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Kativik environmental quality commission
Commission de la qualité de l'environnement Kativik

STRANGE LAKE RARE EARTHS MINING PROJECT

REF: 3215-14-020

DIRECTIVE FOR PREPARING THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

OCTOBER 2023

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1. INTRODUCTION

This document is intended as the directive for the Strange Lake Rare Earths Mining Project by Torngat Metals Ltd. The project is located within the territory covered by Section 23 of the *James Bay and Northern Quebec Agreement* (JBNQA) and Title II of the *Environment Quality Act* (EQA). This directive was prepared following the submission of preliminary project information by the proponent on May 11, 2023, to the Deputy Minister of the Environment, Climate Change, Wildlife and Parks and Provincial Administrator of the JBNQA.

It outlines the nature, scope and extent of the environmental and social impact assessment that the proponent must carry out.

1.1. The project

The Strange Lake rare earths mine project is located near Brisson Lake in Nunavik, some 235 km northeast of Schefferville, 325 km southeast of Kuujjuaq and 285 km southeast of Kangiqsualujjuaq.

The project mainly consists of an open pit, a tailings facility, a low-grade ore stockpile, a waste rock stockpile, a basin, an industrial-area that houses the ore concentrator plant and camp, an airstrip and a landfill. The proponent also plans to build a 160-km access road linking the mine to port facilities to the east, on the Labrador coast. An 18-km stretch of this route would be located in Quebec.

The deposit would be open-pit mined for 30 years. Between 160 and 200 million tonnes of ore would be mined, an average of 5.7 to 6.7 million tonnes per year. Between 125,000 and 300,000 tonnes of concentrated rare earths oxides would be produced each year by the on-site concentrator facilities, which would have a processing capacity of between 16,000 and 20,000 tonnes of ore per day. The rare earths oxides will be shipped to a hydrometallurgical plant for the separation of high-purity rare earths. The proponent is considering the ports of Sept-Îles, of Grande-Anse (in the Saguenay region) and of Baie-Comeau as potential locations for this plant.

1.2. Kativik Environmental Quality Commission

The Kativik Environmental Quality Commission (KEQC) was created under Section 23 of the JBNQA and is governed by sections 181 to 213 of the EQA. It is responsible for evaluating and reviewing projects in the territory covered by the JBNQA and located north of the 55th parallel.

Following the submission of an impact study, the KEQC may request clarifications and additional information to ensure that the study complies with the requirements laid out in the directive. The KEQC publishes the impact studies and the additional documents filed by proponents on its website (www.keqc-cqek.ca). The KEQC may hold public consultations with the communities affected by a project. At the end of its review process, the KEQC decides on the projects' execution. This is conveyed to the proponent as a

certificate of authorization or a written refusal. Where applicable, the decision will contain conditions for implementation and mitigation measures or monitoring.

2. GENERAL PRINCIPLES

2.1. Taking the issues into account

To make the environmental assessment process more efficient, to properly disseminate information to the public and Indigenous communities, and to highlight information that is relevant to decision-making, the impact study must be structured in such a way as to highlight the impacts of the project specifications ("issues"). An issue is defined as a major concern for the government, the scientific community or the public, including the affected Indigenous communities; analysis of an issue can influence the decision to authorize or refuse a project. In this way, the elements required for decision-making must be highlighted in the main document of the impact study. Certain more technical elements, such as methods or results, which are essential to the review of the project, can be placed in an appendix to the main document or grouped in another document.

2.2. Sustainable development

Passed in 2006, the *Sustainable Development Act* (chapter D-8.1.1) defines sustainable development and lays out 16 principles of sustainable development.[1]

In Quebec, sustainable development is understood to be a "development that meets current needs without compromising the ability of future generations to meet their needs. Sustainable development is based on a long-term vision that takes into account the inseparable connection of the environmental, social and economic dimensions of development activities."

It is the proponent's responsibility to take sustainable development objectives and principles into account when developing a project in the environmental and social context of Nunavik. These objectives and principles can be integrated as much in the planning and management of the project as in the proposed mitigation and compensation measures. The impact study must summarize the sustainable development approach the proponent has taken and explain how the project design takes it into account. The management programs to be put in place must be presented and include concrete and measurable sustainable development objectives.

2.3. Consideration of climate change

Climate change must be designed into the project. The project's impact on climate changes must also be assessed, as well as the anticipated repercussions of climate change on the project implementation and setting. The analysis of alternatives, variants and mitigation measures must also take climate change into account, particularly with regard to the potential for reducing greenhouse gas (GHG) emissions and adapting to climate change. In particular, the proponent must assess the project's contribution to Quebec's overall GHG emissions. The project design must take intensification of meteorological hazards into

1 For more information, the proponent may consult the sustainable development section of the MELCCFP's website[https://www.environnement.gouv.qc.ca/developpement/definition_en.htm].

account, in particular by examining the project's resilience to climate change. The proponent can consult the following guides on the subject: *Les changements climatiques et l'évaluation environnementale - Guide à l'intention de l'initiateur de projet,*[2] *le Guide de quantification des émissions de gaz à effet de serre,*[3] as well as *Guide de bonnes pratiques en restauration minière dans un contexte de changements climatiques.*[4]

2.4. Indigenous knowledge

The knowledge the communities affected by the project hold about their environment is essential to adequately assessing the project's impacts. At the very least, the Inuit communities of Kangiqsualujjuaq and Kuujjuaq, and the Naskapi community of Kawawachikamach are affected by the Strange Lake Rare Earths Mining Project. It is up to the proponent, depending on the study area it determines, to include other communities and justify its choice.

Each cultural group has its own system for perceiving itself, its neighbouring communities and environment, as well as its past and future. Since it partly determines the group's reaction to change, this system of representation and the communities' knowledge of their environment must be both understood and integrated into the impact study. This includes their understanding of the temporal and spatial boundaries of the project and its area of influence.

The integration of Indigenous knowledge into the impact study is necessary and requires the collection of information from the communities and land users affected by the project. The analysis of this data also requires their participation. As a whole, this exercise promotes the involvement of these communities and their knowledge of the project.

2.5. Information and public consultation processes

The proponent must take advantage of the capacity of the affected communities and citizens to express their views and concerns about the project. Begun as soon as possible, a consultation process should involve all concerned parties (individuals, groups and communities, ministries and public and parapublic bodies, etc.) so that their opinions are taken into account in decision-making and choices. The earlier in the process leading up to a decision consultation takes place, the greater the citizens' influence on the project as a whole and the more likely the project is to be considered socially acceptable.

A chapter of the impact study must be devoted to presenting and analyzing the consultations. The proponent must describe its consultation program as well as the public

2 https://www.environnement.gouv.qc.ca/evaluations/directive-etude-impact/guide-intention-initiateur-projet.pdf

3 https://www.environnement.gouv.qc.ca/changements/ges/guide-quantification/guide-quantification-ges.pdf

4. https://www.environnement.gouv.qc.ca/Industriel/secteur-minier/guide-bonnes-pratiques-restauration-miniere.pdf

meetings it has already organized and those planned at each stage of the project. The proponent must indicate the dates and locations of the information and consultation sessions, as well as the participants. It must produce minutes for these meetings, which will include the comments, concerns, opinions and reactions of the individuals, groups, organizations and land users of Nunavik.

All documents relating to the consultations must be made public on the proponent's website and in the communities concerned by the project.

The proponent should indicate how the collected viewpoints have influenced the issues to be considered, choices, decision-making and modifications to the project. The proponent must present how it will take concerns about its project into account and how this may influence a potential Impact Benefit Agreement (IBA) with the communities.

The proponent must adopt a communications plan or strategy for all draft phases. It must also explain the means it intends to use to disseminate information and communicate it with the various actors. This plan must include regular updates on project progress, the results of impact analysis and monitoring and follow-up reports.

The proponent must translate the essential elements of the project documents, make them public and disseminate the information to concerned individuals and groups.

3. IMPACT STUDY CONTENT

Background

3.1.1 Presentation of the proponent

The impact study must present the proponent, the people tasked with project management and its environmental consultants, if any. This presentation must include general information on the proponent's history in relation to the proposed project and the project's sector of activity, specifically in rare earths ore mining.

3.1.2 Location of the project

The impact study must present the location, including a site plan, and the project area. The geographical coordinates of the main project components must also be included in this section. The maps must show the location of facilities within the footprint of the mining lease as well as any others located outside the mining lease.

3.1.3 Rationale for the project

The goal of this section is to explain the context in which the project will be carried out and the rationale for the project. It provides an up-to-date profile of the activity sector, sets out the project objectives, explains the needs the project meets, and presents the local, regional, national and international constraints, if any, or requirements linked to its execution. It also features:

- The technical and economic requirements for implementing and operating the mine, including the extent of these requirements and the timetable for completion;
- The list of permits, rights and authorizations required to carry out the project, in accordance with the laws and regulations of Quebec, Canada and other jurisdictions, if applicable;
- The description of how the project fits in with the various government policies and orientations related to the project's activity sector;
- Where applicable, relevant aspects of agreements between Indigenous communities and government in connection with the project's setting.

The proponent must clearly indicate that the project feasibility study required under section 101 of the *Mining Act* (chapter M-13.1) has been confirmed. The impact study must present and take into account the project's main technical and economic characteristics as they appear in the feasibility study. The feasibility study must be submitted as an appendix to the impact study. The impact study must be based on these characteristics and filed only if the feasibility study has been carried out, to ensure that the project will not be modified in any major way during the environmental assessment procedure, and that the anticipated and analyzed impacts are those that will be presented to the public and are indeed likely to occur.

The project history, the business opportunities in the target sector, and mineral resource and reserve estimates must also be described.

In addition, the proponent must explain what rare earths metals are, the known methods for mining and processing the ore, and the general technological risks associated with this type of mining and processing. It must also present the known impacts of rare earths mining (i.e. of the rare earths metals themselves, co-extracted products and mining co-products) on the environment and on human health.

It must present the general context in which the project is to be carried out, the related components, and the project's timetable and costs. It must specify whether it is planning subsequent expansions or projects, even if these are in a preliminary stage. It must also specify whether the termination of third-party agreements could jeopardize the project's completion or financial health. It must discuss events that could lead to a slowdown or temporary halt in operations or even to the abandonment of the project.

The proponent must present a history of the project, outlining its main stages, including the various exploratory phases involved. It must indicate the physical structures that were put in place and present any environmental or social problems encountered during these activities. It must also mention any agreements already established for the use of certain services (transportation, storage, maintenance, etc.), if applicable.

Finally, the proponent must indicate how its project meets the objectives and principles of existing agreements in Nunavik, including the JBNQA and the Sanarrutik Agreement, the Nunavik Inuit Mining Policy, and the Québec Mineral Strategy orientations. It must explain how the project fits in with the Kativik Regional Master Plan. It must also explain how the project takes the orientations of the Plan Nord into account.

3.1.4 Developments and related projects

The impact study must mention any existing developments or projects in the planning or execution stages, including port facilities and roads, that are likely to influence the design or impacts of the proposed project, for instance, in terms of energy sources, transportation of people, equipment and production. Information on these developments and projects should make it possible to identify potential interactions with the proposed project. The proponent must also specify the construction sequence for the planned infrastructures and the project as a whole, and the energy sources that will be used.

