)	Total Distance Traveled (km)	Consumption (L)
Expo South	Ore	680,704	37,140	74,280
	Concentrate	49,100	294,720	589,440
Ivakkak UG	Ore	410,682	343,528	687,056
	Concentrate	29,623	177,840	355,680
Mequillon UG 2	Ore	1,446,727	622,400	1,052,320
	Concentrate	104,355	626,160	1,252,320
Nanaujaq	Ore	1,370,509	323,960	647,920
	Concentrate	98,857	593,280	1,186,560
TOTAL				**5,845,576**

Expo Complex

In addition to the mobile equipment used during ore extraction and transport, other equipment is used to ensure the smooth running of activities at the Expo Complex. From the consumption readings of mobile equipment used at the Expo Complex in 2020, it is possible to estimate the overall consumption of diesel fuel during a year of operation.

Table 8-17 presents the consumption of mobile equipment by type of activity.

Table 8-17: Consumption of Mobile Equipment for Other NNiP Activities in 2020

Site	Activity	Consumption (L)
Expo Complex	Surface and earthwork services	1,211,437
	Exploration	290,125
	Mine – Tailings site	3,721,043
	Transportation of explosives	35,464

During the operation phase of the Project, certain activities of Phase 1 of the NNiP will still be in progress at the Expo Complex. In order to consider only the fuel consumption of mobile equipment related to Phase 2a of the NNiP at the Expo Complex, several assumptions were made based on the information provided by CRI:

- The planned expansion of Camp Expo during Phase 2a will increase the accommodation capacity of the camp. It is estimated that this will lead to a 20% increase in diesel consumption of mobile equipment used for surface services and earthwork;
- 50% of diesel fuel consumption for related exploration activities will be for Phase 2a;
- 30% of activities related to the Expo tailings pond will be for Phase 2a;
- 100% of the activities related to the transport of explosives will be for Phase 2a.

Based on these assumptions, the diesel fuel consumption by mobile equipment at the Expo Complex during the Project's operating phase has been revised and is presented in Table 8-18.

Table 8-18: Consumption of Mobile Equipment at the Expo Complex for Phase 2a of the NNiP

Site	Activity	Consumption Annual (L)	Consumption Total (L)
Expo Complex	Surface and earthwork services	1,453,724	15,990,964
	Exploration	290,125	3,191,375
	Mine – Tailings site	1,116,313	12,279,442
	Explosives	35,464	390,104
TOTAL		**2,895,626**	**31,851,885**

In total, the total diesel fuel consumption at the Expo Complex during the eleven years of operation of Phase 2a of the NNiP is estimated at 31,851,885 L.

Deception Bay Port

During 2020, the mobile equipment used at the port enabled the export of 124,585 tons of concentrate for a consumption of 185,123 L of diesel fuel, which represents an average rate of 1.48 L diesel per ton of concentrate. During Phase 2a of the NNiP, the quantity of concentrate sent to the port is estimated at 281,935 tons.

Based on the rate calculated for the year 2020, the consumption of mobile equipment associated with the handling of concentrate from Phase 2a is estimated at 417,264 L of diesel fuel.

LEMN

During the operating period of the new LEMN landfill cell (2024-2032), several mobile equipment will be required (Table 8-19). It is assumed that the equipment will be used 5 hours per week, or 260 hours per year.

Table 8-19: Equipment Consumption for the Operation of the New Landfill Cell at the LEMN

Equipment	Number	Consumption Rate (L/h)	Hours of Use	Consumption (L)
Excavator	1	10	2,340	24,336
Truck	2	31		145,080
Tractor	1	6		13,806
TOTAL				**183,222**

The consumption of mobile equipment for operations at the LEMN is estimated at 183,222 L.

8.2.3.2.2 Stationary Combustion Systems

Mining Sites

According to data compiled by CRI, the total diesel fuel consumption by stationary equipment (Table 8-20) in 2020 for the Allammaq underground site is 266,945 L, while the quantity of ore extracted is 412,000 tonnes, which gives a rate of 0.65 L diesel / ton ore.

Table 8-20: List of Fixed Equipment Used During the Operation of the Allammaq Mining Site in 2020

Kind	Number	Consumption Rate (L diesel / t ore)
Compressor	1	**0.65**
Welder	1	
heating unit	3	

Based on the deposits estimated for each of the sites of Phase 2a of the NNiP, an overall consumption of fixed equipment during the operating phase is estimated and presented in Table 8-21.

