APPENDIX AD

Canadian Environmental Assessment Agency
Guidelines for the preparation of an Environmental Impact Statement (EIS) for an environmental assessment conducted pursuant to the *Canadian Environmental Assessment Act, 2012*
Joyce Lake Direct Shipping Iron Ore Project

Canadian Environmental Assessment Agency | Agence canadienne d'évaluation environnementale

ENVIRONMENTAL IMPACT STATEMENT GUIDELINES

Guidelines for the preparation of an Environmental Impact Statement (EIS) for an environmental assessment conducted pursuant to the *Canadian Environmental Assessment Act, 2012*.

Joyce Lake Direct Shipping Iron Ore Project

Labec Century Iron Ore

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Canada

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DISCLAIMER

This document is not a legal authority, nor does it provide legal advice or direction; it provides information only, and must not be used as a substitute for the *Canadian Environmental Assessment Act, 2012* (CEAA, 2012) or its regulations. In the event of a discrepancy, the CEAA, 2012 and its regulations prevail. Portions of CEAA, 2012 have been paraphrased in this document, but will not be relied upon for legal purposes.

Part 1 - Background

1 INTRODUCTION

The purpose of this document is to identify for the proponent the information requirements for the preparation of an Environmental Impact Statement (EIS) for a designated project[1] to be assessed pursuant to the Canadian Environmental Assessment Act, 2012 (CEAA, 2012). This document specifies the nature, scope and extent of the information required.

It is the responsibility of the proponent to provide sufficient data and analysis on any potential changes to the environment to permit a thorough evaluation of the environmental effects of the project by the Canadian Environmental Assessment Agency (the Agency). The EIS Guidelines set out minimum information requirements. It is the proponent's responsibility to provide any additional information required to assess the environmental effects of the project. Except where specified by the Agency, the proponent has the discretion to select the most appropriate methods to compile and present data, information and analysis in the EIS.

2 GUIDING PRINCIPLES

2.1 Environmental assessment as a planning tool

Environmental Assessment (EA) is a planning tool used to ensure that projects are considered in a careful and precautionary manner in order to avoid or mitigate the possible adverse effects of projects on the environment and to encourage decision makers to take actions that promote sustainable development.

2.2 Public participation

One of the purposes identified in CEAA, 2012 is to ensure opportunities for meaningful public participation during an EA. The Act requires that the Agency provide the public with an opportunity to participate in the EA and an opportunity to comment on the draft EA report.

The overall objective of meaningful public participation is best achieved when all parties have a clear understanding of the proposed project as early as possible in the review process. The proponent is required to provide current information about the project to the public and especially to the communities likely to be most affected by the project.

2.3 Aboriginal consultation

One of the purposes of CEAA, 2012 is to promote communication and cooperation with Aboriginal peoples, including First Nations, Inuit and Métis. To work toward this goal, the proponent will ensure that it engages with Aboriginal people and groups that may be affected by the project or that have potential or established Aboriginal and Treaty rights and related interests in the project area, as early as possible in the project planning process. The proponent is strongly encouraged to work with Aboriginal groups in establishing an engagement approach. In addition, the Aboriginal persons involved will have access to

1 In this document, "project" has the same meaning as "designated project" as defined in the CEAA, 2012.

relevant information that allows them understand the proposed project and to determine its impacts on their rights and interests. The proponent will make reasonable efforts to integrate “traditional Aboriginal knowledge” that will contribute to the assessment of environmental impacts.

All information gathered through the EA process and associated engagement by the proponent and consultation by government with Aboriginal peoples will be used to inform decisions under CEAA, 2012. This information will also inform the Crown’s understanding of the potential adverse impacts of the project on potential or established Aboriginal and Treaty rights and related interests, and the effectiveness of measures proposed to avoid or minimise those impacts.

3 PREPARATION AND PRESENTATION OF THE EIS

3.1 Agency guidance

The proponent is encouraged to consult relevant Agency Policy and Guidance[2] on topics to be addressed in the EIS. The proponent is further encouraged to consult with the Agency and federal authorities (see section 3.4.1) during the planning and development of the EIS materials.

3.2 Study strategy and methodology

The proponent is expected to respect the intent of the EIS Guidelines and to consider the effects that are likely to arise from the project (including situations not explicitly identified in these guidelines), the technically and economically feasible mitigation measures that will be applied, and the significance of any residual effects. It is possible that the EIS Guidelines may include matters that, in the judgement of the proponent, are not relevant or significant to the project. If such matters are omitted from the EIS, the proponent will clearly indicate it and the justification for their conclusion provided so that the Agency, federal authorities, Aboriginal groups, the public and any other interested party have an opportunity to comment on this decision. Where the Agency disagrees with the proponent's decision, it may require the proponent to provide the specified information.

In describing methods, the proponent will document how it used scientific, engineering, traditional and local knowledge to reach its conclusions. Assumptions will be clearly identified and justified. All data, models and studies will be documented such that the analyses are transparent and reproducible. All data collection methods will be specified. The uncertainty, reliability and sensitivity of models used to reach conclusions will be indicated.

All significant gaps in knowledge and understanding related to key conclusions presented in the EIS will be identified. The steps to be taken by the proponent to address these gaps will also be identified. Where the conclusions drawn from scientific and technical knowledge are inconsistent with the conclusions drawn from traditional knowledge, the EIS will contain a balanced presentation of the issues and a statement of the proponent's conclusions.

3.3 Integration of EA, Aboriginal and public consultation information

In preparing the EIS, the proponent is encouraged to integrate Aboriginal and public consultation outcomes into the consideration and mitigation of environmental effects at the appropriate EA analytical steps (Figure 1). The proponent will ensure that public and Aboriginal concerns are well documented in

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Visit the Canadian Environmental Assessment Agency website: [2] www.ceaa-acee.gc.ca/default.asp?lang=En&n=F1F30EEF-1

the EIS. The proponent will identify and explain all unresolved questions or concerns as part of its analysis of the impacts of the project.

This information will help the Crown assess adequacy of consultation with Aboriginal groups, as set out in the "Updated Guidelines for Federal Officials to Fulfill the Duty to Consult" (2011)[3].

[3] Visit the Aboriginal Affairs and Northern Development Canada website at: www.aadnc-aandc.gc.ca/eng/1100100014680/1100100014681

Figure 1. Integration of environmental assessment, Aboriginal and public consultation information into the Environmental Impact Statement.

3.4 Use of information

3.4.1 Scientific advice

Section 20 of CEAA, 2012 requires that every federal authority with specialist or expert information or knowledge with respect to a project subject to an EA make that information or knowledge available to the Agency. The Agency will advise the proponent of the availability of any pertinent information or knowledge so that it can be incorporated into the EIS, along with, as appropriate, expert and specialist knowledge provided by other levels of government.

3.4.2 Community knowledge and Aboriginal traditional knowledge

Sub-section 19(3) of CEAA, 2012 states that "the environmental assessment of a designated project may take into account community knowledge and Aboriginal traditional knowledge". For the purposes of these guidelines, community knowledge and Aboriginal traditional knowledge refers to knowledge acquired and accumulated by a community or an Aboriginal community, through generations of living in close contact with nature.

The proponent will incorporate into the EIS the community and Aboriginal traditional knowledge to which it has access or that is acquired through Aboriginal engagement activities, in keeping with appropriate ethical standards and without breaking obligations of confidentiality, if any. Agreement should be obtained from Aboriginal groups regarding the use, management and protection of their existing traditional knowledge information during and after the EA.

3.4.3 Existing information

In preparing the EIS, the proponent is encouraged to make use of existing information relevant to the project. However, when relying on existing information to meet requirements of the EIS Guidelines, the proponent will either include the information directly in the EIS or clearly direct the reader to where it may obtain the information (i.e., through cross-referencing). When relying on existing information, the proponent will also comment on how the data have been applied to the project, clearly separate factual lines of evidence from inference, and state any limitations on the inferences or conclusions that can be drawn from the existing information.

3.4.4 Confidential information

In implementing CEAA, 2012, the Government of Canada is committed to promoting public participation in the environmental assessment of projects and providing access to the information on which environmental assessments are based. All documents prepared or submitted by the proponent or any other stakeholder in relation to the environmental assessment are included in the Canadian Environmental Assessment Registry (CEAR) and made available to the public on request. For this reason, the EIS will not contain:

- Information that is sensitive or confidential (i.e., financial, commercial, scientific, technical, personal, cultural or other nature), that is treated consistently as confidential, and the person affected has not consented to the disclosure; or,
- Information that may cause harm to a person or harm to the environment through its disclosure.

The proponent will consult with the Agency regarding whether specific information requested by these guidelines will be treated as confidential.

3.5 Presentation and organization of the EIS

To facilitate the identification of the documents submitted and their placement in the Canadian Environmental Assessment Registry, the title page of the EIS and its related documents will contain the following information:

- project name and location;
- title of the document, including the term “environmental impact statement”;
- subtitle of the document;
- name of the proponent; and
- the date.

The EIS will be written in clear, precise language. A glossary defining technical words, acronyms and abbreviations will be included. The proponent will provide charts, diagrams, tables, maps and photographs, where appropriate, to clarify the text. Perspective drawings that clearly convey the various components of the project will also be provided. Wherever possible, maps will be presented in common scales and datum to allow for comparison and overlay of mapped features.