3.1. Description of the setting

3.2.1 Delimitation of the study area

The proponent must determine a study area in keeping with the project's issues. The portion of the territory included in this study area must be sufficient to cover all planned activities, including other elements required for project execution (e.g. access roads and borrow pits or airport facilities) and to identify all of the project's direct and indirect effects. If necessary, the study area can be made up of different areas delimited according to the impacts studied. The proponent must justify the location and scope of its study area, indicating technical, economic and social constraints. It must specify which communities are included and justify this choice.

3.2.2 Description of the receiving environment

The impact study describes the components of the physical, biological and human environments that the project is likely to disturb. The description of these components should focus on the environment's components of value. It must contain only the data needed to determine the issues and to analyze the impacts. These components must be presented according to their linkages to enable an understanding of the relationships and interactions between different elements. The impact study specifies the reasons and criteria justifying the choice of components to be considered. The following sections give several examples of components to be considered, but the proponent is required to include in the impact study any other element it deems relevant. The information of these sections must be presented on one or more maps clearly indicating the project's scope and components, the defined study area and all environmental components of value. Maps must be supplemented by summary tables of non-map elements.

Description of physical and biological components in the environment

The description of the physical and biological environments should be based on the activities foreseen for the project's various phases.

For the Strange Lake Rare Earths Mining Project, the following components must be presented as part of the description of the project environment:

- The area's various lithologies and its mining potential;
- Areas susceptible to erosion and landslides;
- A characterization of permafrost, including the thickness of the active layer and thermal profiles according to type of surface deposit;
- Geological information condemning certain sites for storage mining infrastructure;

- Physicochemical characterization of the initial state of the soil in accordance with the *Guide de caractérisation physico-chimique de l'état initial des sols avant l'implantation d'un projet industriel,*[1] if no past human activity has taken place on the site;
- Phase I report on a soil characterization study carried out in accordance with the MELCC's *Guide de caractérisation des terrains.* [2]
- Physicochemical characterization of aquatic environments before the implementation of an industrial project, carried out in accordance with the *Guide de caractérisation physico-chimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel.*[3] If the effluent's receiving environment has complex hydrodynamics or if effluent will not be fully mixed over the entire watercourse at a distance of 300 metres from the point of discharge, CORMIX modelling of effluent dispersion will be required to establish Environmental Discharge Objectives (EDO). Consequently, the proponent will have to provide the data required for this modelling, referring to Appendix 3 of the above-mentionned guide;
- Characterization of the site's hydrology, including low-water flows in the watercourse receiving the effluent (summer and winter $Q2_{,7}$, $Q10_{,7}$ and $Q5_{,30}$), using the method developed by the Ministère's Direction de l'expertise hydrique.[4] It must also assess the surface area of the watershed upstream of the discharge point for each effluent. Where applicable, low-water flow (summer and winter $Q5_{,30}$) is also required at the first municipal drinking-water intake downstream of the discharge;
- Hydrogeological setting (physicochemical quality of groundwater and establishment of background levels, identification of aquifer formations, determination of their vulnerability [e.g. DRASTIC] and their importance, flow direction and hydrogeological modelling of flows and contaminant transport) according to the indications given in the following guides:
    - *Guide d'échantillonnage à des fins d'analyses environnementales : cahier 3,*[5]

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1 Ministère de l'Environnement et de la Lutte contre les changements climatiques *Guide de caractérisation physico-chimique de l'état initial des sols avant l'implantation d'un projet industriel*. [http://www.mddelcc.gouv.qc.ca/sol/terrains/guide/caracterisation-avant-projet-industriel.pdf].

2 Ministère de l'Environnement et de la Lutte contre les changements climatiques *Guide de caractérisation des terrains* [https://www.environnement.gouv.qc.ca/sol/terrains/guide/guidecaracterisation.pdf]

3. Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 2017. *Guide de caractérisation physico-chimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel*. [http://www.mddelcc.gouv.qc.ca/eau/oer/Guide_physico-chimique.pdf].

4. Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 2018. Débits d'étiage. [http://www.cehq.gouv.qc.ca/debit-etiage/cartes/debits-etiage.htm].

5. Ministère du Développement durable, de l'Environnement et des Parcs, 2011. *Guide d'échantillonnage à des fins d'analyses environnementales : cahier 3,* Centre d'expertise en analyse environnementale du Québec. [http://www.ceaeq.gouv.qc.ca/documents/publications/echantillonnage/eaux_soutC3.pdf].

- *Guide technique de suivi de la qualité des eaux souterraines*[6]
- *Fiche d'information : Analyse des résultats du suivi de la qualité des eaux souterraines* [7]
- *Guide de réalisation des analyses de la vulnérabilité des sources destinées à l'alimentation en eau potable au Québec* [8]
- *Guide de présentation des travaux de modélisation hydrogéologique*[9]

– Characterization of atmospheric quality (initial concentration of contaminants, odours, sensitive receptors, prevailing winds, etc.), as described in the *Guide de la modélisation de la dispersion atmosphérique*[10] and the *Guide d'instructions – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers.*[11]

The vegetation in areas the project is likely to affect must also be presented. The proponent must indicate the presence of fragile or exceptional stands. The main wildlife[12] and plant species must be presented in terms of their life cycles (migration, feeding, reproduction and protection), the communities they form and their habitats, in accordance with the *Regulation Respecting Wildlife Habitats* (chapter C-61.1, r. 18) and the *Regulation Respecting Threatened or Vulnerable Plant Species and Their Habitats* (chapter E-12.01, r. 3).

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6 Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 2017. *Guide technique de suivi de la qualité des eaux souterraines*. [http://www.mddelcc.gouv.qc.ca/eau/souterraines/GTSQES/GTSQES.pdf].

7 Ministère de l'Environnement et de la Lutte contre les changements climatiques, 2019. *Fiche d'information : Analyse des résultats du suivi de la qualité des eaux souterraines*. [https://www.environnement.gouv.qc.ca/eau/souterraines/fiche-info-analyse-resultats-suivi-qualite.pdf]

8 Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 2016. *Guide de réalisation des analyses de la vulnérabilité des sources destinées à l'alimentation en eau potable au Québec*. [http://www.mddelcc.gouv.qc.ca/eau/prelevements/guide-analyse-vulnerabilite-des-sources.pdf].

9 Ministère de l'Environnement et de la Lutte contre les Changements climatiques, 2020. *Guide de présentation des travaux de modélisation hydrogéologique*. https://www.environnement.gouv.qc.ca/eau/souterraines/guide-modelisation-hydrogeologique.pdf

10 Ministère du Développement durable, de l'Environnement et des Parcs, 2005. *Guide de la modélisation de la dispersion atmosphérique.* [http://www.mddelcc.gouv.qc.ca/air/atmosphere/guide-mod-dispersion.pdf].

11 Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 2017. *Guide d'instructions – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers*. [http://www.mddelcc.gouv.qc.ca/air/criteres/secteur_minier.pdf].

12 To this end, the Ministère des Forêts, de la Faune et des Parcs offers standardized protocols for inventories, monitoring and impact assessment. It is strongly recommended that proponents contact the appropriate regional offices to request these protocols.

Particular attention must be paid to plant and animal species that are threatened or vulnerable or likely to be designated as such,[13] invasive alien species and species with special social, economic, cultural or scientific importance. This description also includes an analysis of the importance of each listed ecosystem, according to its ecological and social value, and its degree of vulnerability and uniqueness. In addition, it is important to consider the functions of the habitats, such as reproduction, feeding, rearing and resting, as well as the connectivity of these habitats within the ecosystem.

The description of wetlands and water environments, in accordance with section 46.0.2 of the *Environment Quality Act,*[14] must include the information and documents required under section 46.0.3.

The description of the physical and biological environments is based on a review of the scientific literature, but also on information available from government and municipal agencies,[15] as well as local community knowledge and traditional Indigenous knowledge.

Further, it may be necessary to acquire more detailed knowledge of the ecosystems to be able to assess the project's impact. In this case, the proponent must carry out inventories using proven and recognized scientific methods. In particular, these methods must take into account the life cycle and habits of the species likely to be encountered, so as to enable analysis according to the project's different phases and the foreseen timetable.

Appended to the impact study, the inventory descriptions must include all the information needed to understand and interpret the inventories (author(s), inventory dates, methods used, sampling maps, field sheets, photos, scientific references, etc.). As stipulated in section 31.8 of the *Environment Quality Act*, information and detailed results on threatened or vulnerable species must be presented in a separate, confidential document.

The description of the physical and biological environment must be accompanied by maps showing, in particular, the components identified in the ecosystem: wetlands and hydric environments; regular and intermittent watercourses, including the direction of their flow; wildlife and plant habitats; the location and abundance of invasive exotic species; proposed

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[13] For species that are threatened or at-risk or likely to be designated as such, the proponent should consult the website of the Centre de données sur le patrimoine naturel du Québec (CDPNQ): www.cdpnq.gouv.qc.ca/demande.asp. In the event a discovery is made in the study area, the proponent must also submit its inventory data to the CDPNQ.

[14] For projects in northern environments, the guide *Identification et délimitation des milieux humides du Québec méridional* should be used: www.environnement.gouv.qc.ca/eau/rives/guide-identif-dellimit-milieux-humides.pdf. It is not, however, intended for literal application in the North. Its suggestions are meant only to guide inventory work. In order to obtain results that are representative of the study area, inventory plots must be set up in each homogeneous vegetation unit within the area to be characterized.

The proponent can also consult the *Identification et délimitation des milieux hydriques et riverains* fact sheet www.environnement.gouv.qc.ca/eau/rives/delimitation.pdf and the *Guide d'interprétation de la Politique de protection des rives, du littoral et des plaines inondables* www.environnement.gouv.qc.ca/eau/rives/guide-interpretationPPRLPI.pdf.

[15] To this end, the proponent can consult Données Québec: www.donneesquebec.ca/fr/.

or permanent protected areas,[16] structured wildlife territories as laid out under Chapter IV.1 of the *Act Respecting the Conservation and Development of Wildlife* (chapter C-61.1).

The description of major ecosystems can be based on the *Cadre écologique de référence du Québec*, which can be consulted on the MELCCFP website,[17] or an equivalent scientific framework. The description must also include the geological, topographical, hydrological and climatic factors conditioning the ecosystem and the ecosystem's main species according to life cycle (migration, feeding, reproduction and protection). This description also includes an analysis of the importance of each listed ecosystem, according to its ecological and social value, and its degree of vulnerability and uniqueness.

Ecosystem descriptions can be based on Indigenous knowledge, a review of scientific literature and information available from governmental, municipal or other agencies. If this information is not available or no longer representative of the environment, the proponent must carry out inventories using proven scientific methods and taking into account, in particular, the life cycle and habits of the species likely to be encountered. The inventory descriptions must include all the information needed to understand and interpret the inventories (inventory dates, author(s), methods used, scientific references, sampling maps, etc.). Information and detailed results, including raw data, on threatened or vulnerable species must be presented in a separate, confidential document.

The impact study must include a map of the study area showing, in particular, the ecosystems' identified components, the wildlife habitats defined in accordance with the *Regulation Respecting Wildlife Habitats* (chapter C-61.1, r. 18) as well as any new or planned protected areas.