Table 8-21: Consumption of Fixed Equipment During the Operational Phase

Site	Ore Deposit (t)	Consumption (L)
Nanaujaq	1,370,509	887,986
Ivakkak UG	410,682	266,091
Mequillon UG2	1,446,727	937,369
Expo South	680,703	441,044
Total		**2,532,490**

In addition, since the mining sites are not supplied by an external electrical network, generators are also used to produce electricity. For each of the sites, the diesel fuel consumption from these generators is presented in Table 8-22.

Table 8-22: Consumption of Generators Present on Mining Sites During the Operating Phase

Site	Number of Generators	Consumption Rate (L/h)	Hours of use	Consumption (L)
Nanaujaq	2	100	70,080	7,008,000
Ivakkak UG	2	100	35,040	3,504,000
Mequillon UG2	2	250	35,040	8,760,000
Expo South [has]	0	-	-	-
Total				**19,272,000**

[a]: The Expo South mine site is connected to the generators used at Camp Expo.

Diesel fuel consumption by fixed equipment during the eleven-year operating phase is thus estimated at 21,804,490 L.

Expo Complex

In the same way as for the mobile equipment, the consumption readings for the fixed equipment used indicate a total of 3,822,287 L of diesel fuel consumed at the Expo Complex. It is assumed that this consumption will be identical during Phase 2a of the NNiP for each year of operation. Since the operating period is set at eleven years (2024-2034), the consumption of fixed equipment at the Expo Complex is estimated at 42,045,157 L of diesel fuel.

As with the mining sites, the Expo Complex is powered by generators. In 2020, their consumption was estimated at 21,738,112 L of diesel fuel. Considering that the efficiency of the generators will remain constant throughout the entire operation phase of Phase 2a of the NNiP, the overall consumption of the generators is estimated at 239,119,232 L of diesel fuel.

Deception Bay Port Facilities

In 2020, the consumption of fixed equipment at the port facilities in Deception Bay was 127,621 L of diesel fuel. Considering that this consumption will be constant during Phase 2a of the NNiP, planned between 2024 and 2034, an overall consumption of 1,403,831 L is estimated.

8.2.3.3 Closing Stage

8.2.3.3.1 Mobile Combustion Systems

Based on the information available at the time of this assessment, it was considered that the mining site closure operations will take place 4 months per year for 2 years after the end of the mining sites operating period presented in Phase 2a of the NNiP.

The list of mobile equipment used during the closure phase is presented in Table 8-23 by activity.

Table 8-23: Consumption of Mobile Equipment During the Closing Phase

Activity	Equipment	Number	Rate (L/h)	Hours of Use	Consumption Total (L)
Restoration work	Backhoe	1	36	4,380	157,680
	Charger	1	16		70,956
	production truck	3	10		131,400
crushing	crusher	1	36		157,680
Closure of the Fosse Expo tailings site	production truck	3	10		131,400
	Charger	1	16		70,956
	Compactor	1	11		45,990
	Forklift _	1	31		135,780
	Tractor	1	6		25,842
TOTAL					**927,684**

The consumption of mobile equipment during the closure phase of the Project is thus estimated at 927,684 L of diesel fuel.

8.2.3.3.2 Stationary Combustion Systems

During the closure phase, it is assumed that the generators present on each of the mining sites will be used for the entire duration of the work. For each site, Table 8-24 presents the diesel fuel consumption by these generators.

Table 8-24: Consumption of Generators During the Closing Phase

Site	Number of Generators	Consumption Rate (L/h)	Hours of Use	Consumption (L)
Nanaujaq	2	100	11,520	1,152,000
Ivakkak UG	2	100	11,520	1,152,000
Mequillon UG2	2	250	11,520	2,880,000
Expo South [has]	0	-	-	-
Total				**5,184,000**

[a]: The Expo South mine site is connected to the generators used at Camp Expo.

In total, generator consumption is estimated at 5,184,000 L during the shutdown phase.

8.2.4 GHG Emissions Report

Table 8-25 below outlines the total GHG emissions emitted for all of Phase 2a and its related projects.

8.2.5 Conclusion

The evaluation of GHG emissions from Phase 2a of the NNiP has established that emissions related to the construction phase of the Project are estimated at 14,911 tons of CO_2 equivalent. For the operation phase, planned between 2024 and 2034, a total of 971,974 tons of CO_2 equivalent is obtained. Finally, GHG emissions during the closure phase are estimated at 16,935 tons of CO_2 equivalent.