For purposes of brevity and to avoid repetition, cross-referencing is preferred. The EIS may make reference to the information that has already been presented in other sections of the document, rather than repeating it. The exception to this preference is the cumulative effects assessment, which should be provided in a stand-alone section as described in section 12.1.2. Detailed studies (including all relevant and supporting data and methodologies) will be provided in separate appendices and will be referenced by appendix, section and page in the text of the main document of the EIS. The EIS will explain how information is organized in the document. This will include a list of all tables, figures, and photographs referenced in the text of the EIS. A complete list of supporting literature and references will also be provided. A Table of Concordance, which cross references the information presented in the EIS with the information requirements identified in the EIS Guidelines, will be provided. The proponent will provide copies of the EIS and its summary for distribution, including paper and electronic version in an unlocked, searchable PDF format, as directed by the Agency.

Part 2 – Content and Structure of the EIS

4 SUMMARY OF ENVIRONMENTAL IMPACT STATEMENT

The proponent will prepare a summary of the EIS in both of Canada's official languages (French and English) to be provided to the Agency at the same time as the EIS and which will include the following:

- A concise description of all key components of the project and related activities;
- A summary of the consultation conducted with Aboriginal groups, the public, and government agencies, including a summary of the issues raised and the proponent's responses;
- An overview of the key environmental effects of the project and proposed technically and economically feasible mitigation measures; and
- The proponent's conclusions on the residual environmental effects of the project and the significance of adverse environmental effects after taking mitigation measures into account.

The summary is to be provided as a separate document and should follow the outline provided below:

1. Introduction and environmental assessment context
2. Project overview
3. Scope of project and assessment
4. Alternative means of carrying out the project
5. Public and Aboriginal engagement
6. Summary of environmental effects assessment
7. Mitigation measures
8. Proposed significance determination

The summary will have a sufficient level of detail for the reader to learn and understand the entire project, potential impacts, mitigation measures proposed by the proponent, the residual effects and the conclusions regarding significance.

It is strongly recommended that the proponent translates the summary into the appropriate Aboriginal language(s) in order to facilitate consultation activities during the environmental assessment.

5 INTRODUCTION AND PROJECT OVERVIEW

5.1 Geographical setting

The EIS will contain a concise description of the geographical setting in which the project will take place. This description will focus on those aspects of the project and its setting that are important in order to understand the potential environmental effects of the project. The description will address the natural and human elements of the environment as well as explain the interrelationships between the biophysical environment and people and communities. The following information will be included:

- the UTM coordinates of the main project site;
- current land use in the area and the relationship of the project facilities and components with any federal lands;

- the environmental significance and value of the geographical setting in which the project will take place and the surrounding area;
- environmentally sensitive areas, such as national, provincial and regional parks, ecological reserves, wetlands, estuaries, and habitats of federally or provincially listed species at risk and other sensitive areas;
- local and Aboriginal communities (including locations/proximity to the project-site and populations); and
- traditional Aboriginal territories, treaty lands, Indian reserve lands.

The EIS will provide expanded description and mapping of the project location, including each of the project components as outlined in section 5.6 of this document.

Maps of the project's location at an appropriate scale will accompany the text. The location map should include the boundaries of the proposed site including UTM coordinates, the major existing infrastructure, adjacent land uses and any important environmental features. In addition, site plans/sketches and photographs showing project location, site features and the intended location of project components will be included.

5.2 Regulatory framework and the role of government

To understand the context of the EA, this section will identify, for each jurisdiction, the government bodies involved in the EA as well as the EA processes. More specifically identify:

- any federal power, duty or function to be exercised that may permit the carrying out (in whole or in part) of the project or associated activities;
- the environmental and other specific regulatory approvals and legislation that are applicable to the project at the federal, provincial, regional and municipal levels;
- government policies, resource management, planning or study initiatives pertinent to the project and/or EA and discuss their implications;
- any treaty or self government agreements with Aboriginal groups that are pertinent to the project and/or EA;
- any relevant Land Use Plans, Land Zoning, or Community Plans;
- major components of the project and identify those being applied for and constructed within the duration of approvals under provincial and federal legislation; and
- in a summary form the regional, provincial and/or national objectives, standards or guidelines that have been used by the proponent to assist in the evaluation of any predicted environmental effects.

In planning for a mine proposal and in developing the EIS and technical support documentation, the proponent is advised to consider the "Environmental Code of Practice for Metal Mines"[4], published by Environment Canada in 2009. The recommended practices in the Code include the development and implementation of environmental management tools, the management of wastewater and mining wastes, and the prevention and control of environmental releases to air, water and land. In addition, the parameters and approach of the Environmental Effects Monitoring program under the Metal Mining Effluent Regulations should be considered when developing a baseline monitoring program for the aquatic environment.

[4] www.ec.gc.ca/lcpe-epa/default.asp?lang=En&n=CBE3CD59-1

Submission of regulatory and technical information necessary for federal authorities to make their regulatory decisions during the conduct of the environmental assessment is at the discretion of the proponent. Although that information is not necessary for the EA decision, the proponent is strongly encouraged to submit it concurrent with the EIS.

5.3 Participants in the environmental assessment

Clearly identify the main participants in the EA including jurisdictions other than the federal government, Aboriginal groups, community groups, and environmental organizations.

5.4 The proponent

The proponent will:

- provide contact information (e.g., name, address, phone, fax, email);
- identify itself and the name of the legal entity that would develop, manage and operate the project;
- explain corporate and management structures, as well as insurance and liability management related to the project;
- specify the mechanism used to ensure that corporate policies will be implemented and respected for the project;
- summarize key elements of its environment, health and safety management system and discuss how the system will be integrated into the project; and
- identify key personnel, contractors, and/or sub-contractors responsible for preparing the EIS.

5.5 Purpose of the project

The proponent will describe the purpose of the project by providing the rationale for the project, explaining the background, the problems or opportunities that project is intended to satisfy and the stated objectives from the perspective of the proponent. If the objectives of the project are related to or contribute to broader private or public sector policies, plans or programs, this information will also be included.

5.6 Project components

The proponent will describe the project, by presenting the project components, associated and ancillary works, activities, scheduling details, the timing of each phase of the project and other characteristics that will assist in understanding the environmental effects. This will include:

- A characterization of geochemical properties of pit mine materials, waste rock, foundation materials and tailings pond foundation materials;
- A description of the geology, based on results from drilling, test pits and sampling programs;
- A description of the tailings management facility (geotechnical properties and foundation conditions for tailings management facility/dams, hazard classification, location, preliminary designs, tailings properties, and tailings water seepage);
- A description of the waste rock, overburden and low grade ore storage and stock piles (locations, volumes and development plans; geotechnical conditions, seismicity and design criteria and a description of waste water management components of the project);

- A description of open pit and underground mine (development plans including pit phases, phase designs, pit design including slopes, design standards, geotechnical and hydrogeologcial considerations (e.g., pit wall management));
- A description of water management (pit water and/or underground mine water); and
- Permanent and temporary access infrastructure, identifying the route of each access road and the location and types of structure used for stream crossings.

In cases where the geotechnical design is based on the observational method, the general nature and geotechnical properties of the geological materials will be provided.

If the project is part of a larger sequence of projects, the proponent will outline the larger context and present the relevant references, if available.

5.7 Project activities

The EIS will include expanded descriptions of the construction, operation, maintenance, foreseeable modifications, and where relevant, closure, decommissioning and restoration of sites and facilities associated with the proposed project.

This would include detailed descriptions of the activities to be carried out during each phase, the location of each activity, expected outputs and an indication of the activity's magnitude and scale.

Although a complete list of project activities is required, the emphasis will be on activities with the greatest potential to have environmental effects. Sufficient information will be included to predict environmental effects and address public concerns identified. Highlight activities that involve periods of increased environmental disturbance or the release of materials into the environment.

The EIS will include a detailed schedule including time of year, frequency, and duration for all project activities.

The EIS will provide the preliminary outline of a decommissioning and reclamation plan for any components associated with the project. This will include ownership, transfer and control of the different project components as well as the responsibility for monitoring and maintaining the integrity of some of the structures. The plan would serve to provide guidance on specific actions and activities to be implemented to decrease the potential for environmental degradation in the long-term during decommissioning and abandonment activities for temporary facilities, and to clearly define the proponent’s ongoing environmental commitments. A conceptual discussion on how decommissioning could occur will be provided for permanent facilities.

6 SCOPE OF PROJECT

The scope of project for the purposes of the EA includes the components (section 5.6), physical activities (section 5.7) and federal decisions (section 5.2). The proponent will consider all the components, activities and decisions identified in these sections as part of the effects assessment.

Based on information received in the project description from the proponent, the Agency defines the scope of project to be assessed as the construction, operation and decommissioning of the following project components:

- open pit;
- dewatering of Joyce Lake and any associated infrastructure;

- all stockpiles and waste storage areas including waste rock, overburden and low grade ore;
- modular beneficiation plant including a crushing and washing process for Phase I and additional processing elements for Phase II;
- tailings management facility;
- ancillary infrastructure to support the mine and beneficiation plant, including a workshop, explosives magazine storage, office buildings, warehouse area and employee facilities (including accommodation camp), conveyors, stockpiles, pipeline, water supply systems, sewage and water treatment units, power generator, fuel storage, mobile equipment, settling ponds and drainage infrastructure;
- all access roads and haulage roads including water crossings;
- ice bridge corridors;
- barge for the open water season and associated infrastructure;
- potential conveyor;
- optional floating conveyor; and
- rail track, yard and loop and associated infrastructure including water crossings.