Description of human-environment components

The description must present the main social, cultural and historical characteristics of the human environment, the relationship between the communities concerned and the natural environment, the subsistence and harvesting activities as well as other uses the communities make of the various elements in the environment, as well as their perceptions of the project. At the very least, the Inuit communities of Kangiqsualujjuaq and Kuujjuaq and the Naskapi community of Kawawachikamach are affected by the Strange Lake Rare Earths Mining Project. If necessary, this description could include the areas of interest for the Innu, the Nunatsiavut Inuit communities or other relevant Indigenous communities. The following items must be presented:

– The main social characteristics of the communities concerned: family, education, health, housing, poverty and cost of living, employment and community development. These characteristics should be presented both for the communities concerned and from

[16] To this end, the proponent should contact the MELCC's Direction des aires protégées.

[17] The reference framework is available at www.mddelcc.gouv.qc.ca/biodiversite/aires_protegees/provinces/conclusion.htm

a regional perspective. In addition, whenever relevant, the proponent must present a gender-differentiated analysis of the following elements:

- demographic profile: proportion of men and women, age categories, demographic outlook for the population concerned and comparisons with other communities or regions,
- cultural context: culture refers notably to knowledge, beliefs, values, norms, roles, ways of life and behaviours acquired by individuals as members of a specific group, community or society,
- economic situation and development prospects: activity, inactivity and unemployment rates, sources of income, salaries, as well as the main sectors of activity and information on training and employment; these data can be compared with those from other communities or regions,
- the pool of workers and enterprises who are qualified to hold positions or carry out contracts in the planned mining activities and the construction of the project,
- Social cohesion: stability and strength of social ties within a given group or community; also illustrated by the sense of belonging to a community; social tensions or divisions can also be described,
- quality of life (the point of view of the various communities should be presented): household social structure based on cultural values, such as families (*ilaginniq* in Inuktitut), the number of people, intergenerational aspects, community life, including social relationships, consumer habits, subsistence and harvesting activities, local and regional political and social dynamics, the sense of belonging to the community and the biophysical environment,
- school systems: the number of students, level of education, number of graduates, success and dropout rates, etc., training programs in place for both youth and adults, as well as joint training programs with school boards or other organizations related to the mining sector,
- broad-ranging health: non-medical factors such as alcohol and drug abuse, housing conditions, workplace discrimination and poverty influence people's physical and mental health. Alcohol and drug abuse is a major problem in Nunavik and elsewhere, and it can have repercussions on employment in the mines; the proponent must indicate whether it intends to offer support to employees with substance abuse problems; the proponent must also describe existing drug and alcohol programs in the communities concerned by the project.

– Means of accessing the nearest communities;

– The importance of social representations of the land and wildlife resources in the culture of the communities concerned: the notion of social representation is defined as a form of social knowledge, common sense, socially elaborated and shared by members of the same social or cultural group. It is a way of thinking, appropriating and interpreting everyday reality and our relationship with the world;

- Current social issues (housing, education, health, the conditions of children, the cost of food, the number of hunters versus those who no longer hunt, etc.);
- The tenure and boundaries of the Category I, II and III lands.
- Information based on Indigenous knowledge, past and present land use of Nunavik and Labrador Inuit, Naskapi and Innu, including:
  - the interest for land users of the affected watersheds,
  - traditional travel routes and when they are most used,
  - locations of subsistence and harvesting activities in the study area, including associated infrastructure (roads, trails, camps, etc.) and the resources that are used or extracted,
  - areas of cultural or spiritual importance.
- The location and description of various buildings situated near the project;
- Location and description of exploration and mining sectors, quarries and sandpits, outfitters and any other type of land use, including resort leases;
- Water sources;
- The sound climate, providing:
  - the $L_{Aeq,\ 24\ h}$ and L_{Aeq} hourly indices at sound survey points (in graphic form); the location of sampling points must cover the sensitive areas most likely to suffer the greatest impacts,
  - three isophone maps of $L_{Aeq\ daytime\ (7\ a.m.\ to\ 7\ p.m.)}$, $L_{Aeq\ evening\ (7\ p.m.\ to\ 10\ p.m.)}$ and $L_{Aeq\ night\text{-}time\ (10\ p.m.\ to\ 7\ a.m.)}$ for the entire study area. Sensitive areas must be shown on these maps,
  - any background information relevant to the interpretation of results at noise survey points, including the characterization of noise peaks at night (10 p.m. to 7 a.m.), specifying the number of events causing noise in excess of 15 dB(A).
- The historical and archaeological heritage: the prehistoric, historical and spiritual sites in the study area, the sites of special interest (such as burial grounds, sacred or special sites). In addition, the proponent must carry out detailed archaeological studies to characterize the archaeological potential of the area, identifying known archaeological sites, areas with archaeological potential and other elements of heritage interest, whether or not they are protected by the *Cultural Property Act*. The Avataq Cultural Institute has expertise in this field and should be consulted for this purpose;
- Landscapes, including visual elements and ensembles of local, tourist or cultural interest, and landmarks that represent the environment.

3.2. Description of alternative plans

3.3.1 Identifying the variants

The impact study presents the various project alternatives,[18] taking into account, where applicable, the variants that were proposed during the proponent's consultations. Alternative plans must take the needs to be met and sustainable development objectives into account. In addition, the proponent must analyze the variations, keeping in mind their potential for GHG emissions, the impact climate change could have on the project or the environment, and climate change adaptation strategies. All these considerations must take the particularity and evolution of the northern environment into account in the context of climate change. In this regard, the proponent must indicate how it intends to adapt its project to climate change and to permafrost degradation to ensure the integrity and long-term stability of its facilities.

The proposal of an alternative may be motivated, for example, by the desire to avoid, reduce or limit:

- Encroachment onto wetlands and water environments or on the land environment that could limit other existing or potential uses;
- Deterioration or loss of habitats,[19] which could affect the biodiversity of the environment;
- Deterioration or loss of habitats that may affect the practice of traditional Indigenous activities;
- Loss of threatened or vulnerable plant species or species likely to be so designated;
- Loss of environments of interest to the communities concerned;
- Loss of exceptional environments;
- Areas at risk of landslides, bank erosion, flooding and submersion;
- The project's carbon footprint;
- Emissions of contaminants, GHGs or other discharges;
- Water use or water management;
- Project construction and operating costs.

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[18] Alternatives are the various means available for implementing a project, whether this means geographical location (sites, corridors, zones), technological availability (processes, construction techniques, operating methods) or operational techniques (actions, measures, programs, management).

[19] To this end, the proponent is invited to consult the *Lignes directrices pour la conservation des habitats fauniques*, available at: https://mffp.gouv.qc.ca/nos-publications/lignes-directrices-conservation-habitats-fauniques

In addition, each selected variant must meet the identified needs and be legally, regulatorily and technically feasible. The selected alternatives must be aimed to limit impacts on the physical, biological and human environments, while maximizing positive spin-offs.

The proponent must present a comparison of the shortlisted alternatives (with a view to selecting one or more that stand out), the rationale and the criteria used to come to the choice of the variant(s) selected for the detailed impact analysis.

Mapping should be the preferred means of representation. It should present the areas of constraint for each alternative and may be supplemented by a comparison table of non-map elements.

Location of project facilities

Taking into account the information gathered during the environmental inventory and the comments received during public consultations, the proponent must choose the location of its infrastructures by comparing the options from environmental, social, technical and economic standpoints. The impact study must explain how the chosen sites differ from the others that were considered and why the latter were not included in the detailed impact analysis. The proponent must illustrate its explanation with maps showing the different elements on which its choice of site was based. Maps must be supplemented by summary tables of non-map elements.

When selecting locations, the proponent must take into account, in particular:

- Land use conflicts;
- Technical and financial opportunities (accessibility, capacity, existing buildings, mining equipment or infrastructure, availability of services and labour, specifications of connection to the service network, possibility of facility layout or or expansion, topography, treated water retention time, construction schedule, costs, etc.)
- Geological condemnation of mining infrastructure sites;
- Social and economic conditions (major concerns, local and regional economic spin-offs, sources of employment, etc.)
- The “avoid and minimize” principle, especially for wetlands, water environments and flood-prone areas.

The proponent must describe the different potential locations for implementing the necessary infrastructure for operating its mine. Given the long lifespan of transportation infrastructures and their importance in opening up the territory to travel (from West to East or North to South), the proponent must analyze the alternatives for accessing the mine site and transporting the concentrate to the processing plant (road, port, etc.). This analysis must include alternatives in Quebec, particularly in Nunavik. In addition to the usual environmental, technical and economic criteria, the analysis must include criteria on the consequences of the project, such as the opening up of the territory and the impact of this on the maintenance of subsistence and harvesting activities. The analysis must also take into account the risks (accidents, spills, etc.) associated with each alternative.

The description of the potential locations must be sufficiently detailed to allow them to be compared and their respective advantages to be assessed from biophysical, human, technical and economic points of view.

The proponent's choices must take into account geological, geotechnical, hydrological and hydrogeological considerations, possible technical and financial constraints, and the scope of impacts stemming from the choices made. Reducing the project's footprint on the local area must be prioritized when choosing alternatives.

The proponent must present the reasoning and criteria that led to the site selection and indicate precisely how these criteria were considered. Particular attention must be paid to justifying the choice of access alternatives to the mine site if these are located outside the province of Quebec and Nunavik. In the event that there is only one physically possible site, the proponent must justify its reasoning.

Technologies used

The impact study must present the advantages and disadvantages of the main technologies the proponent foresees using, considering the technology most favourable to meeting sustainable development objectives. This presentation should include production technologies (open-pit or underground mining methods, ore processing methods, tailings management, etc.), impact mitigation or elimination technologies (effluent recirculation, dust emission reduction, etc.), energy production technologies (renewable energies), as well as access-road and road construction, and the transportation of the concentrate to port facilities. The proponent must also compare the technologies selected for the extraction and processing of rare earths metals and for the management of mine tailings with those used elsewhere in the world.

The impact study must then present the preferred technologies, setting out the rationale and the technical, economic and environmental criteria justifying the choice. The method used to select the technologies must be clearly explained and include the following elements:

- Ability to meet the demand (objectives, needs, opportunities);
- Availability and technical feasibility;
- Completion at costs that do not compromise the project's economic viability;
- Ability to limit the extent of negative impacts on the biophysical and human environments and to maximize positive benefits.

3.3.1 Description of the selected variant(s)

The description of the selected project variant must cover the entire project and all its stages, from infrastructure construction to site restoration, including the operating and ore-processing phase.

All activities likely to emit contaminants into the environment and generate nuisances, including noise, vibrations, odours and dust, must be identified, described, located and quantified, along with the means and mechanisms planned to mitigate their impact.

The impact study must therefore describe all the known and foreseeable characteristics of the selected alternative or, where applicable, of each of the alternatives selected for the detailed impact analysis. This description must include the activities, layouts, work, storage and equipment planned for the various phases of the project, the energy sources foreseen, the labour required and where workers will come from, as well as the temporary, permanent and related facilities and infrastructures.

It must also present a cost estimate for each alternative selected and provide a schedule for the different project phases, the duration of the work (dates and the sequence generally followed), as well as the project's lifespan and future development phases.

This description must also include:

- The geographic coordinates in decimal degrees of the project's centre point;
- The surface area, tenure and ownership of the land, including the land leases needed to build the mining infrastructure;
- Land ownership status, rights of ownership and use granted (or steps required or taken to acquire them), rights of way and easements. On publicly owned land, the land use indicated in the public land use plan for the land concerned;
- An overall plan of the project's components at appropriate scale and an image of all planned developments and structures (perspective plan, visual simulation, etc.), including, if possible, a recent aerial photograph of the area;
- Plans of the road network and other infrastructures, and the source of borrow materials. The proponent must indicate the location, type and size of all bridges and culverts installed over streams and rivers. It must describe the criteria and procedures for their construction and any possible problems for fish movement. It must specify maintenance methods (snow removal, culvert de-icing, measures to improve road network safety, etc.).
- Existing facilities (exploration camp, water treatment system, etc.) and their future (dismantling, relocation, reuse, etc.).