In total, it is estimated that Phase 2a of the NNiP will be responsible for the emission of 1,003,819 tons of CO_2 equivalent. The use of generators to supply electricity to the complexes (industrial and port) and mining sites is the main source of GHG emissions and alone accounts for nearly 75% of the Project's GHG emissions. Impact mitigation measures

CRI implements various mitigation measures to reduce the impacts of its GHG emissions:

On the site, various concrete mitigation measures are implemented as presented in Section 7 2.1.4 and Table 7-5. These measures are:

- Avoid leaving vehicles running unnecessarily;
- Use machinery that meets Environment and Climate Change Canada emission standards for on-road and off-road vehicles;
- Use generators with low contaminant emission rates;
- Inspect the machinery beforehand and regularly to ensure its good condition and proper functioning;
- Apply the mechanical service preventive maintenance program to ensure optimal operation of the machinery.

At the administrative level, since 2013, Canadian Royalties has participated in the Quebec cap-and-trade system (SPEDE), and offsets part of its GHG emissions by purchasing carbon credits.

The diversification of energy sources by adding green energy sources is also provided for by Canadian Royalties. This energy diversification will involve the integration of two 3 MW wind turbines at the NNiP mining site. This new energy source will make it possible to avoid the combustion of 5 ML/year of diesel and will prevent the emission of 14,000 T/year of GHGs into the atmosphere, or almost 12% of GHG emissions from all mining activities of the NNiP. In addition, the energy supply will be diversified with a renewable energy penetration of around 15% to 20%.

Table 8-25: GHG Emissions Associated with the Different Phases

Type of Emission Sources	Consumption (L)	Emissions (tons)			(Tons of CO2 Equivalent)			
		CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	Total
Construction phase								
Stationary combustion systems	4,184,280	11,143	0.56	1.67	11,143	14	499	11,655
Mobile combustion systems	1,210,357	3,245	0.09	0.03	3,245	2	8	3,255
Total GHG emissions - construction phase		**14,388**	**0.64**	**1.70**	**14,388**	**16**	**507**	**14,911**
Operation phase								
Stationary combustion systems	304,372,710	810,545	40.48	121.75	810,545	1,012	36,281	847,838
Mobile combustion systems	40,226,618	107,848	2.94	0.88	107,848	73	264	108,185
Transportation of ore and ore concentrate	5,845,576	15,672	0.64	0.88	15,672	16	263	15,951
Total GHG emissions - operation phase		**934,064**	**44.06**	**123.52**	**934,064**	**1,102**	**36,808**	**971,974**
Closing stage								
Stationary combustion systems	5,184,000	13,805	0.69	2.07	13,805	17	618	14,440
Mobile combustion systems	927 684	2,487	0.07	0.02	2,487	2	6	2,495
Total GHG emissions - closure phase		**16,292**	**0.76**	**2.09**	**16,292**	**19**	**624**	**16,935**
TOTAL	**361 944 648**	**964,744**	**45.46**	**127.31**	**964,744**	**1,137**	**37,939**	**1,003,819**

9 Monitoring and Surveillance Program

9.1 Surveillance

The environmental surveillance completed during the project will consist of ensuring compliance with environmental commitments and obligations. It also aims to verify the project's integration of the proposed mitigation measures and CRI's commitments, in addition to ensuring compliance with the laws, regulations and other environmental considerations enacted in the various government permits for the plans, specifications and subcontracts.

One of the monitoring program's activities will consist of ensuring that all authorization and permit applications required for the project have been completed and that the authorizations and permits have been received.

Construction site meetings will take place before the start of each of the projects presented above, jointly organized by the heads of the environmental department and site managers. A copy of the authorization documents will be given to the site managers, as to define the work in accordance with the authorizations' provisions. These meetings will also inform and sensitize the staff assigned to the environmental and safety provision site, which will be observed throughout the work periods and to explain the monitoring activities' general operation. Also, a weekly meeting during the construction period will be held to target potential problems and identify applicable solutions.

The CRI Environmental Department will be responsible for the environmental monitoring. The mitigation measures must be rigorously applied during work periods. Generally speaking, the person in charge of environmental surveillance must perform regular visits to the work areas, take note of the rigorous respect of the commitments, obligations, measures and other requirements from the parties involved. They must also assess the quality and effectiveness of the measures applied and note any non-compliance observed. The supervisor must ensure the effectiveness of these measures, inform those in charge and propose alternative protective measures if required. Site monitoring forms (Appendix V) will allow the site supervisor to monitor the application of mitigation measures. Any incidents will be noted in the last column of the form entitled "Comments/Corrective Actions. The supervisor will take note of the following information:

- The nature of the event;
- The intervention measures applied;
- The effectiveness of the intervention. A follow-up will also be performed in the days following the application of the corrective intervention.
- A weekly report will be prepared during the infrastructure development phase, which will include photos to facilitate understanding of the non-compliance events observed and the corrective actions taken. The environmental monitoring sheets will be given to the site supervisor on a weekly basis, or when required in the event of non-compliance.