7 SCOPE OF ASSESSMENT

7.1 Factors to be considered

7.1.1 Valued components

Valued Components (VCs) refer to attributes associated with the project that have been identified to be of concern by the proponent, government agencies, Aboriginal peoples and/or the public. The value of a component not only relates to its role in the ecosystem, but also to the value placed on it by humans.

The proponent will identify the VCs deemed appropriate to ensure the full consideration of the factors listed in subsection 19(1) of CEAA, 2012 as well as the 2012 amendment to section 79 of the *Species at Risk Act*. As a minimum, the proponent must consider the list of environmental components provided in section 9.1 of this document. The final list of VC to be presented in the EIS will be completed according to the evolution and design of the project and reflect the knowledge acquired on the environment through public and Aboriginal consultations. The proponent will describe how the VCs were selected and what methods were used to predict and assess the adverse environmental effects of the project on these components.

The VCs will be described in sufficient detail to allow the reviewer to understand their importance and assess the potential for environmental effects arising from the project activities. The rationale for selecting these components as VCs and for excluding others will be stated. Challenges may arise regarding particular exclusions, so it is important to document the information and the criteria used to make each determination. Examples of justification include primary data collection, computer modelling, literature references, public consultation, expert input or professional judgement. If comments are received on a component that has not been included as a VC, these comments will be summarised and addressed in this section.

For consultations associated with the identification of VCs, the proponent will identify those VCs, processes, and interactions that either were identified to be of concern during any workshops or meetings

held by the proponent or that the proponent considers likely to be affected by the project. In doing so, the proponent will indicate to whom these concerns are important and the reasons why, including Aboriginal, social, economic, recreational, and aesthetic considerations. The proponent will describe any issues raised or comments noted regarding the nature and sensitivity of the area within and surrounding the project and any planned or existing land and water use in the area. The proponent will also indicate the specific geographical areas or ecosystems that are of particular concern to interested parties, and their relation to the broader regional environment and economy.

7.1.2 Effects of potential accidents or malfunctions

The proponent will identify the probability of potential accidents and malfunctions related to the project, including an explanation of how those events were identified, potential consequences (including the environmental effects), the plausible worst case scenarios and the effects of these scenarios.

The geographical and temporal boundaries for the assessment of malfunctions and accidents may be different than those in the scope of factors for each VC. This will include an identification of the magnitude of an accident and/or malfunction, including the quantity, mechanism, rate, form and characteristics of the contaminants and other materials likely to be released into the environment during the accident and malfunction events.

The EIS will also describe the safeguards that have been established to protect against such occurrences and the contingency/emergency response procedures in place if accidents and/or malfunctions do occur. Detailed contingency and response plans will be presented.

7.1.3 Effects of the environment on the project

The EIS will take into account how local conditions and natural hazards, such as severe and/or extreme weather conditions and external events (e.g., drought, flooding, ice jams, landslides avalanches, fire, erosion, subsidence, outflow conditions and seismic events) could adversely affect the project and how this in turn could result in impacts to the environment (e.g., extreme environmental conditions result in malfunctions and accidental events). These events will be considered in different probability patterns (i.e., 5-year flood vs. 100-year flood). Longer-term effects of climate change will also be discussed up to the projected post-closure phase of the project. This discussion will include a description of climate data used.

The EIS will provide details of a number of planning, design and construction strategies intended to minimize the potential environmental effects of the environment on the project.

7.2 Scope of the factors

Scoping establishes the boundaries of the EA and focuses the assessment on relevant issues and concerns. The spatial and temporal boundaries used in the EA may vary depending on the VC.

7.2.1 Spatial boundaries

The EIS will clearly indicate the spatial boundaries to be used in assessing the potential adverse environmental effects of the proposed project and provide a rationale for each boundary. It is recognized that the spatial boundaries for each VC may not be the same.

Spatial boundaries will be defined taking into account as applicable the appropriate scale and spatial extent of potential environmental effects, community and Aboriginal traditional knowledge, current land

and resource use by Aboriginal groups, ecological, technical and social and cultural considerations. The description of the project setting will be presented in sufficient detail to address the relevant environmental effects of the project.

The proponent is advised to consult with the Agency, federal and provincial government departments and agencies, local government and Aboriginal groups, and take into account public comment when defining the spatial boundaries used in the EIS.

7.2.2 Temporal boundaries

The temporal boundaries of the EA will span all phases of the project: construction, operation, maintenance, foreseeable modifications, and where relevant, closure, decommissioning and restoration of the sites affected by the project. Temporal boundaries will also consider variations related to VCs for all phases of the project, as appropriate. Community and Aboriginal traditional knowledge should factor into decisions around appropriate temporal boundaries.

If the temporal boundaries do not span all phases of the project, the EIS will identify the boundaries used and provide a rationale.

8 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

The EIS will identify and consider the effects of alternative means of carrying out the project that are technically and economically feasible. The proponent will complete the following procedural steps for addressing alternative means:

Identify the alternative means to carry out the project.

- Develop criteria to determine the technical and economic feasibility of the alternative means; and
- Identify those alternative means that are technically and economically feasible, describing each alternative means in sufficient detail.

Identify the effects of each alternative means.

- Identify those elements of each alternative means that could produce effects in sufficient detail to allow a comparison with the effects of the project; and
- The effects referred to above include both environmental effects and potential adverse impacts on potential or established Aboriginal and Treaty rights and related interests.

Identify the preferred means.

- Identify the preferred means based on the relative consideration of effects; and of technical and economic feasibility; and
- Determine criteria to examine the effects of each remaining alternative means to identify the preferred means.

In its alternative means analysis, the proponent will address, as a minimum, the following project components:

- Ore production technologies including open-pit extraction method, ore processing methods, waste rock and tailings disposal, contaminated water treatment etc.;

- Contracting or lengthening of the operations;
- Energy sources for the mine complex operations;
- Location of infrastructure related to the mine and the operation of the mine, including the location of the final effluent discharge point;
- Transportation routes for the ore, oil and gas, and any other goods needed to operate the mine; and
- Worker accommodations and transportation.

8.1 Assessment of alternatives for mine waste disposal

The proponent has indicated that they do not intend to use natural water bodies frequented by fish for the disposal of mine waste, including tailings and waste rock, and for the management of process water. Before any fish frequented natural water bodies could be used for mine waste disposal, the Metal Mining Effluent Regulations (MMER) would need to be amended to add the affected water bodies to Schedule 2 to designate them as Tailings Impoundment Areas (TIAs). This regulatory process will not be initiated until a detailed assessment of alternatives for mine waste disposal has been undertaken by the proponent.

Should an MMER Schedule 2 amendment be required for the project, the proponent is strongly encouraged to include MMER requirements for an assessment of alternatives for mine waste disposal in the EIS. The proponent needs to undertake a robust and thorough assessment of mine waste disposal alternatives, which applies methodology that is provided in Environment Canada's "Guidelines for the Assessment of Alternatives for Mine Waste Disposal" (2011)[5].

Pursuant to the MMER requirements, the assessment of alternatives for mine waste disposal will objectively consider all available options for mine waste disposal, including at least one that does not impact a natural water body frequented by fish. It will qualitatively and quantitatively assess the environmental, technical and socio-economic aspects of each alternative. Both the short term impacts of each alternative and the long term risks through the closure and post closure phases will be assessed. The assessment of alternatives for mine waste disposal needs to include all aspects of the project that may contribute to the predicted impacts associated with the proposed TIA. The economic component of the assessment will consider the full costs of each alternative throughout the mine life cycle, from construction through post-closure, including long term maintenance and monitoring requirements, as well as costs associated with the legislated requirement for a compensation plan to offset fish habitat loss.

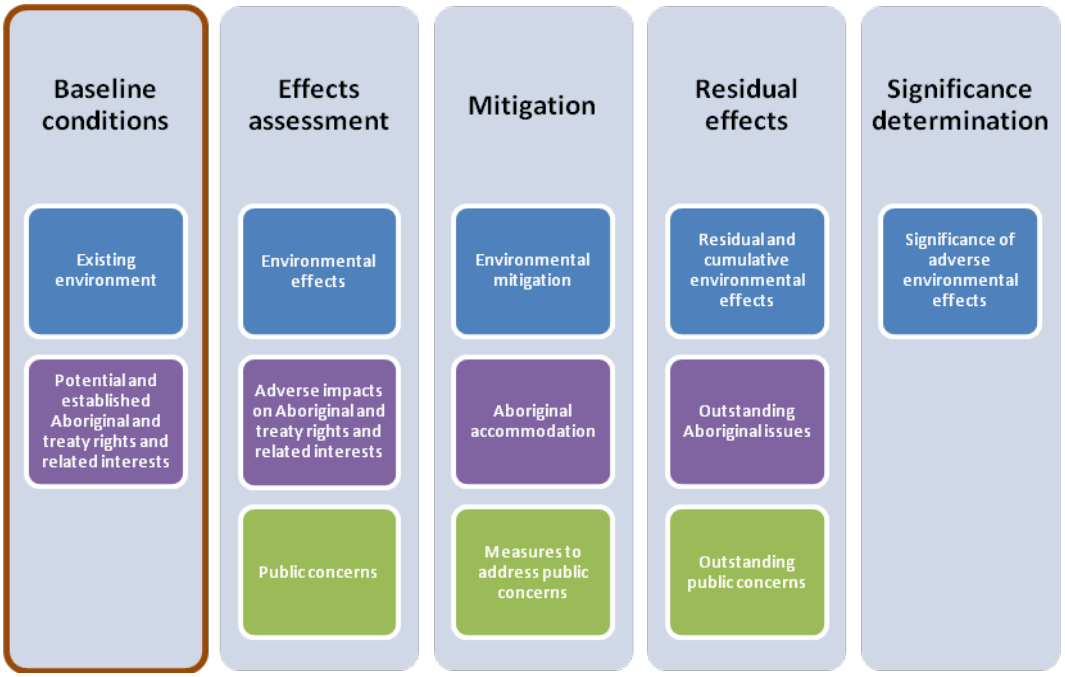
Conducting this robust and thorough assessment of alternatives during the EA stage will streamline the overall regulatory review process and minimize the time required to proceed with the MMER amendment process. It also facilitates a thorough and transparent review of the assessment of alternatives as part of the EA process. For further guidance, the proponent should consult Environment Canada's "Guidelines for the Assessment of Alternatives for Mine Waste Disposal" (2011).