Development and construction phases

Without limitation to the following, the proponent must describe: deforestation, clearing, burning, blasting, concrete paving, use of heavy machinery, truck traffic, relocation or dismantling of buildings or infrastructure, detour and crossing of watercourses, and dewatering of portions of watercourses. Excavation, dredging, backfilling and borrow material extraction must also be described. This description must take into account expected volumes, sources, transportation, reuse, disposal and management methods, where applicable.

Also to be considered:

– Runoff management,[20] drainage and dewatering (collection, control, diversion, treatment, containment, sedimentation basins);

– The risks of soil contamination and the planned management of contaminated soils,[21] including proposed disposal sites and the risk of discovering adventitious contamination;

– Management of soils containing invasive alien plant species;

– Arable soil management;

– Atmospheric emissions (point and diffuse);

– An estimate of the main sources of GHG emissions from the construction phase;

– Residual materials (type, volume, location and management methods [recovery and disposal], etc.). When discharges (particularly of water and hazardous or non-hazardous residual materials) are managed by a third party, the study must demonstrate that the equipment used is capable of managing these discharges in compliance with government requirements;

– Site facilities and other temporary infrastructure (access roads; machinery yards and parking lots; connection points to networks or the receiving environment; work, storage, handling and shipping areas; hazardous materials storage sites, sanitary facilities, docks or other infrastructure encroaching on water environments, etc.).

Operating phase

Without limitation to the following, the proponent must address these elements of the operating phase:

– Buildings, other permanent structures and related facilities (road, rail, port and airport facilities; water intakes; reception, handling and storage areas; parking lots, etc.);

– A description of the work required to repair or rebuild an existing building, structure, equipment or works, or to replace or modify related technical equipment, where applicable;

– Existing or new installations required for the electrical hook-up, with a description of energy and power requirements;

– Residual materials (type, volume, location and management methods [recovery and disposal, etc.]). When discharges (particularly water and hazardous or non-hazardous residual materials) are managed by a third party, the study must demonstrate that the

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20 The *Guide de gestion des eaux pluviales* should be considered to this end. It can be found on the MELCC website:(http://www.environnement.gouv.qc.ca/eau/pluviales/guide-gestion-eaux-pluviales.pdf).

21 Soil and groundwater management must comply with the following guidelines: Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (2019). *Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés* (http://www.environnement.gouv.qc.ca/sol/terrains/guide-intervention/guide-intervention-protection-rehab.pdf).

equipment used is capable of managing these discharges in compliance with government requirements;

- Storage of hazardous materials and the measures that will be taken to ensure that these facilities are maintained in good condition;
- Storage and disposal of residual hazardous materials;
- Processes and equipment;
- Liquid, solid and gaseous discharges (including point and diffuse atmospheric emissions);
- An estimate of the main sources of GHG emissions;
- Consideration of current and future climate change risks in the location, design and operation of project infrastructure;
- Measures for the rational use and conservation of resources (reduction at source, improved efficiency of use and application of recovery technologies: reuse, recycling, etc.);
- Maintenance of structures, facilities and installations.

Shutdown phase

Without limitation to the following, the proponent must address these elements for the closing phase:

- Activities related to the closure and dismantling of facilities;[22]
- Site restoration activities;
- Post-shutdown management activities, if applicable.

More precisely, the following elements specific to mining projects must be included in the impact study:

- Permanent facilities and infrastructure, including galleries, shafts, access ramps, crushers, ore processing plants, buildings, water-retaining structures, dikes, tailings accumulation areas, overburden and ore stockpiles, water treatment units, machinery and equipment yards or garages, fuel storage and distribution facilities, hazardous materials storage sites, drinking-water wells and workers' camps;
- Sealing requirements for tailings accumulation areas; These must be specified, and a modelling study demonstrating groundwater protection must be provided (see Directive 019, sections 2.9.4 and 2.3.1.1);
- Imperviousness levels and stability of retaining structures. These must also be demonstrated and must comply with the requirements laid out in Directive 019.

[22] To this end, the *Guide de bonnes pratiques pour la gestion des matériaux de démantèlement* and the *Lignes directrices relatives à la gestion de béton, de brique et d'asphalte issus des travaux de construction et de démolition et des résidus du secteur de la pierre de taille* should be considered www.environnement.gouv.qc.ca/matieres/valorisation/lignesdirectrices/beton-brique-asphalte.pdf.

Where applicable, a geotechnical characterization of the site soils of the proposed accumulation area, design criteria (safety factors, flood recurrence, seismic resistance, etc.), measures to prevent erosion and maintain the structural integrity, and failure analysis must be presented;

- Processes and equipment, as well as process diagrams and mass balances (inputs and outputs) for each stage of production and waste management;
- The water and waste management plan;
- Water circulation and balance (dewatering, process, runoff, cooling water; sanitary and storm water) in relation to contaminant-generating activities;
- Ore (quantity, geochemical characteristics, transportation [type, frequency, schedule, storage, etc.]);
- Average and maximum daily and annual extraction rates;
- A description of mining and blasting methods;
- The types of explosives used, the approximate quantity required per quantity of ore to be mined and the main chemicals left over from their use and the quantitative ratio;
- Maximum daily mining or processing capacity for ore, waste rock and overburden;
- Tailings, including waste rock, and overburden (quantity; types; geotechnical, mineralogical and chemical characteristics; geochemical behaviour; acid-generation potential; leaching potential [contaminated neutral drainage, etc.]). The proponent must demonstrate, among other things, the representativeness of the sampling carried out on ore and tailings (including waste rock), particularly in terms of acid-generation potential and potential for leaching of harmful substances. In addition to the static and leaching tests required by Directive 019, the proponent is encouraged to carry out further tests to refine the results it obtains, if necessary. Tailings management is a major component of mining projects and it is linked to a number of issues related to this type of project. The characterization of tailings, including waste rock, is therefore key to the project description;
- Other raw materials (technical data sheets for the products used must be provided when available);
- For each type of activity and each stage of the project: liquid, solid and gaseous discharges (quantity and detailed physical and chemical characteristics, precise location of discharge points); noise, odours, diffuse emissions and other types of nuisance; and the associated equipment and facilities (capture, purification, treatment, dispersion, diffusion, elimination, control, reception, storage, handling, etc.);
- For liquid discharges, a presentation of the monthly variability of effluent flows for all phases of the project;
- A description of the wastewater treatment process and design flow. Specify expected average flow rates and, if applicable, these estimates should be detailed for the different project phases;

- Identification of expected contaminants in the effluent. As much as possible, assess concentrations for all the contaminants used to set EDOs. Expected concentrations must be comparable with EDO concentrations;
- In addition to the precise location of discharge points, a description of the effluent discharge method between the treatment system and the receiving environment (pipe, ditch, riprap, etc.);
- The net quantity of water that will be withdrawn from the environment and the source of water used (this must also include dewatering or lowering of the water table);
- A description of the energy sources required to operate the mine site;
- A technical and economic study of using a fleet of low-carbon vehicles and equipment;
- Residual materials (type, volume, location and management methods [recovery and disposal], etc.). When discharges (particularly water and hazardous or non-hazardous residual materials) are managed by a third party, the study must demonstrate that the equipment used is capable of managing these discharges in compliance with government requirements.

Other information

- Working hours, on-site accommodations and living conditions, worker transport (type, frequency, schedule, etc.);
- The type of aircraft used to transport workers and goods, and the frequency of flights.
- Transportation of goods and materials (type, frequency, schedule, etc.);
- Shipping from concentrator to port and the anticipated frequency of trucks;
- Measures for the rational use and conservation of resources (reduction at source, improved efficiency of use and application of recovery technologies: reuse, recycling, composting, etc.);
- Employability measures aimed specifically at Nunavimmiut to facilitate their access to mining jobs and certification, including the proportion of jobs reserved for Nunavimmiut, the communities to be served by air transportation, mining-related training programs, etc.;
- Measures for the linguistic and cultural integration of employees from Indigenous communities, and measures to combat racism, bullying and harassment;
- Programs to educate employees about the cultures of the various Indigenous communities;
- Alcohol and drug policy, restriction and disciplinary measures;
- Policy on use of the road network and access to the mine site;
- Policy for managing the hunting and fishing activities of JBNQA employees, beneficiaries or non-beneficiaries;

- The proponent's health services organization plan. This plan must provide for the availability of sufficient, competent human and material resources to meet the special needs of remoteness and the challenges of a harsh climate. It must also consider the number of workers, possible delays in evacuation and the on-site availability of certain drugs requiring rapid administration;
- The organization and health service corridors planned for emergency or non-emergency evacuations; these must be translated into service agreements with health network establishments in or outside the region;
- Decision-making criteria leading to temporary or permanent closure of the facilities;
- Scenarios and procedures for the progressive restoration of open pits, waste rock stockpiles and tailings accumulation areas;
- A copy of the restoration and redevelopment plan as filed with MERN and provided for in the *Mining Act* (chapter M-13.1) and the characteristics of the monitoring committee provided for in the *Mining Act*. To this end, the proponent is invited to consult the *Guide de préparation du plan de réaménagement et de restauration des sites miniers au Québec* (MERN, 2022) and the *Guide des bonnes pratiques sur les comités de suivi et obligations légales des promoteurs pour des projets miniers et hydrocarbures* (MERN, 2019).

3.3. Identifying the issues

In this section, the proponent must identify the issues at stake in its project, based on the possible interactions between the project and the components of value in the environment. It must also take into account any concerns expressed during public consultations and pay particular attention to traditional knowledge.

The proponent must identify the most important environmental and social issues for all the communities involved, as well as for scientists and citizens concerned with the conservation and sustainable development of northern environments. The proponent's choices must consider climate change and the project's lifespan, which is likely to have long-term negative and positive effects for more than one generation.

This choice must take into account factors related to ecological and human conditions, which may relate to these environmental components':

- Protection status and rarity;
- Importance of their ecological role and the preservation of biodiversity;
- Sensitivity to disturbance and pollution;
- Cultural, economic and social importance and value.

Issues must be described for the planning, construction, operation and closure phases. Once the issues have been identified, the proponent must specify the environmental and human components related to each issue and the inventories and analyses it has carried out (or intends to carry out) to characterize these components.

Given the diversity of the communities affected by the project, it is to be expected that the environmental components associated with the issues will not be equally valued. The proponent must take this into account in its impact analysis.

3.4.1 Identifying the issues

The following issues must be considered when preparing an impact study for a mining project:

- Conservation and protection of surface and groundwater resources;
- Conservation of air quality;
- Implementing responsible mining development.

Further, after reviewing the preliminary information, the KEQC identified other issues to be considered in the impact study. However, this list is not exhaustive, and it is up to the proponent to identify all the issues that should be addressed in the impact study.