The "as-built" (AB) plans will be prepared and sent to regional, provincial and federal authorities as required once the work is completed.

9.2 Monitoring

The NNiP Environmental Monitoring Program (EMP) includes all of CRI's commitments, their obligations, conditions and requirements created by the appropriate authorities, in addition to the current applicable directives and regulations.

The EMP's 5th version was revised in 2022 and includes the latest authorizations issued since the previous version was published in 2015, specifically regarding the Puimajuq deposit and the PEIIC (CRI, 2022a). The EMP will continue during CRI's mining activities and the associate monitorings are listed in Table 7-1. The projects' description and their anticipated impacts submitted in the previous chapters of this addendum, indicate that they

have few additional repercussions on the environmental and social environment. Consequently, it has been established that adding additional monitoring to the version 5 EMP is not required, under the scope that the extension of the already existing new project monitoring, when applicable, will allow for adequate monitoring of the mitigation measures' effectiveness and the residual impacts, if any. For example, Monitoring 26, which relates to the acid-generating potential of the rock, will be applied to the Nanaujaq water collection pond, in addition to the new drainage and clean water diversion ditches of the four projects. The results will also be presented in the annual environmental monitoring report.

Table 9-1: Environmental Monitorings that Make Up the NNiP's Environmental Monitoring Program, Version 5

Monitoring number	Monitoring title	Monitoring number	Monitoring title
1	Drinking water for the Expo complex and Deception Bay camp	19	Program for Environmental Improvement in Inuit Communities (PEIIC)
2	Effluent of treated sanitary wastewater	20	Drabas
3	Mining effluents	21	Atmospheric emissions from the incinerator
4	Surface water - Mine effluent receiving water	22	Concentration of dust in the air at the EXPO complex site
5	Surface water - Water quality at the Puvirnituq village water intake	23	Dust dispersion
6	Surface water - Water temperature of Expo's last effluent for the receiving environment	24	Non-hazardous residual materials
7	Surface water - Deception Bay	25	Residual hazardous materials and special waste
8	Environment Effects Monitoring (EEM) - Fish	26	Acid generating potential of waste rock
9	Metal concentration in fish tissue from the Puvirnituq River	27	Tailings and waste rock park
10	Mercury content in fish tissue from Lac du Bombardier	28	Sill bridge at the Lac du Bombardier outflow
11	Lac du Bombardier fish population	29	Deception Bay marine navigation
12	Culvert stability and fish movement	30	Wharf-related monitoring
13	Free passage of the sill bridge at the Lac du Bombardier outflow	31	Wet snowslides
14	Arctic char spawning grounds	32	Environmental monitorings
15	Sport fishing	33	Visual Impacts
16	Benthic communities	34	Noise Impacts
17	Polar Bear Sightings	35	Inuit communities information program
18	Collisions with Caribou	36	NNiP perception and assessment plan

The EMP will be updated accordingly with the evolution of CRI's mining activities, to include the monitoring required during the post-exploitation and post-restoration phases. Proposed changes will be submitted to the Administrator for information.

10 Accident Risk Management

CRI advocates risk reduction through prevention and taking said risks into account during the designation of various infrastructures, through the use of safe technologies, in addition to the implementation of NNiP risk-specific measures, which includes the new deposits and new structures covered by this addendum.

As part of the NNiP, CRI has developed an Emergency Response Plan (ERP) due to the inherent risks of all industrial activities and the remoteness and the fragility of Arctic ecosystems. The prevention and contingency measures associated with each of these risks identified in the NNiP, are integrated into the CRI's EMP. Accident risk management that could be specific to the four projects presented in this addendum is therefore included in this ERP.

The ERP is based on good practices in the field of emergency management and aims to ensure the protection of people, the environment and CRI's assets. More specifically, CRI's NNiP is subject to the *Environmental Emergency Regulations* – SOR/2019-51 (EER) resulting from the *Canadian Environmental Protection Act* – S.C. 1999, c. 33. Consequently, the EMP of the NNiP acts as an Environmental Emergency Plan (EEP) in accordance with the provisions set out in the EER.

The objective of the CRI's ERP is to:

- Establish a framework for effective and efficient emergency management at CRI;
- Establish a framework for the maintenance and continuous improvement of the contingency management program within CRI;
- Establish a framework to ensure employee awareness and responder training in emergency measures;
- Ensure periodic testing of established mechanisms and procedures.

The EMP is revised on an annual basis and the 2021 version is presented to Appendix W. It can also be modified outside the annual review period to include any new risks or situations reported on-site for the various activities in progress.

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