In the event that the proponent chooses not to conduct an assessment of alternatives for mine waste during the EA stage pursuant to the MMER requirements, the EA under CEAA 2012 will continue. In these circumstances, the proponent should discuss with Environment Canada how the information

[5] Visit Environment Canada's website at www.ec.gc.ca/pollution/default.asp?lang=En&n=C6A98427-1

requirements and public consultation associated with the MMER amendment process can be addressed through other means.

9 BASELINE CONDITIONS



9.1 Existing environment

9.1.1 Methodology

The EIS will include a description of the environment, including the components of the existing environment and environmental processes, their interrelations and interactions as well as the variability in these components, processes and interactions over time scales appropriate to the project. The description will be sufficiently detailed to characterize the environment before any disturbance to the environment due to the project and to identify, assess and determine the significance of the potential adverse environmental effects of the project. This data should include results from studies done prior to any physical disruption of the environment due to initial site clearing activities. The information describing the existing environment may be provided in a stand-alone chapter of the EIS or may be integrated into clearly defined sections within the effects assessment of each VC. This analysis will include environmental conditions resulting from historical and present activities in the local and regional study area.

In describing the physical and biological environment, the proponent will take an ecosystem approach that considers both scientific and traditional knowledge and perspectives regarding ecosystem health and integrity. The proponent will identify and justify the indicators and measures of ecosystem health and integrity used for analysis and relate these to the identified VCs and proposed monitoring and follow-up measures.

For the biophysical environment, baseline data in the form of inventories alone are not sufficient to assess effects. The proponent will consider the resilience of relevant species populations, communities and their

habitats. The proponent will summarize all pertinent historical information on the size and geographic extent of relevant animal populations as well as density, based on best available information. Where little or no information is available, specific studies will be designed to gather further information on species populations, densities and the interrelations of these species to the ecosystem.

Habitat at regional and local scales should be defined in ecological mapping of aquatic and terrestrial vegetation types and species (e.g., ecological land classification mapping). Habitat use will be characterized by type of use (e.g., spawning, breeding, migration, feeding, nursery, rearing, wintering), frequency and duration. This assessment will consider all relevant seasonal variations in for all VCs as appropriate. Emphasis will be on those species, communities and processes identified as VCs. However, the interrelations of these components and their relation to the entire ecosystem and communities of which they are a part will be indicated (e.g., population-level risk assessment). The proponent will address issues such as habitat, nutrient and chemical cycles, food chains, productivity, to the extent that they are appropriate to understanding the effect of the project on ecosystem health and integrity. Range and probability of natural variation over time will also be considered. The proponent will also examine changes in the distribution, populations, behaviour, and availability of wildlife, fish, and flora in the important context of implications to current use of lands and resources by Aboriginal peoples.

If the baseline data have been extrapolated or otherwise manipulated to depict environmental conditions in the study areas, modelling methods and equations will be described and will include calculations of margins of error and other relevant statistical information, such as confidence intervals and possible sources of error.

9.1.2 Biophysical environment

Based on the scope of project described in section 6, the proponent will present the following baseline information to facilitate the identification of valued components (VC) for the purposes of the environmental assessment. Should other VCs be identified during the conduct of the EA, these will also be described in the EIS.

Atmospheric Environment and Climate

The EIS will describe the following:

- Ambient air quality in the project areas and, for the mine site, the results of a baseline survey of ambient air quality, including the contaminants: Total Suspended Particulates, PM2.5, PM10, SOx, VOCs and NOx;
- Current ambient noise levels at both sites and within the local area, including the results of a baseline ambient noise survey. Information on typical sound sources, geographic extent and temporal variations will be included;
- Existing ambient light levels at the project site and at any other areas where project activities could have an effect on light levels. The EIS will describe night-time illumination levels during different weather conditions and seasons; and
- Historical records of total precipitation (rain and snow), mean, max and min temperatures.

Terrestrial Environment-Geology and Geochemistry

The EIS will describe the following:

- A discussion of the bedrock and host rock geology of the deposit which includes a table of geologic descriptions, geological maps and cross-sections of appropriate scale. Where appropriate, the following geologic parameters will be included:
    - Maps of surficial and bedrock geology showing the distribution of geologic units;
    - Representative lithologic and sediment descriptions including: age, colour, grain size, porosity, moisture conditions, permeability, mineralogy, physical strength, hardness, weathering characteristics, depositional setting and correlations of surficial and bedrock units;
    - A geological stratigraphic framework for the surficial sediments and bedrock as appropriate in support of hydrogeological assessments. In particular, delineation of key stratigraphic and hydrogeologic boundaries, the spatial distribution and thickness of lithologic units shown in plan and cross-section;
    - Alteration styles, mineralogy, bulk chemistry, trace metal chemistry, occurrence and intensity of bedrock units;
    - Structural fabric (e.g., joints and fractures, faults, foliation and lineation) and structural relationships, structural characterization of the rock formations impacted by the project;
    - Ore mineralogy, including sulphide types, abundance, mode of occurrence, extent of previous oxidation and an estimate of relative sulphide reactivity;
    - Type and grade of metamorphism; and
    - Regional geologic framework including tectonic belt, terrane, regional metamorphism and structure.
- A delineation of the regional and local geological structures in the project area that may affect the proposed infrastructure. This includes major structural features as well as lesser local structures, their ecological functions and distribution in the local study area;
- Geomorphology and topography of areas proposed for construction of major project components;
- Bedrock lithology, morphology, geomorphology and soils where earthworks are proposed;
- A description of geological hazards that exist in the areas planned for the project facilities and infrastructure, including:
    - History of seismic activity in the area;
    - Isostatic rise or subsidence;
    - Landslides, slope erosion and the potential for ground and rock instability, and subsidence following project activities; and
    - History of landslide-generated tsunamis if near a shoreline.
- Sites of paleontological or palaeobotanical significance; and

- A characterization of the geochemical composition of expected mine materials such as waste rock, ore, low grade ore, tailings, overburden and potential construction material, which will include:
    - Mineralogy;
    - Elemental composition of host lithologies and ore in study area (major and trace elements); and
    - Potential for acid generation, neutralization and contaminated neutral drainage.

Acid Rock Drainage/Metal Leaching

The manual produced by the Mine Environment Neutral Drainage (MEND) Program, entitled, "MEND Report 1.20.1, "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials", Version 0 - December 2009[6]" is a recommended reference for use in Acid Rock Drainage/Metal Leaching (ARD/ML) prediction.

The ARD/ML prediction information will be used to predict water quality for effects assessment and to determine mitigation requirements for the Project. Additional information will be provided on the following:

- the type and method used for the ARD/ML prediction and possible mitigation measures;
- waste rock, tailings and low grade ore characterization, volumes, segregation/disposal method mitigation/management plans, contingency plans, operational and post-closure monitoring and maintenance plans;
- assessment of short term metal leaching properties;
- longer term kinetic testing to evaluate rates of acid generation (if any) and metal leaching;
- assessment of the feasibility to successfully segregate potentially-acid generating (PAG) and non-potentially acid generating (NPAG) waste materials during operations, proposed geochemical segregation criteria and identification of operational methods that will be required to achieve geochemical characterization during operations (i.e., geochemical surrogates, on site lab, procedures needed, etc);
- sensitivity analysis to assess the effects of imperfect segregation of waste rock;
- estimates of the potential for mined materials (including waste rock, tailings and low grade ore) to be sources of ARD or ML; estimates of potential time to the onset of ARD or ML; and the ability to prevent or control ARD and ML during operation and post-closure;
- pit water chemistry during operation and post-closure, and pit closure management measures (e.g., flooding). This will include geochemical modeling of pit water quality in the post-closure period;
- surface and seepage water quality from the waste rock dumps, tailings/waste rock impoundment facility, stockpiles and other infrastructure during operation and post-closure;
- ARD/ML prevention/management strategies under a temporary or early closure scenario, including low grade ore;
- quantity and quality of leachate from samples of tailings, waste rock, and ore;
- quantity and quality of effluent to be released from the site into the receiving waters; and.