The longevity of the land and Indigenous communities' traditional activities

The project is located in an area that is not currently accessible by over-land transportation. The project and road construction will lastingly open up this area and this is likely to have a structuring effect on the area's development and conservation. Based on preliminary information, the area would subsequently be used mainly along an East-West axis. The proposed and future development as well as subsistence and harvesting activities could take place along this axis, which favours trade between Quebec and Newfoundland and Labrador rather than within Quebec, to the south (Schefferville) or to the north (Kuujjuaq and Kangiqsualujjuaq). This increased access to would also open up the George River corridor.

Further, the project will be implemented on land used by various Indigenous communities. The JBNQA states that "The needs and interests of the native peoples are closely tied to their lands; their lands are at the very centre of their existence."

Section 23 of the JBNQA stipulates that government and the bodies created under this section must pay particular attention, in their development activities, to protecting: Indigenous people, their societies and communities, and their economies; Indigenous hunting, fishing and trapping rights; wildlife resources; and the physical and biological environment and ecosystems. Consequently, it is essential the proponent documents food resource capacity in the area affected by the project in relation to the current and future population.

Conserving ecosystems in the George River watershed

The George River watershed requires special attention, as it is a salmon river and home to several habitats that are critical to the caribou. The communities of Kangiqsualujjuaq and Kawawachikamach have close ties with this river, particularly for their subsistence and harvesting activities. The caribou migration corridors and all the wildlife and plant

resources in this watershed are also subject to conservation measures. The Government of Québec has set aside 8,383 km^2 along the George River as a protected area.

The conservation of ecosystems in the George River watershed depends on the protection of water resources in particular. The proponent must describe the policies, programs and actions it intends to implement to ensure the long-term protection of this watershed.

Risks associated with the mining and processing of rare earths metal ores

The extraction and processing of rare earths is not well known to the general public. The perceptions held by the concerned communities of the risks of this type of activity and the pollution it generates, in particular radioactivity, must be taken into account when drawing up the impact study. It will therefore have to present the potential impacts of this industry and of this specific project and propose mitigation measures to make the project acceptable both environmentally and socially. The description of the reference state as well as the generation and management of radioactive residues, for example, are among the sensitive elements that will need to be addressed. The proponent must include an assessment of the risks associated with transporting rare earths oxide concentrate in its evaluation of the impact of radioactivity generated by mining the deposit.

Equitable development

The project development should generate socio-economic spin-offs as well as a significantly contribute to the health, well-being and education of the populations concerned. Subsistence, harvesting and recreational activities must not be compromised. Existing and planned outfitting operations, parks and conservation areas must also be protected and enhanced.

The implementation of a project of this scale can lead to changes in the habits, conditions and quality of life of the members of the communities concerned. Among other considerations, and given current and future mining activities in Nunavik, the labour pool available in the short, medium and long term in Nunavik deserves particular attention. Programs to inform and train local workers and to adapt available opportunities should be developed in partnership with existing local and regional organizations.

Particular attention must be paid to the equitable distribution of project benefits among Nunavik residents and cross-border populations. It will have to take into account the technical risks associated with the project, as well as the risks perceived by the population of the communities concerned.

3.6 Analysis of the project variants

3.6.1 Linking issues and impacts

Once the issues have been identified, the proponent must specify the elements of environmental value associated with each issue. It must also define the precise sources of the impacts of development, construction, operation and closure activities, if any, likely to modify these elements.

The proponent is encouraged to use an interrelationship grid to present the links between the sources of impact and the elements of environmental value, in order to predict the project's likely impacts. The proponent must identify and assess the impacts of the selected variant(s) during the development, construction, operation and closure phases, as applicable. It must identify the scope of these impacts using appropriate methods and criteria. The impact assessment method should be presented in an appendix to the document. The proponent must consider the positive, negative, direct and indirect impacts on the environment in relation to the identified project issues.

3.6.2 Description of the impacts

The proponent must identify the impacts of the selected variant(s) during the preparation, construction and operation phases, and assess the scope of these impacts using an appropriate method and criteria. It must consider the positive, negative, direct, indirect and cumulative impacts and, as the case may be, the synergistic, differed and irreversible impacts caused by project implementation. As previously mentioned, the proponent must present the Indigenous communities' perspectives on the impacts on biophysical and human environment components caused by the major issues of the project.

The study must describe the chosen method for assessing the impacts, as well as its inherent uncertainties or biases. The method and techniques used will have to be objective, concrete, reproducible and understandable by all. The reader must be able to easily follow the reasoning the proponent used to determine the impacts. The study must provide a monitoring tool to link project activities and the presence of structures to environmental components. It can consist of checklists or impact sheets.

The following impacts must be considered in particular when drawing up the impact study:

- Effects on soil quality and, based on the profile of permafrost distribution, the impacts of subsidence and erosion risks associated with melting permafrost at the edges of planned developments;
- Disturbance of aquatic and wetland environments: effects on their integrity, water flow and ice regime and sediment regime; the project's impacts on the George River and Brisson Lake aquatic environments must be described and mitigation measures must be proposed;
- Effects on the quality of surface water; these must be assessed on the basis of the high-risk activities and the former detailed description of the receiving environment and of potential discharges. The proponent will also assess effects by comparing anticipated liquid effluent quality with the EDOs calculated by the Ministry. If it has not already requested and obtained EDOs for the project, the proponent must ensure that it submits all the information the Ministry requires to issue them at this stage. The proponent should refer to the *Calcul et interprétation des objectifs environnementaux de rejet pour les contaminants du milieu*

aquatique.[1] The project's impact on George River and Brisson Lake surface water quality must be described and mitigation measures must be proposed;

- Effects on groundwater: To estimate the project's effect on groundwater, the proponent must carry out groundwater flow and contaminant migration modelling, as presented in appendix III of Directive 019. The impact of various mining infrastructures must be considered (pit, tailings accumulation areas, mine wastewater retention basins, etc.);
- The effects of the project on vegetation, wildlife and their habitats and on threatened or vulnerable species or species likely to be so designated, in a context where maintaining biodiversity in the region and the province are priorities. This aspect will also have to take into account the possibly increased pressure on hunting and fishing caused by the arrival of workers;
- Effects on protected areas;
- The transboundary impacts of the project, given the proximity of the facilities to the province of Newfoundland and Labrador;
- Effects on atmospheric quality: To assess contaminant concentrations across the area potentially affected by the project's atmospheric emissions, the proponent is conducting atmospheric dispersion modelling of contaminants potentially emitted by the project in accordance with the *Clean Air Regulation* and the following documents:
  - *Guide de la modélisation de la dispersion atmosphérique,*[2]
  - *Guide d'instructions – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers,*[3]
  - *Devis de modélisation de la dispersion atmosphérique*[4] (the drawn-up estimate must be approved in advance by the Ministry).
- The proponent must also provide a full report detailing the methodology used to carry out the modelling, as well as the results in the form of tables and maps at an appropriate scale showing isoconcentration curves. The proponent must also compare the results of the study with the ambient air-quality criteria.[5] It should be noted that the mitigation measures envisaged must form an integral part of the modelling scenarios and that their effectiveness must be assessed by atmospheric dispersion modelling;

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[1] Ministère du Développement durable, de l'Environnement et des Parcs, 2007. *Calcul et interprétation des objectifs environnementaux de rejet pour les contaminants du milieu aquatique* – 2nd edition. [http://www.mddep.gouv.qc.ca/eau/oer/Calcul_interpretation_OER.pdf].

[2] Ministère du Développement durable, de l'Environnement et des Parcs, Direction du suivi de l'état de l'environnement, 2005. *Guide de la modélisation de la dispersion atmosphérique.* [http://www.mddelcc.gouv.qc.ca/air/atmosphere/guide-mod-dispersion.pdf].

[3] Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 2017. *Guide d'instructions – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers*.

[http://www.mddelcc.gouv.qc.ca/air/criteres/secteur_minier.pdf].

[4] Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 2015. *Devis de modélisation de la dispersion atmosphérique – Modélisation de niveau 2*. [http://www.mddelcc.gouv.qc.ca/air/criteres/Formulaire-Devis-de-modelisation.doc].

[5] Normes et critères de qualité de l'atmosphère (gouv.qc.ca).

- The project's impact on Quebec's ability to meet its GHG reduction targets. To do so, the proponent must present a complete quantification of the project's GHG emissions according to the criteria laid out in the guide for the consideration of climate change;
- Vibration caused by the project;
- Impacts on the economic situation of the communities concerned. These elements must be specified, without limitation to the following:
    - the total initial CapEx amounts and those made during the project, and an estimate of the percentage of these investments carried out in the project's administrative region,
    - the annual OpEx amounts and an estimate of the percentage of these expenses incurred in the project's administrative region,
    - the number of employees hired (direct jobs) for the development and for the operating phases; data must be presented by year,
    - the distribution of these jobs: distinguish between those expected to be fulfilled by the administrative region and by Nunavik's Indigenous communities,
    - expected short- and long-term economic spin-offs for Nunavik-based businesses (contracts, sales of goods and services, etc.), especially those managed or run by members of the communities concerned,
    - development prospects in related sectors for the communities concerned and the region,
    - an estimate of the corporate and mining taxes that the proponent expects to pay, the tonnage to be extracted from the mine and the concentration of substances to be upgraded, as well as the expected selling price (if it is not confidential),
    - an estimate of the corporate and mining taxes that the proponent expects to pay for the processing plant, the quantities sold and the expected selling price on leaving the plant (if it is not confidential).

- A cost-benefit analysis of the project;
- The effects on family and community life of prolonged worker absences;
- Changes in the habits and living conditions of the members of affected communities resulting from salaried work, including: subsistence and harvesting activities, the creation of social classes, migration to urban centres, housing, changes in family cash inflows and outflows, and substance use habits;
- Alcohol and/or drug use;
- Possible impacts on people's social representations caused by changes to the land and their impact on resources;
- The impact of changes in access patterns on land users' subsistence and harvesting activities;
- Potential impacts on public health, considering in particular the concentrations or loads of contaminants, including radionuclides (in water, air and, where applicable, soil) to which land users could be exposed. The assessment should include an estimate of exposure to possible contamination of traditional foods, using a model based on dietary habits. It should be estimated

according to public health criteria, taking into account existing background noise in the receiving environment. When it comes to public health risks, an appropriate level of analysis must be used. If specific concerns are expressed, additional studies, such as a full risk assessment, may be requested in order to characterize the risk more accurately;

- Nuisance caused by noise or dust, considering not only measurable changes, but also the perception that land users might have;
- Modification of the sound climate in the study area, by providing:
  - Estimates of $L_{eq,\ 24\ h}$ and hourly L_{eq} indices at sound survey points (in graphic form). The location of sampling points must cover the sensitive areas most likely to suffer the greatest impacts;
  - Three isophone maps of $L_{eq\ daytime\ (7\ a.m.\ to\ 7\ p.m.)}$, $L_{eq\ evening\ (7\ p.m.\ to\ 10\ p.m.)}$ and $L_{eq\ night\text{-}time\ (10\ p.m.\ to\ 7\ a.m.)}$ for the entire study area, at the start of operations and 10 years thereafter. Sensitive areas must be shown on these maps;
- Economic impacts associated with mine development and operation; economic impacts may include prices and wages, regional employment or contracting opportunities, and income distribution, with analysis by gender;
- The impacts on prehistoric, historical and spiritual sites present in the area under study, the sites of special interest (such as burial grounds, sacred, preferred or archeological sites).
- Impacts on areas of cultural importance;
- Land users' perceptions and fears of possible environmental contamination from the project, including radionuclides;
- Use of wildlife resources by sport hunters and anglers;
- The impact of opening up new territories and the land-use conflicts that could result;
- Effects on the visual environment (light pollution, intrusion of new visual elements and changed aesthetics of the landscape by pits, tailings facilities, waste rock piles and oxidation caused by the reworking of surface deposits). Where appropriate, the proponent should use visual simulations to illustrate the operating, restoration and closure phases of the project;
- The additional pressure the project causes on the public services and infrastructures of the communities concerned, as well as on local and regional organizational capacities.

3.6.3 Impact mitigation

Impact mitigation aims for the best possible integration of the project into the biophysical and human environments. In this respect, the study must specify the measures planned for the various project phases to eliminate negative impacts or reduce their scope, as well as the measures planned to promote or maximize positive impacts. The study must present an assessment of the effectiveness of the proposed mitigation measures and provide an estimate of their costs.

In terms of the human environment, the proponent must pay particular attention to the measures, policies and programs to be implemented to ensure a safe and harmonious working environment for all workers that is free from discrimination and harassment. To this end, measures to educate non-Indigenous workers about the cultures of the various Indigenous communities should be described.

The proponent must demonstrate the project's ability to meet discharge standards, criteria and requirements. The level and efficiency of mine wastewater treatment and air emissions purification systems must be set according to the requirements of applicable laws and regulations, supplemented where necessary by the specific characteristics of the receiving environment and the best available and economically feasible technologies. The management of these systems must aim for at-source reduction, target minimum discharge and include a continuous improvement program.

In particular, the following mitigation measures should be considered in the context of a mining project:

- An air emissions management plan (including standard and specific mitigation measures during construction and operation, and a preliminary monitoring program). The instruction guide *Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers*[6] provides further detail on this subject;
- Reducing the consumption of water taken from the environment, in particular by optimizing water management and treatment;
- The reclamation of mine tailings according to the *Guide de valorisation des matières résiduelles inorganiques non dangereuses de source industrielle comme matériau de construction*[7] and the *Lignes directrices relatives à la valorisation des résidus miniers*[8] or the reuse of mine tailings or waste rock on the mine site;
- Progressive restoration of overburden and waste rock piles, as well as the tailings accumulation area, during operation, if applicable;
- Development and stabilization of waste rock piles, tailings and overburden areas to control erosion;
- Reduction of the project's footprint and the quantities of waste rock and tailings;
- Enhancement of disused or redeveloped facilities (wildlife habitats, wetlands, etc.);
- The recovery of certain equipment and sites;
- The selection of routes for the transportation of materials and the scheduling of works to avoid accidents and nuisances.

If necessary, mitigation measures specific to road and power-line construction or camp localization should be presented in the impact study.

The KEQC is aware that a potential IBA between the proponent and third parties is likely to include

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[6] Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 2017. *Guide d'instructions – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers*. [http://www.mddelcc.gouv.qc.ca/air/criteres/secteur_minier.pdf].

[7] Ministère du Développement durable, de l'Environnement et des Parcs, 2002. *Guide de valorisation des matières résiduelles inorganiques non dangereuses de source industrielle comme matériau de construction.* [http://www.mddelcc.gouv.qc.ca/matieres/mat_res/inorganique/matiere-residuelle-inorganique.pdf].

[8] Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 2014. *Lignes directrices relatives à la valorisation des résidus miniers*. [http://www.mddelcc.gouv.qc.ca/programmes/prri/lignes_directrices_valorisation_residus_miniers.pdf].

social and environmental mitigation measures, as well as commitments on follow-up and monitoring of project impacts. Thus, the proponent must provide its general intentions in the short, medium and long terms concerning the content and implementation of the IBA, including policies, programs and concrete measures relating to the training and education of Indigenous employees, hiring, supply and service contracts, community development, conflict resolution mechanisms, etc. Without being bound by this IBA, the KEQC must be informed so that it has a full picture and can take these elements into account in its decision.

3.6.4 Compensation for residual impacts

The proponent must propose measures to compensate residual impacts (i.e. impacts on the biophysical and human environments that remain after mitigation measures have been implemented). Compensation measures target the residual impacts on the project's key issues. Losses of wetland or aquatic habitats could be compensated by the creation or improvement of equivalent habitats, particularly by supporting the animal populations that form the basis of subsistence and harvesting activities.

The restoration of abandoned mining sites, the possible reuse of equipment or temporary facilities for public or community purposes, reserving certain construction residues, such as overburden or any other residue, for future use should be among the compensatory measures under consideration. More specifically, as part of its restoration plan, the proponent must focus on existing opportunities, taking into account both the requirements in this area (*Mining Act*) and the potential for innovation, particularly in managing rare earths extraction residues.

Finally, in the event that the proponent finds it economically impossible to process the low-grade ore, it must describe the mitigation and restoration measures it intends to implement, the residual impacts and the compensation measures.

3.6.5 Cumulative and transboundary impacts

The analysis of the project's cumulative and transboundary impacts must focus on all the major issues, including those identified by the KEQC. In particular, the health and social security of individuals, families and communities, education and employment, subsistence and harvesting activities, and other dimensions of an evolving culture will need to be analyzed in relation to the project's opportunities and constraints.

The proponent must provide a rationale for the geographic boundaries of the impact study, bearing in mind that this delimitation may vary from one major issue to another.

The methods used to predict cumulative environmental impacts must be clearly described in order to better understand the reasoning of the conclusions presented and how the analysis was carried out. The traditional knowledge of the Indigenous communities concerned has to be integrated into the assessment of the cumulative environmental effects.

The project's lifespan, its economic importance, and its environmental and human impacts will make a significant difference to the lives of local residents. As presented in the preliminary information, the project is likely to have an impact on all Nunavik communities. These changes will add to those already underway.

The proponent must take into account, in particular, existing mining projects in Nunavik, other components of this project planned for Labrador, mining exploration activities and other projects already underway or likely to be carried out.

3,7 Preliminary emergency measures plan

The impact study must present a preliminary emergency measures plan for the construction, operating and closure periods, if applicable. The plan(s) must describe the main actions foreseen to deal with emergencies as well as the mechanisms for sending out alerts. They must describe the link with municipal authorities and, where applicable, their coordination with the emergency measures plan of the appropriate municipalities. In addition, given the mine site's proximity to the province of Newfoundland and Labrador, plans must indicate how measures will be coordinated with other jurisdictions.

In general, a preliminary emergency measures plan should include:

- A table of contents;
- A description of the various possible or probable situations. This description should include, for the construction phase, the risks associated with the planned work (use of hazardous materials, landslides, riverbank erosion, etc.) as well as preventive and response measures designed to limit these risks;
- A list of hazardous materials to be used and residual hazardous materials to be produced, as well as the location of storage facilities;
- Information relevant in the event of an emergency (contact information for the persons in charge, available equipment, plans or maps of preferred routes, access roads in all seasons, etc.).
- The emergency response structure;
- Actions to be taken in the event of an emergency (emergency calls, signage, evacuation procedures, etc.);
- Means of effectively alerting the people and communities threatened by a disaster, in consultation with the relevant local, municipal and government agencies (sending out the alert and subsequent updates on the situation to public authorities);
- The procedures for updating and reassessing emergency measures. The impact study may refer to an existing emergency measures plan if it is up to date and available for consultation;
- The financial and technical means of implementation for internal and external stakeholders, and simulation exercises.

Given the remote location of the mining site, the proponent must be the first to apply emergency measures in the event of a technological accident, spill, etc. It must provide information on its response capability and handling methods in the following cases:

- Transportation of chemical products (tankers, explosives, etc.) or products deemed potentially dangerous;
- Tailings management;
- Transportation of concentrate to port facilities;

- Petroleum or hazardous product spills at the project site or along the road, with emphasis on the timeliness and means of on-site response;
- Storage of chemical, petroleum and hazardous products;
- Risk of fire along roads, on the mine site or in the various camps during the construction and operating phases.

This preliminary plan must include the proponent's commitment to submitting the final plan it will complete should the project be authorized.

In addition to these elements, the preliminary emergency measures plan must cover the accident scenarios defined in the technological accident risk analysis (see next section), i.e. their consequences (quantity or concentration of contaminants emitted, thermal radiation, overpressure, etc.), the probabilities of occurrence and the areas affected. For accident scenarios that have potential consequences for the surrounding population, the proponent must undertake to coordinate its emergency measures plan with that of the municipality or relevant local organization.

The proponent is invited to consult the various publications on the preparation of emergency measures plans, including the information document on public safety risk management,[9] the risk management guidelines for major industrial accidents[10] and the *Emergency Preparedness and Response Standard.*[11] This standard must be adapted to Quebec's legislative requirements (*Civil Protection Act*). In addition to Directive requirements, the final emergency plan must present minute-by-minute scenarios for each type of major accident. It must also include accident simulation exercises developed in collaboration with various actors (e.g. Northern Villages, band councils, government departments and agencies) to assess the accuracy and validity of the minute-by-minute scenarios.

3.8 Risk management

Some mining projects may cause accidents the consequences of which may extend beyond the project boundaries. The project impact study will therefore require a technological accident risk analysis. At all times, the impact study must describe the safety measures foreseen and present a preliminary emergency measures plan for the construction and operating phases.

Accidents or damage to mining infrastructure and other project components caused by natural disasters or extreme weather events, such as blizzards, must be assessed. This assessment will also take into account climate change. The proponent must explain how the remoteness of the mining project will guide the design of emergency measures.

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9 Ministère de la Sécurité publique, 2009. *Gestion des risques en sécurité civile.* [https://www.securitepublique.gouv.qc.ca/index.php?id=1265].

10 Conseil pour la réduction des accidents industriels majeurs, 2017. *Guide de gestion des risques d'accidents industriels majeurs*. [http://www.craim.ca/produit/guide-de-gestion-risques-daccidents-industriels-majeurs-2017/].

11 Standard *CSA-Z731-03 (R2014) Emergency Preparedness and Response* [https://www.scc.ca/en/standardsdb/standards/18899].

3.8.1 Technological accident hazards

The analysis of the risks of major technological accidents is based on the identification of hazards (the hazardous nature of products, system failures, sources of breakdowns, etc.) from which accident scenarios are established. A review of past accidents (over approximately five years) in similar projects (or, failing this review, of projects using similar processes) must provide additional information for the development of these scenarios. All project-related activities (handling, operation, transportation, particularly maritime transportation in the Arctic seas, etc.) must be considered. Attention must be paid to any event (a dike rupture or a spill, for example) likely to adversely affect the quality of the environment, its use and its users.[12]

If the analysis shows that the project is not likely to result in major technological accidents, the proponent must simply use the information previously gathered in its contingency planning. The proponent may use the "standardized scenario" concept suggested by the Ministry[13] to demonstrate the absence of potential for major technological accidents.

If the proponent cannot demonstrate that the absence of a risk of major technological accident, it must pursue the risk analysis with in-depth consideration of the resulting hazards and accident scenarios to establish the consequences and associated risks.

The analysis must identify the sensitive elements that could be affected in the environment, such as residential neighbourhoods, hospitals, schools and daycare centres, natural sites of special interest, subsistence areas and activities, zoning, etc.

The risk analysis must therefore include an evaluation of the consequences related to the accident scenarios. This step has the aim of defining the areas within which the safety of the surrounding population and the integrity of the natural and human environment could be affected, as well as the presence of the previously identified sensitive elements. This information must be retained for contingency planning.