[6] http://www.mend-nedem.org/reports/categories-e.aspx?cat_id=1

- quality of humidity cell or column test liquid from acid rock testing.

Surficial Geology (i.e., Terrain and Soil)

The EIS will describe the following:

- Baseline mapping and description of landforms and landform processes and soils within the local and regional project area;
- A description of surface sediments at proposed borrow and quarry sites, and other areas where earthworks are proposed. If the sedimentary deposits are identified as a potential source of granular material a description should be included;
- Maps depicting soil depth by horizon and soil order within the mine site area to support soil salvage and reclamation efforts, and to outline potential for soil erosion;
- Sedimentological and geochemical characteristics of surficial sedimentary units and soils;
- A description/details of soil sample analysis completed and the quality assurance/quality control program followed;
- Suitability of topsoil and overburden for use in the re-vegetation of surface-disturbed areas; and
- A summary of the baseline data on the concentration of trace elements in site soils prior to project development.

If there is permafrost in the study area the EIS will including the following information:

- Discussion of the geomorphologic and topographic features at areas proposed for construction of major project components, including the type, thickness, and distribution of soils as applicable;
- Discussion of permafrost conditions including distribution of frozen and unfrozen ground, thermal conditions (ground temperatures), ground ice, thaw sensitivity and active layer thickness;
- Discussion of the potential for thaw settlement and terrain instability associated with ground thawing;
- Description of the morphology, geomorphology and soils (including sediments and the thermal and ground ice conditions) at proposed borrow and quarry sites, and other areas where earthworks are proposed. If the sedimentary deposits are identified as a potential source of granular material then a description of granular material properties, including thermal condition and ice content, will also be described;
- Discussion of the relationship between permafrost conditions and associated processes and active layer, topography, drainage conditions and surface hydrology;
- Details regarding the suitability of topsoil and overburden for use in the re-vegetation of surface-disturbed areas;
- Description of permafrost distribution (i.e., distribution of frozen and unfrozen ground) in the local project area, high ice-content soils, ice lenses, thaw-sensitive slopes, and talik zones; and
- Description of permafrost temperatures at areas planned for project facilities and infrastructure, including discussion of sensitivity to warming induced by project activities (construction and operation of facilities) or climate change, and implications for integrity, performance and safety of infrastructures.

Lacustrine Environment

The EIS will include the following:

- Description of lacustrine physical processes in the shipping area, including the proposed shipping routes across Iron Arm, Attikamagen Lake;
- Description of baseline information regarding climatic conditions at the proposed loading and unloading sites for barge transportation on the shore of Attikamagen Lake;
- Description of the lake bottom sediment quality and thickness at the loading and unloading sites, including grain size, mobility, and the presence of permafrost on the lake bottom;
- Description of available bathymetric information for the proposed loading and unloading sites and along the proposed shipping route if applicable;
- Description of available bathymetric information for all lakes impacted by project footprint; and
- Description of lacustrine ice climate in the regional study area, including ice formation, thickness, ridging, breakup, and movement.

Water Resources

The EIS will describe the following:

- The hydrogeologic conditions at the site. It will examine all available existing hydrogeology information required to assess the effects of the project.
- An appropriate hydrogeologic model will be presented for the project area, which discusses the hydrostratigraphy and groundwater flow systems. Include the rationale for the selected model.
- A detailed conceptual model will be provided. Model input parameters and boundary conditions will be clearly defined. Model inputs will be based on a sufficiently large data set and be conservative in nature. The model will be calibrated against baseline conditions and should be tested using site groundwater monitoring data to confirm the generated model.
- A sensitivity analysis will be performed to test model sensitivity to climatic variations (e.g., recharge) and hydrogeologic parameters (e.g., hydraulic conductivity).
- A description of the hydrogeology at the site and at local and regional study areas. The description will:
    - Characterize the hydrogeological context (e.g., hydrostratigraphy with aquifers and aquitards, major faults etc.) including the delineation of key stratigraphic and hydrogeologic boundaries;
    - Characterize the physical properties of the hydrogeological units (e.g., hydraulic conductivity, transmissivity, saturated thickness, storativity, porosity, specific yield);
    - Delineate regional and local and site groundwater flow patterns and rates; discuss the hydrogeologic, hydrologic, geomorphic, climatic and anthropogenic controls on groundwater flow;
    - Include a detailed groundwater budget;
    - Discuss temporal changes in groundwater flow (e.g., seasonal and long term changes in water levels);
    - Identify recharge and discharge areas;
    - Delineate and characterize groundwater / surface water interactions including the locations of groundwater discharge to surface water and surface water recharge to

groundwater, and characterize perennial surface water flow (e.g., spatial extent and magnitude of baseflow);

- Describe baseline groundwater and baseflow quality; and the water type with their spatial distribution (zones);
- Describe and locate the groundwater sources used as drinking water in the study area, their current use and potential for future use; and
- In permafrost regions, describe configuration of frozen ground and taliks and the influence on groundwater flow.

- Hydrogeologic maps and cross-sections for the mine area to outline the extent of aquifers and aquitards, including bedrock fracture and fault zones, locations of wells, springs, surface waters, and project facilities. Groundwater levels, potentiometric contours and flow directions should be included.
- An inventory and analysis of existing information on the hydrogeological conditions/groundwater resources in the project area, including published reports, geological maps, well record data (from water wells, monitoring wells and production wells) and Quality Assurance/Quality Control (QA/QC) procedures followed.
- Hydrogeologic maps and cross-sections for the mine area to outline the extent of aquifers and aquitards, including bedrock fracture and fault zones, locations and depths of wells, groundwater types springs, surface waters, and project facilities. Groundwater levels, potentiometric contours and flow directions should be included.
- A review of the physical geography (e.g., topography and physiographic units) and the geology of the area as it pertains to local and regional groundwater flow systems and aquifer/aquitard systems.
- Maps showing groundwater divides and areas of recharge and discharge, with project components overlain.
- Location and description of all groundwater monitoring wells in respect to the project area, including geologic, hydrostratigraphic, piezometric and construction data (e.g., depths of surficial and bedrock units, water level, hydraulic conductivity, diameter and screen depth, and intercepted aquifer unit).
- A description of baseline groundwater level data for regional and local flows in all aquifer units (overburden and bedrock units).
- A description of monitoring protocol for collection of existing groundwater data.
- Measurements of hydraulic conductivity (or transmissivity) for all hydrogeological units in the project area.
- Results of the modelling of baseline hydrogeological conditions (refer to hydrogeological modelling section).
- Graphs or tables indicating the seasonal variations in groundwater levels, flow regime, and quality.
- Tables of baseflow measurements or estimates.
- A description of local and regional potable groundwater supplies, including their current use and potential for future use, as appropriate.
- Baseline analysis of groundwater and baseflow quality at the site and within the regional and local study area, including methods of sampling and analysis and details of QA/QC. This includes determining natural groundwater types and measuring concentrations of major constituents as

well as minor and trace components. Ensure that particular attention is given to the components that would be, from an environmental point of view, potentially of interest in the course of mining operations. This analysis should be performed on sediment and bedrock aquifers.

- Bedrock fracture sizes and orientations in relation to groundwater flow.
- Evaluation of discharge rates.

The EIS will describe surface water quality, hydrology and sediment quality within the area of influence of the project. The baseline will provide the basis for the assessment of potential effects to surface water, presenting the range of water and sediment quality and surface water hydrology.

Furthermore, the EIS will describe:

- The delineation of drainage basins, at appropriate scales.
- The assessment of hydrological regimes.
- Flows or design peak flows for selected periods for the project area.
- Any local and regional potable surface water resource.
- Seasonal water quality field and lab analytical results and interpretation at several representative local stream and lake monitoring stations established at the project site.

Wetlands

Wetlands that may be affected by project activities will be characterized according to their location, size, type (wetland class and form), species composition and ecological function (Canadian Wetland Classification System, National Wetlands Working Group [NWWG] 1997). Efforts should focus on describing the wetlands with the greatest potential to be affected (i.e., within the project footprint). An overview of the key plant communities and animals that rely on wetlands will be presented.

Fish and Fish Habitat

The EIS will describe the limnology, hydrology, freshwater biota, presence of fish and other freshwater species, associated habitats and habitat distribution and fisheries in potentially affected surface waters, based on available published information, information resulting from community consultation, and/or results of on-site baseline surveys.

Furthermore, the EIS will describe the following:

- Characterize fish populations on the basis of species and life stage for affected water bodies (i.e., project footprint, upstream and downstream);
- List any rare fish or invertebrate species that are known to be present.
- Identify any potential waterbodies and fish habitat sites that could be rehabilitated, restored, or created for possible habitat gains to offset losses from the project.

In order to allow analysis of the project's effects, the EIS will document the physical and biological characteristics of the fish habitat likely to be directly or indirectly affected by the project.

Note that certain intermittent streams or wetlands may constitute fish habitat or contribute indirectly to fish habitat. The absence of fish at the time of the survey does not irrefutably indicate an absence of fish habitat.

The EIS will illustrate, on a topographic scale map, the hydrographic network (water bodies and watercourses), including intermittent streams, flood risk areas and wetlands. It will also indicate the boundaries of the watershed and subwatersheds of the study area.

Emphasis will be placed on the watercourses and water bodies likely to be affected by the project and their physical characteristics, water quality and hydrological regime.