When there are sensitive elements in areas likely to be affected, the analysis also includes an estimate of the frequency of occurrence to establish the project risks. These are then indicated according to their geographical position via à vis the location of the mining site or the plant and are illustrated with maps showing the sensitive elements and the various results of the risk analysis. Wherever possible, the proponent must provide the geo-referenced data from this analysis. The proponent must present a discussion of the results of the risk analysis.

Safety measures (retaining dike, safety distances, etc.) intended to mitigate the potential consequences or risks of the selected accident scenarios must be presented and discussed along with the scenario analysis.

The study must provide a summary analysis of external events that could lead to major technological accidents on the project site. All elements or events, whether natural (flood,

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12 The steps to be taken following this initial analysis are presented in Appendix C.

13 Ministère de l'Environnement, 2002. *Guide – Analyse de risques d'accidents technologiques majeurs, document de travail*. [http://www.mddelcc.gouv.qc.ca/evaluations/documents/guide-risque-techno.pdf].

earthquake, etc.) or human (neighbouring project, plane crash, etc.) must be considered. This information must be integrated into contingency planning.

The proponent must conduct the technological risk analysis according to the rules of the trade. It must justify the use of data, formula and calculation assumptions, explain the limitations of the chosen method and the uncertainties surrounding the results, and indicate all references. The analysis must take into account the laws, regulations and codes of practice to which the mine or plant must conform.

If the project involves the construction of dikes or dams subject to the *Dam Safety Act* (chapter S-3.1.01), the proponent must present the steps taken with the Centre d'expertise hydrique du Québec (CEHQ) to ensure that its works comply with the *Dam Safety Act* and the *Watercourses Act* (chapter R-13). It must indicate the classification of the retaining structures and the level of consequence of to failure that the CEHQ assigns of its structures. The proponent must also present the safety standards and requirements of the *Dam Safety Act* that apply to these structures.

3.8.2 Safety measures

The impact study must describe the security measures planned for the operating sites, including related facilities located outside the main site. Among other things, it must describe the following elements:

- Site access limitations;
- Safety measures for land and air transport;
- Security installations and preventive measures (monitoring systems, emergency shutdown, firefighting systems, ventilation and safety shafts, sprinklers, emergency generators, leak detectors, high-level alarms, catchment basins, safety distances, etc.);
- Storage of products according to their level of hazard.

3.9 Preliminary environmental monitoring program

Environmental monitoring must be carried out by the proponent to ensure compliance with:

- Measures laid out in the impact study, including the mitigation or compensation measures;
- Conditions set out in the certificate of authorization;
- The proponent's commitments foreseen in the Ministerial authorizations;
- Requirements in the relevant laws and regulations.

The proponent must propose a preliminary environmental monitoring program in the impact study that will be enhanced once all the components of the project have been defined. It must be completed, if necessary, following authorization of the project.

The program must describe the means and mechanisms put in place to ensure compliance with legal and environmental requirements. The program must make it possible to verify the smooth operation of the works, the equipment and the facilities, and to supervise any disturbance of the environment caused by the project's implementation, operation, closure or dismantling. The

monitoring program makes it possible, if necessary, to redirect the work and possibly improve the progress of construction and implementation of the project's various components.

In particular, the environmental monitoring program must include:

- A list of elements requiring environmental monitoring;
- All of the measures and means foreseen to protect the environment;
- The characteristics of the monitoring program (for each environment: surface water, atmosphere, use of soils, release of tailings or runoff, etc.), when these are foreseeable (e.g. location of interventions, planned protocols, list of measured parameters, analytical methods used, implementation schedule, human and financial resources allocated to the program);
- An intervention mechanism in case of the observation of non-compliance with the legal and environmental requirements or the proponent's commitments;
- The proponent's commitments to file monitoring reports (number, frequency, content);
- The proponent's commitments regarding the dissemination of environmental monitoring results to the population concerned.

3.10 Preliminary environmental monitoring program

The purpose of the environmental monitoring carried out by the proponent must be to verify in the field the accuracy of the evaluation of certain impacts and the effectiveness of certain mitigation or compensation measures in the impact study and for which some uncertainty remains.

Environmental monitoring can cover the physical, biological and human environments. In particular, it can examine certain sustainable development indicators that can be used to track changes in the issues identified during the analysis phase during project operation.

The proponent must propose a preliminary environmental and social monitoring program in its impact study. This preliminary program, if necessary, must be completed following authorization of the project. This program must include:

- The reasons for the monitoring, including a list of the elements requiring environmental monitoring;
- The minimum duration of the monitoring program, its objectives and targeted components (validating the impact assessment, evaluating the effectiveness of mitigation measures for water, air, soil, etc.)
- The number of monitoring studies planned and their main characteristics (the list of parameters to be measured and the projected completion schedule);
- The terms and conditions for producing the monitoring reports (number, frequency, format and distribution);
- The response mechanism that will be implemented in the event of unexpected environmental degradation;
- The proponent's commitments regarding the filing of the final program and of its environmental monitoring reports.

4 PRESENTATION OF THE IMPACT STUDY

4.1 Methodological considerations

The impact study must be written in clear and concise language and be limited to the elements necessary for a solid understanding of the project and its impacts. More technical information should be presented in appendices, not in the main document, unless such details are key to the reader's understanding. The impact study must be structured in such a way as to highlight the main issues and concerns of the affected communities, as well as the way in which they have been considered in the project development.

The highlights of the impact study must be accompanied by elements that clearly illustrate the point, such as graphs, maps and photographs. Maps must be presented with reference data to allow comparison and superimposition of the mapped elements. The availability and quality of the data used must be evaluated by the proponent. All sources of information must be referenced. In addition, the methods used in conducting the impact study (inventories, surveys, interviews, comparative analyses, etc.) must be presented, explained and scientifically validated in an appendix.

Whenever possible, information should be summarized and presented in tables and the data (both quantitative and qualitative) and the impact study should be analyzed in the light of the appropriate documentation.

Summary

A summary of the impact study, presenting a brief description of the project and its rationale, a reminder of the legal context, the modalities of the project's execution and operation, the main issues at stake in the project and the conclusions of the impact study must be included in the introductory pages of the document.

Description of the environment

The description of the environment must include all the information needed to assess its quality (location of inventory and sampling stations, inventory dates, techniques used and limitations, field sheets, photographs). All sources of information must be referenced. The name, profession and title of the people who contributed to the impact study must be indicated. The project proponent must comply with the requirements of the *Act Respecting Access to Documents Held by Public Bodies and Protection of Personal Information* (chapter A-2.1) and the *Act Respecting the Protection of Personal Information in the Private Sector* (chapter P-39.1) and it must avoid including such information in the impact study.

Impact assessment

The evaluation of the scope of an impact first depends on the change undergone by the affected environmental and social components. The more an impact is widespread, frequent, lasting or intense, the more important it will be. The impact must be analyzed at the scale of the study area, region or province (e.g. loss of biodiversity).

The assessment of the scope of the impact also depends on the affected component, namely its intrinsic value for the ecosystem (sensitivity, unicity, rarity, reversibility) and the social, cultural, economic and aesthetic values the population attributes to it. The more an ecosystem component is valued by the local population, the more its impact is likely to be great. The population's fundamental concerns, namely when the project elements constitute a danger to health or safety or a threat to cultural heritage and land or underwater archaeological sites, also influence this assessment. In addition, the impact study must mention any formal recognition of the component through a special status assigned to it.

While description of the impacts is based on anticipated facts, their assessment entails a value judgment. This may not only help establish acceptability thresholds or levels, but also make it possible to determine the impact mitigation criteria and monitoring or follow-up needs.

The impact study must describe, in the appendix, the chosen method and the connected uncertainties or biases. The techniques and methods used will have to be objective, concrete and reproducible. The reader must be able to easily follow the reasoning the proponent used to determine the impacts. At the very least, the impact study must provide a monitoring tool to link project activities and the presence of structures to environmental components. These can be summary tables, checklists or impact sheets. The implementation of citizen participation mechanisms and the consultation of literature on the type of project (including impact studies of similar projects) are other means of identifying and assessing potential impacts during the different project stages.

In order to encourage public participation in the environmental and social impact assessment procedure under Section 23 of the JBNQA, particularly in public consultations, and to facilitate the work of the KEQC, of Nunavik authorities and of communities affected by the project, the proponent must:

- Submit the main document of its impact study in French and provide copies of its study in English;
- Prepare a summary of the impact study content. This summary must cover all the points raised in the impact study and include illustrations and maps to facilitate understanding of the work planned. The summary must be sufficiently detailed so that readers may become familiar with and understand the project as a whole, as well as the issues at stake, the anticipated impacts, the proposed mitigation measures, the residual impacts, compensation measures and the conclusions on the significance of these impacts. **This summary must be submitted in English, French, Inuktitut and Naskapi.**
- The KEQC may request that English versions of documents other than those mentioned above, or summaries thereof, be filed.

4.2 Confidentiality of certain information and data

The KEQC will post on its website all the documents provided by the proponent to support the public hearings what will be held in the communities affected by the project.

Consequently, when the proponent sends information or data concerning industrial processes or the location of threatened or vulnerable species and deems them to be confidential, it must submit a request to exempt them from public consultation. To make such a request, it must demonstrate:

- 1. that the information or data concerns industrial processes or the location of threatened or vulnerable species, and
- 2. why this information or data is confidential and what harm could result if it were disclosed.

This information and data must be placed in a document separate from the impact study and clearly marked as confidential. The information contained in this document must be precise and consistent with the content of the impact study.

APPENDICES

APPENDIX A

ADDITIONAL INFORMATION SPECIFIC TO RARE EARTHS METAL MINING PROJECTS

This appendix presents the additional information specific to rare earths metal (REM) mining projects that is expected to be found in the impact study. It should be emphasized that analysis of the parameters in this directive in an accredited subject area must be carried out by a certified laboratory.

1. ENVIRONMENTAL CHARACTERIZATION

1.2 Initial soil characterization

The proponent must carry out a soil characterization of the study area defined in the impact study to obtain background levels of REMs and all associated parameters (including levels of certain radionuclides) in accordance with the guidelines and requirements mentioned in section 3.2.2 of this directive. The parameters to be analyzed in soils must include all contaminants likely to be generated during each stage of mine operations (extraction, processing, etc.).

1.2. Initial water and sediment characterization

The proponent must carry out a characterization of the surface water in the study area defined in the impact study to obtain background levels of REMs and other associated elements (for which an accredited analytical method exists). The number and location of stations, sampling frequency and period, parameters to be characterized, and sampling and analysis methods are described in the document *Guide de caractérisation physico-chimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel* from the MELCCFP.[1] The basic parameters covered by this characterization, as well as those specific to REM mines, are listed in Table 1. As with other metals, REM require trace analysis.

The location of stations, the number of stations and samples per station, the sampling frequency and period, and the sampling and analysis methods for sediment are also described in this guide. The parameters covered by this characterization, including REMs, are listed in Table 2.