Hence, for all the watercourses and water bodies on which effects are anticipated, the EIS will describe the biophysical characteristics, including:

- For each watercourse, indicate the name of the watercourse and provide a description of the habitat by homogeneous section. The parameters that must be determined are length of the section, width of the channel from the high water mark (bankful width), water depths, type of substrate (sediments), aquatic and riparian vegetation, including bank slopes. It is recommended that photos be attached to the description;
- For each lake or water body affected, indicate the name of the water body and provide a description. The parameters that must be determined are total surface area, bathymetry, maximum and mean depths, water level fluctuations, type of substrate (sediments), and location of submerged, floating and emergent aquatic vegetation, and water quality parameters (e.g., water temperature, turbidity, pH, dissolved oxygen profiles);
- Monthly/seasonal/annual water flow (discharge) data, including minimum and maximum flows;
- Natural obstacles (e.g., falls, beaver dams) or existing structures (e.g., water crossings) that hinder the free passage of fish.
- Preparation of habitat maps at a suitable scale indicating the surface area of habitat for spawning, nursery, feeding, migration routes etc. This information should be linked to water depths (bathymetry) to identify the extent of a lake's littoral zone.

Fish sampling survey methods used will be described in order to allow experts to ensure the quality of the information provided. If studies on fish and fish habitat were carried out previously, they are to be submitted with the EIS.

For all watercourses or water bodies on which the project is likely to have effects, including any water crossings, the EIS will:

- Describe the fish species present on the basis of the surveys carried out and the data available (e.g., electric and experimental fishing, government and historical databases, sport fishing data). Identify the sources of the data and provide the information concerning the fishing carried out (e.g., location of sampling stations, catch methods, date of catches, species);
- Specify the location and surface area of potential or confirmed fish habitats and describe how they are used by fish (spawning, rearing, growth, feeding, migration, overwintering)
- Locate and describe suitable habitats for species at risk that appear on federal and provincial lists and that are found or are likely to be found in the study area.
- Document any blasting activity near water where vibrations may affect fish behaviour, such as spawning or migrations.
- For sites where stream crossings are to be installed, constructed or modified, indicate how fish passage will be maintained.

Birds, Wildlife and their Habitat

The EIS will describe migratory and non-migratory birds (including waterfowl, raptors, shorebirds, marsh birds and other landbirds), ungulates (including the George River Caribou), furbearers, amphibians, small mammals, and their habitat at the project site and within the local and regional areas. The results of any baseline surveys and a description of the methodology will be included.

Migratory birds are protected under the *Migratory Birds Convention Act* (MBCA) and associated regulations. Preliminary data from existing sources will be gathered on year-round migratory bird use of the area (e.g., winter, spring migration, breeding season, fall migration). In addition to information obtained from the Atlantic Canada Conservation Data Centre (ACCDC) and naturalists, other relevant datasets should be consulted, such as those available from:

- Bird Studies Canada's "Nature Counts" web portal: (http://www.birdscanada.org/birdmon/default/datasets.jsp);
- the Quebec Breeding Bird Atlas 1984-89 (Les oiseaux nicheurs du Québec: atlas des oiseaux nicheurs du Québec méridional). A copy of this atlas is available at: http://www.atlas-oiseaux.qc.ca/1eratlas_en.jsp; and
- other data and projects, based on consultation with government and other agencies.

Existing data will be supplemented by surveys, where necessary. Surveys should be designed with reference to the Canadian Wildlife Service's guidance such as Technical Report No. 508, A Framework for the Scientific Assessment of Potential Project Impacts on Birds[7] (Hanson *et al*. 2009). Appendix 3 of the Framework provides examples of project types and recommended techniques for assessing impacts on migratory birds.

Other wildlife and their habitat that could be impacted by project activities will be characterized using existing data, supplemented by surveys as appropriate. The EIS will give particular consideration to areas of concentration of migratory animals, such as breeding, denning and/or wintering areas, as well as breeding areas of species low in number and high in the food chain (e.g., furbearers such as black bear and wolf).

The description of the existing environment will include consideration of existing or proposed protected areas, special management areas, and conservation areas in the regional study area.

Species at Risk and Species of Conservation Concern

As background for the analysis of the project's effects on Species at Risk (SAR), the EIS will:

- Identify all SARs that may be affected by the project, using existing data and literature as well as surveys to provide current field data, as appropriate;
- Incorporate any published studies that describe the regional importance, abundance and distribution of SARs; and
- Identify residences, seasonal movements, movement corridors, habitat requirements, key habitat areas, identified critical habitat and/or recovery habitat (where applicable) and general life history of SARs that may occur in the project area, or be affected by the project.

[7] http://publications.gc.ca/site/eng/367497/publication.html

The following information sources on species at risk and species of conservation concern should be consulted:

- *Species At Risk Act* (www.sararegistry.gc.ca);
- Committee on the Status of Endangered Wildlife in Canada;
- Atlantic Canada Conservation Data Center;
- Newfoundland and Labrador *Endangered Species Act*;
- Newfoundland and Labrador Species Status Advisory Committee;
- Newfoundland and Labrador Department of Environment and Conservation – Wildlife Division General Status of Wildlife Ranks;
- Québec Loi sur les espèces menacées ou vulnérables;
- Relevant Government agencies;
- Local naturalist and interest groups; and
- Aboriginal groups and First Nations.

Ecosystems (grassland, temperate forest etc.)

The EIS will describe the various ecosystems found within the project area which are likely to be affected by the project.

Flora

The EIS will describe potential or known plant species in the project area, which are listed under the *Species at Risk Act* or other provincial or territorial endangered species legislation, and critical habitat that are likely to be affected by the project.

This is a minimum list that is not meant to be exhaustive. The proponent may consider the inclusion of other biophysical VCs in the EIS.

The species selected within each biotic VC should include those of importance to health and socio-economic conditions, cultural heritage and the current use of land and resources for traditional purposes by Aboriginal persons.

9.1.3 Human Environment

The definition of the human environment will be interpreted broadly. Based on the scope of project described in section 6, the following VCs will be identified and described in the relevant sections of the EIS:

- Land use context (e.g., hunting, fishing, outdoor recreation, use of seasonal cabins, existing land development);
- Health and socio-economic conditions;
- Physical and cultural heritage, including structures, sites or things of historical, archaeological, paleontological or architectural significance;
- Current use of land and resources for traditional purposes by Aboriginal persons; and
- In describing how the project may impede navigation, the EIS will:

- identify any Project components and a description of any activities (e.g., dredging, alteration of water bed and/or water banks) that may affect waterways and water bodies;
- describe any recreational uses of natural waters(e.g., swimming, canoeing, fishing); and
- provide information on current and/or historic usage of all waterways and water bodies that will be directly affected by the project, including current Aboriginal uses, where available.

This is a minimum list that is not meant to be exhaustive. The proponent may consider the inclusion of other human environment VCs in the EIS.

The proponent will include all baseline information relevant to human health in one section of the EIS. The proponent will refer to Health Canada's "Useful Information for Environmental Assessments" document[8] in order to include the appropriate baseline information relevant to human health.

In describing the socio-economic environment, the proponent will provide information on the functioning and health of the socio-economic environment, encompassing a broad range of matters that affect communities and Aboriginal peoples in the study area in a way that recognizes interrelationships, system functions and vulnerabilities. A description of the rural and urban settings likely to be affected by the project will be provided.

In describing physical and cultural heritage, the proponent will provide information on heritage resources, including structures, sites or things of historical, archaeological, paleontological or architectural significance.

In describing current uses of land and resources by Aboriginal groups for traditional purposes, the proponent will include activities related, but not limited, to hunting, fishing, trapping, cultural, navigational use and other traditional uses of the land (e.g., collection of medicinal plants, use of sacred sites). Potential effects on current uses include access to areas that are of importance or concern to Aboriginal groups.

9.2 Potential or Established Aboriginal and Treaty Rights and Related Interests

For the purposes of developing the EIS, the proponent will engage with Aboriginal groups whose potential or established Aboriginal rights and Treaty rights and related interests may be affected by the project which include, at a minimum, the following groups:

- Innu Nation of Labrador
- NunatuKavut Community Council
- Naskapi Nation of Kawawachikamach
- Innu First Nation of Matimekush-Lac John
- Innu First Nation of Uashat mak Mani-Utenam

In preparing the EIS, the proponent will ensure that Aboriginal groups, especially those most likely to be affected by the project, have access to timely and relevant information that they require in respect of the project and how the project may adversely impact them.

[8] This document can be obtained at http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/environ_assess-eval/index-eng.php

For the Aboriginal groups previously identified by the Agency, the proponent will hold meetings and facilitate these by making key EA summary documents (baseline studies, EIS and key findings) accessible and making plain language summaries of these documents.