The radionuclides to be analyzed in surface water and sediments are also described in Table 3, where radionuclide selection is based on the assumption of the presence of equilibria in radioactive decay chains, as explained in the document *Radionucléides recommandés pour l'analyse de la radioactivité dans les matrices environnementales* (CEAEQ, 2015). Certain radionuclides, notably polonium, could also be characterized in fish flesh or tissues.[2]

Table 1. Basic and specific parameters associated with rare earths metal deposits targeted by the characterization of the initial state of surface waters

Basic physical chemistry and nutrients

[1] *Guide de caractérisation physico-chimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel* (MDDELCC, 2015). Document available at: www.mddelcc.gouv.qc.ca/eau/oer/Guide_physico-chimique.pdf

Protocole d'échantillonnage pour le suivi des substances toxiques dans la chair des poissons de pêche sportive en eau douce. 18 pages. https://www.environnement.gouv.qc.ca/eau/eco_aqua/toxique/Protocole_echantillonnage.pdf

Alkalinity Dissolved organic carbon Conductivity Hardness Suspended matter	Dissolved oxygen pH Total dissolved solids Temperature Turbidity	Ammoniacal nitrogen (in N) Total nitrogen (in N) Nitrates-Nitrites (in N) Total phosphorus (in P) Faecal coliforms
Anions and cations		
Bromides Calcium	Chlorides Fluorides Magnesium	Potassium Sodium Sulfates
Total extractable trace metals [3]		
Aluminum Antimony Silver Arsenic Barium Beryllium Boron	Cobalt Cadmium Chromium Copper Iron Manganese Molybdenum	Lead Nickel Selenium Strontium Uranium Vanadium Zinc
Total extractable rare earths metals and trace rare metals		
Lanthanum ($_{57}$La) Cerium ($_{58}$Ce) Praseodymium ($_{59}$ Pr) Neodymium ($_{60}$ Nd) Promethium ($_{61}$Pm) [4] Scandium ($_{21}$Sc) Yttrium ($_{39}$Y)	Samarium ($_{62}$Sm) Europium ($_{63}$Eu) Gadolinium ($_{64}$Gd) Terbium ($_{65}$Tb) Dysprosium ($_{66}$Dy) Lithium (Li) Niobium (Nb) Zirconium (Zr) Tantalum (Ta)[4]	Holmium ($_{67}$Ho) Erbium ($_{68}$Er) Thulium ($_{69}$Tm) Ytterbium ($_{70}$Yb) Lutetium ($_{71}$Lu)

[3] For some metals, water-quality characterization is rounded out by a fish-flesh characterization. These are mercury, selenium and arsenic. For this follow-up, fish-flesh sampling must be carried out according to the Ministerial protocol (MDDEFP, 2013).

[4] Promethium, zirconium and tantalum are not currently analyzed by the CEAEQ

Table 2. Basic and parameters associated with rare earths metal deposits targeted by the characterization of the initial state of sediments

Basic parameters		
Total organic carbon	Sulfur	Particle size
Total extractable metals [5]		
Aluminum Antimony Silver Arsenic Barium Beryllium Boron	Cobalt Cadmium Chromium Copper Iron Mercury Manganese Molybdenum	Lead Nickel Selenium Strontium Uranium Vanadium Zinc
Rare earths metals and total extractable rare metals		
Lanthanum ($_{57}$La) Cerium ($_{58}$Ce) Praseodymium ($_{59}$ Pr) Neodymium ($_{60}$ Nd) Promethium ($_{61}$Pm) [7] Scandium ($_{21}$Sc) Yttrium ($_{39}$Y)	Samarium ($_{62}$Sm) Europium ($_{63}$Eu) Gadolinium ($_{64}$Gd) Terbium ($_{65}$Tb) Dysprosium ($_{66}$Dy) Lithium (Li) Niobium (Nb) Zirconium (Zr) Tantalum (Ta)[6]	Holmium ($_{67}$Ho) Erbium ($_{68}$Er) Thulium ($_{69}$Tm) Ytterbium ($_{70}$Yb) Lutetium ($_{71}$Lu)

Table 3. Radionuclides for surface water and sediment characterization

Surface water **Reference state and EDO monitoring**	**Sediment** **Reference state and monitoring**
U-238	U-238
U-234	-
Ra-226	Ra-226
Pb-210	Pb-210
Th-232	Th-232
Ra-228	Ra-228
Th-228	Th-228

[5] For some metals and in some situations, water-quality and sediment characterization is rounded out by a fish-flesh characterization. These include mercury, selenium and arsenic, namely. Rare earths metals and radionuclides can be added to this list. For this monitoring, fish-flesh sampling must be carried out in accordance with the Ministerial protocol (MDDEFP, 2013).

[6] Promethium, zirconium and tantalum are not currently analyzed by CEAEQ

1.3 Groundwater characterization

The proponent must carry out a groundwater characterization of the study area defined in the impact study to obtain local baseline levels of groundwater quality and its spatial variability, including any parameters whose levels are likely to be modified by mining operations. Sampling and analysis should be carried out for the basic parameters of Mining Directive 019 (section 2.3.2.2).

The proponent must therefore ensure that groundwater characterization includes rare earths minerals and any associated parameters (including radionuclides) likely to leach from ore, waste rock and tailings storage areas, to obtain a reference value for the analysis stipulated in section 2.3.1 of Mining Industry Directive 019. The radionuclides to be analyzed in groundwater are the same as those to be analyzed in surface water in Table 4, i.e.: U-238, U-234, Ra-226, Pb-210, Th-232, Ra-228, Th-228.

2. ATMOSPHERIC MODELLING

In the same way as for any other mining project, a rare earths mining project must carry out an atmospheric dispersion modelling of contaminants, as stipulated in section 197 of the *Clean Air Regulations* (chapter Q-2, r. 4.1) and according to the information presented in section 3.2.2 of this directive.

In addition to the contaminants usually required in atmospheric dispersion modelling for a mining project, the proponent will need to analyze additional parameters specific to REM mines. This should include certain REMs, such as cerium (CAS 7440-45-1) and yttrium (CAS 7440-65-5). In addition, given the probable presence of radionuclides in the deposit, the proponent must include the following elements in its atmospheric modelling: for the uranium-238 decay chain: U-238, Th-230, Rn-222 and Pb-210, and for the thorium-232 decay chain: Total Th for the series (Th-232 and Th-228). Modelling of other elements may be required depending on the composition of the ore, tailings and waste rock.

Finally, the MELCCFP calculates the initial atmospheric concentrations of the contaminants targeted by a modelling study as per the guidelines set out in section 202 of the *Clean Air Regulation* (chapter Q-2, r. 4.1). Please note that further information on determining initial concentrations can be found in section 4.4 of the *Guide d'instructions - Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques: Projets miniers*. If the proponent wishes to install its own sampling station to establish initial atmospheric concentrations before the project is carried out, it must contact the Ministry for this purpose. In general, a minimum sampling period of five years prior to project completion is required to obtain representative values.

3. RADIOTOXIC RISK ASSESSMENT

Following geological reworking of ores containing REMs, thorium and its descendants can be dispersed in the environment, redistributed throughout all ecosystem compartments and adversely affect the flora and fauna with which they are in contact. In order to estimate the risk associated with these substances for land flora and fauna, the proponent must carry out an assessment of the

radiotoxic risks associated with the presence of radionuclides or their release into the environment. This can be carried out using the radiotoxic risk assessment procedure developed by CEAEQ.[7]

The aim of radiotoxic risk assessment is to estimate the probability of occurrence of adverse effects on ecological receptors likely to be affected by exposure to one or more radionuclides, depending on the specific characteristics of the source of contamination and the site under study. The assessment can be applied to a number of situations for which an ecotoxicological risk assessment is carried out, i.e. for any installation or practice leading to a significant increase in the level of exposure of ecological receptors to radionuclides compared with the background level. Necessary to the risk assessment process for mining projects, this study will provide an appropriate framework for rare earths mining activities. Finally, it will enable management measures to be put in place to limit the exposure of ecological receptors to radionuclides, should the study conclude that there is a potential risk arising from such exposure.

4. CHARACTERIZATION OF ORE, TAILINGS AND WASTE ROCK

A comprehensive characterization of ore, concentrate, waste rock and mill tailings is required under Mining Directive 019. The proponent must describe the mineralogical nature of the deposit and the bedrock. The number of samples must be sufficient and representative for each geological unit. The *Guide de caractérisation des résidus miniers et du minerai,*[8] which was published in June 2020 and is available on the Ministry website, can be used to guide the proponent in carrying out the characterization.

For REM mining projects, the proponent must provide the relative percentages of the various minerals with their chemical formula and identify minerals containing radioactivity (e.g. monazite, thorite) as well as REMs. This information must be detailed for each of the geological units representing ore and waste rock, as well as for tailings produced during pilot processing, if applicable. The proponent must determine the total extractable content of ore, waste rock and tailings by analyzing the parameters in Table 4. The proponent may need to add additional parameters depending on the characteristics of the ore and waste rock.

[7] Centre d'expertise en analyse environnementale du Québec. 2015. *Procédure d'évaluation du risque radiotoxique pour l'environnement*, Québec, Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 28 pp. and appendices. http://www.ceaeq.gouv.qc.ca/ecotoxicologie/pere/perr.pdf

[8] Guide de caractérisation des résidus miniers et du minerai (gouv.qc.ca)

Table 4. Basic parameters and parameters for REM deposits, targeted by the characterization of ore, waste rock and tailings

Metals and other parameters	Radionuclides
Metals from the Policy and other recommended soil parameters (columns 1 and 2 of Table 1)	U-238
Antimony	Ra-226
Bismuth	Pb-210
Boron	Th-232
Calcium	Ra-228
Iron	Th-228
Magnesium	U-234*
Potassium	Th-230
	Po-210*
	K-40
	U-235

*These parameters are required in situations of secular disequilibrium, either for mill tailings where processing modifies the secular equilibrium or for the analysis of leachates generated by ore, waste rock and mill tailings.

Under Mining Directive 019, the proponent must also determine the potential for acid mine drainage and conduct leach tests on ore, waste rock and mill tailings. To determine whether ore, waste rock and mill tailings are considered radioactive or high-risk, the S coefficient (Appendix II of Mining Directive 019) will have to be evaluated for each material and for any leachates generated. The S coefficient is calculated from the activities of the radionuclides identified in Table 4.

Rare-earths metal-rich pegmatite and apatite minerals can contain elements, such as Li, B, Ba, Be, F, Nb, Sn, Sr, Ta, Ti, Zr, REE, Y, Sc, U and Th. These elements must be analyzed when characterizing discharges and the receiving land environment.

In the preliminary information document, the proponent indicates the presence in the ore of metals, such as silver, arsenic and copper, that are potentially toxic to land organisms. It also states that "certain metallic elements may be leachable at a risk level classified as 'intermediate'" (courtesy translation). The proponent must provide a portrait of the concentration and mobility of metallic elements and radioelements (e.g. U and Th) found in the solid mine tailings, due to the risks of dispersion of these elements from, in particular, the tailings accumulation area and dust dispersion.

5. ADDITIONAL INFORMATION

In addition to the above information, the proponent of a rare earths mining project must provide a detailed description of all stages of the ore treatment process. It must specify whether the separation of the various rare earths elements is planned on the mine site or not. It must provide an exhaustive list of all the inputs and reactants used in the process, together with the corresponding data sheets. Based on these inputs and reactants, the proponent will determine whether additional parameters need to be characterized in soil, water and air, and analyzed in ore and tailings. Finally, the proponent should note that modelling of expected final effluent concentrations must be carried out for the metals listed in Table 1, in addition to those deemed relevant to the proponent's deposit and process.

The proponent must also predict the impact of permafrost degradation on the mobility of metallic elements and radioelements present in permafrost for land flora and fauna.