At a minimum, the EIS will summarize available information on the potential or established Aboriginal and Treaty rights and related interests of the named Aboriginal groups that have the potential to be adversely impacted by the project. As part of this summary, the EIS will include for each Aboriginal group:

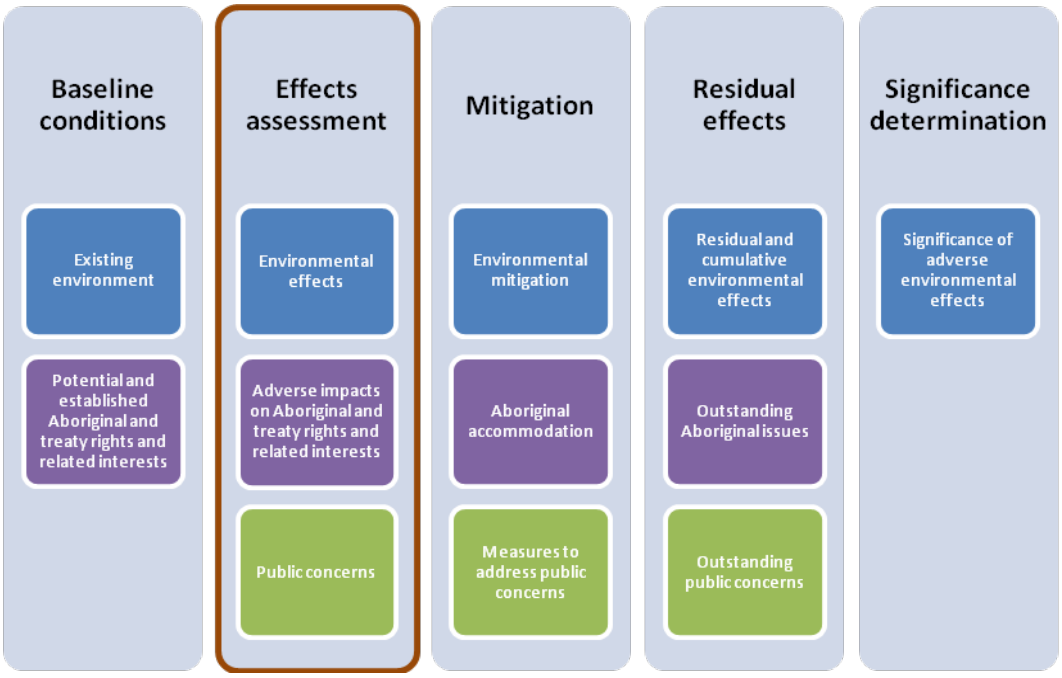
- Background information and a map of the group's traditional territory;
- A summary of engagement activities conducted prior to the submission of the EIS, including the date and means of engagement (e.g., meeting, mail, telephone);
- Information on each group's potential or established rights (including geographical extent, nature, frequency, timing), including maps and data sets (e.g., fish catch numbers) when this information is provided by a group to the proponent;
- An overview of key comments and concerns provided by each group to the proponent;
- Responses provided by government and/or the proponent, as appropriate;
- Future planned engagement activities; and
- Efforts undertaken to engage with Aboriginal groups as part of developing the information identified above.

The proponent will describe all efforts, successful or not, taken to solicit the information required to prepare the EIS.

The Agency will provide additional instructions to the proponent in cases where further research and/or engagement effort by the proponent is required to support Canada's ability to fulfil the duty to consult with one or more Aboriginal groups that may be adversely affected by the project.

Should the proponent have knowledge of potential adverse impacts to an Aboriginal group not appearing on the above list, the proponent will bring this to the attention of the Agency at the earliest opportunity.

10 EFFECTS ASSESSMENT



10.1 Environmental effects

10.1.1 Methodology

The proponent will indicate the project's effects during construction, operation, maintenance, foreseeable modifications, and where relevant, closure, decommissioning and restoration of sites and facilities associated with the project, and describe these effects using appropriate criteria. To the maximum extent possible, this documentation will include, for each potential project-related environmental effect, an indication of the nature of the effect, mechanism, magnitude, duration, frequency, geographic extent, and the degree to which it may be reversible. The proponent will consider both the direct and indirect, reversible and irreversible, short- and long-term environmental effects of the project. In predicting and assessing the project's effects, the proponent will indicate important details and clearly state the elements and functions of the environment that may be affected, specifying the location, extent and duration of these effects and their overall impact.

The assessment of the effects of each of the project components and physical activities, in all phases, will be based on a comparison of the biophysical and human environments between the predicted future conditions with the project and the predicted future conditions without the project. In undertaking the environmental effects assessment, the proponent will use best available information and methods. All conclusions will be substantiated. Predictions will be based on clearly stated assumptions. The proponent will describe how it has tested each assumption. With respect to quantitative models and predictions, the proponent will discuss the assumptions that underlie the model, the quality of the data and the degree of certainty of the predictions obtained.

Risk assessment framework

The proponent is expected to employ, where appropriate, standard ecological risk assessment frameworks that categorize the levels of detail and quality of the data required for the assessment. These tiers are as follows:

- Tier 1: Qualitative (expert opinion, including traditional and local knowledge, literature review, and existing site information);
- Tier 2: Semi-quantitative (measured site-specific data and existing site information); and
- Tier 3: Quantitative (recent field surveys and detailed quantitative methods).

Thus, if the Tier 2 assessment still indicates a potential for effects to VCs, a Tier 3 assessment may need to be conducted to reduce the level of uncertainty. If the risk characterization component is uncertain this may necessitate the probabilistic modelling of the population-level consequences of the proposed project.

Biophysical changes to the environment that may impact human health include changes to: air quality, water quality, noise levels, contaminants in country food sources, and radiation levels. Such changes in the biophysical environment, as described in Section 9 (Baseline Environment), can impact human health. When risks to human health due to changes in one or more of these components are predicted, a complete Human Health Risk Assessment (HHRA) examining all exposure pathways for pollutants of concern may be necessary to adequately characterize potential risks the human health.

Impact matrix

An impact matrix methodology in combination with identification of VCs should be used to evaluate environmental effects of the proposed project, including those related to Aboriginal peoples. The assessment will include the following general steps:

- identification of the activities and components of the project;
- predicting/evaluating the likely effects on identified valued components;
- identification of technically and economically feasible mitigation measures for any significant adverse environmental effects;
- determination of any residual environmental effects;
- ranking of each residual adverse environmental effect based on various criteria; and
- determination of the potential significance of any residual environmental effect following the implementation of mitigation.

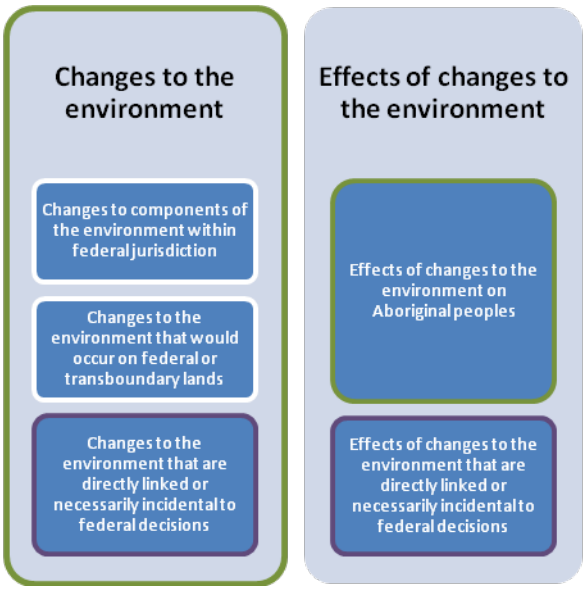
Application of precautionary approach

In documenting the analyses included in the EIS, the proponent will:

- Demonstrate that all aspects of the project have been examined and planned in a careful and precautionary manner in order to ensure that they would not cause serious or irreversible damage to the environment, especially with respect to environmental functions and integrity, system tolerance and resilience, and/or the human health of current or future generations;
- Outline and justify the assumptions made about the effects of all aspects of the project and the approaches to minimize these effects;
- Ensure that in designing and operating the project, priority has been and would be given to strategies that avoid the creation of adverse effects;
- Develop contingency plans that explicitly address accidents and malfunctions; and

- Identify any proposed follow-up and monitoring activities, particularly in areas where scientific uncertainty exists in the prediction of effects.

10.1.2 Changes to the environment



Section 5 of CEAA, 2012 describes specific categories of direct and indirect environmental effects that will be considered in the EA. However, to be able to assess these categories of environmental effects, a complete understanding of the changes the project will cause to the environment is required, including changes that are directly linked or necessarily incidental to any federal decisions that would permit the project to be carried out.

The EIS will describe any change that may be caused by the project (as scoped in section 6 of this document) on the environment, which is defined as the components of the Earth, including:

- Land, water and air, including all layers of the atmosphere;
- All organic and inorganic matter and living organisms; and
- The interacting natural systems that include the components described above.

These descriptions will be integrated into the effects assessment sections of each VC included in the EIS.

Changes to components of the environment within federal jurisdiction

The EIS will include a stand-alone section that summarises those changes that may be caused by the project on the components of the environment listed in paragraph 5(1)(a) of CEAA, 2012, namely fish and fish habitat, aquatic species and migratory birds.

Changes to the environment that would occur on federal or transboundary lands

The EIS will include a stand-alone section that summarises any change the project may cause to the environment that may occur on federal lands or lands outside the province in which the project is to be located (including outside of Canada).

Changes to the environment that are directly linked or necessarily incidental to federal decisions

In situations where the project requires one or more federal decisions identified in section 5.2, the EIS will also include a stand-alone section that describes any change that may be caused by the project on the environment that is directly linked or necessarily incidental to these decisions.

10.1.3 Effects of changes to the environment

Effects of changes to the environment on Aboriginal peoples

The EIS will describe the effects of any changes the project may cause to the environment, with respect to Aboriginal peoples, on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Effects of changes to the environment that are directly linked or necessarily incidental to federal decisions

In situations where the EIS has identified changes to the environment that are directly linked or necessarily incidental to federal decisions identified in section 5.2, the EIS will also include a stand-alone section that describes the effects of these changes on health and socio-economic conditions, physical and cultural heritage, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, other than as they pertain to Aboriginal peoples (who are considered in the previous section).

10.2 Adverse Impacts on Aboriginal and Treaty Rights and Related Interests

The EIS will describe, from the perspective of the proponent, the potential adverse impacts of the project on the ability of Aboriginal peoples to exercise the potential or established Aboriginal and Treaty rights and related interests identified in section 9.2. As part of this description, this section will summarise:

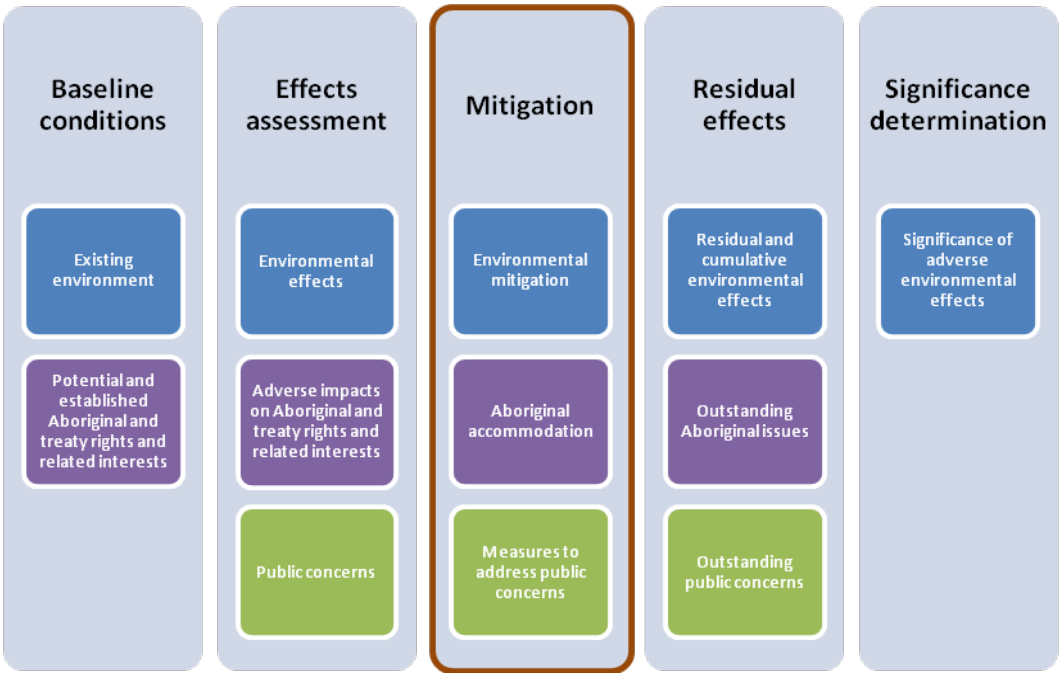
- Potential adverse impacts (on potential or established Aboriginal and Treaty rights and related interests) that were identified through the environmental effects described in sections 10.1.2 and 10.1.3;
- Specific issues and concerns raised by Aboriginal groups in relation to the potential adverse impacts of the project on potential or established Aboriginal and Treaty rights and related interests;
- VCs suggested for inclusion in the EIS, whether or not those factors were included, and the rationale for any exclusions;
- Where and how Aboriginal traditional knowledge or other Aboriginal views were incorporated into the consideration of environmental effects and potential adverse impacts on potential or established Aboriginal and Treaty rights and related interests; and
- Efforts undertaken to engage with Aboriginal groups as part of collecting the information identified above.

The assessment of the potential adverse impacts of each of the project components and physical activities, in all phases, will be based on a comparison of the exercise of the identified rights between the predicted future conditions with the project and the predicted future conditions without the project. It is recommended that the impact matrix methodology described in section 10.1.1 be adapted for this purpose.

10.3 Public concerns

This section will detail public concerns raised in relation to the project, including through public consultation conducted prior to the preparation of the EIS, and/or community knowledge that may have been provided.

11 MITIGATION



11.1 Environmental mitigation

11.1.1 Methodology

Every EA conducted under CEAA, 2012 will consider clear, enforceable measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project. As a first step, the proponent is encouraged to use an approach based on the avoidance and reduction of the effects at the source. Such an approach may include the modification of the design of the project or relocation of project components.

The EIS will describe the standard mitigation practices, policies and commitments that constitute technically and economically feasible mitigation measures and that will be applied as part of standard practice regardless of location. The proponent will then describe its environmental protection plan and its environmental management system, through which it will deliver this plan. The plan will provide an overall perspective on how potentially adverse effects would be minimized and managed over time.

The EIS will then describe mitigation measures that are specific to each environmental effect identified in section 10.1. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them. Where mitigation measures have been identified in relation to species and/or critical habitat listed under the *Species at Risk Act*, the mitigation measures will be consistent with any applicable recovery strategy and action plans.

The EIS will describe proponent commitments, policies and arrangements directed at promoting beneficial or mitigating adverse socio-economic effects. The EIS will further discuss the mechanisms the proponent would use to require its contractors and sub-contractors to comply with these commitments and policies and with auditing and enforcement programs.

The EIS will specify the actions, works, minimal disturbance footprint techniques, best available technology, corrective measures or additions planned during the project's various phases (construction, operation, modification, decommissioning, abandonment or other undertaking related to the project) to eliminate or reduce the significance of adverse effects. The impact statement will also present an assessment of the effectiveness of the proposed technically and economically feasible mitigation measures. The reasons for determining if the mitigation measure reduces the significance of an adverse effect will be made explicit.

The EIS will indicate what other technically and economically feasible mitigation measures were considered, including the various components of mitigation, and explain why they were rejected. Trade-offs between cost savings and effectiveness of the various forms of mitigation will be justified. The EIS will identify who is responsible for the implementation of these measures and the system of accountability.

Where mitigation measures are proposed to be implemented for which there is little experience or for which there is some question as to their effectiveness, the potential risks and effects to the environment should those measures not be effective will be clearly and concisely described. In addition, the EIS will identify the extent to which technology innovations will help mitigate environmental effects. Where possible, it will provide detailed information on the nature of these measures, their implementation, management and the development of the Follow-up Program as described in section 11.4.

Adaptive management is not considered a valid mitigation measure, but if the Follow-up Program indicates that corrective action is required, the proposed approach for managing the response should be identified.

11.1.2 Summary of environmental mitigation

In addition, the EIS will summarise the mitigation measures, follow-up and related commitments identified to address the categories of environmental effects specified in section 10:

- Changes to components of the environment within federal jurisdiction;
- Changes to the environment that would occur on federal or transboundary lands;
- Changes to the environment that are directly linked or necessarily incidental to federal decisions;
- Effects of changes to the environment on Aboriginal peoples; and
- Effects of changes to the environment that are directly linked or necessarily incidental to federal decisions.

11.2 Measures to address impacts on Aboriginal rights

This section will describe, from the perspective of the proponent, the measures identified to mitigate the potential adverse impacts of the project described in section 10.2 on the potential or established Aboriginal and Treaty rights and related interests identified in section 9.2. These measures will be written as specific commitments that clearly describe how the proponent intends to implement them. This description will include a summary of:

- Specific suggestions raised by Aboriginal groups for mitigating the potential adverse impacts of the project on potential or established Aboriginal and Treaty rights and related interests in relation to environmental effects specified in sections 10.1.2 and 10.1.3;
- Environmental mitigation measures identified in section 11.1 that also serve to address potential adverse impacts on potential or established Aboriginal and Treaty rights and related interests;
- Any potential cultural, social and/or economic impacts or benefits to Aboriginal groups that may arise as a result of the project;
- Where and how Aboriginal traditional knowledge or other Aboriginal views were incorporated into the mitigation of environmental effects of potential adverse impacts on potential or established Aboriginal and Treaty rights and related interests; and
- Efforts undertaken to engage with Aboriginal groups as part of developing the information identified above.

In preparing the EIS, the proponent will ensure that Aboriginal people and groups have access to the information that they require in respect of the project and of how it may impact them. The proponent will describe all efforts, successful or not, taken to solicit the information required to prepare the EIS.

The proponent will structure its Aboriginal engagement activities to provide adequate time for Aboriginal groups to have reviewed the relevant information in advance and to ensure there are sufficient opportunities for individuals and groups to provide oral input in the language of their choosing. Consultation activities must be appropriate to the groups' needs and should be arranged through discussions with the groups.

11.3 Measures to address public concerns

This section will describe measures identified for addressing public concerns in relation to the project identified in section 10.3. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them.

For any consultations undertaken with the general public, the EIS will describe the ongoing and proposed consultations and information sessions with respect to the project at the local, regional and provincial levels, where applicable. The EIS will provide a summary of discussions, indicate the methods used and their relevance, locations, the persons and organizations consulted, the concerns raised, the extent to which this information was incorporated in the design of the project as well as in the EIS, and the resultant changes. The proponent will also provide a description of efforts made to distribute project information and provide a description of information and materials that were distributed during the consultation process.

11.4 Follow-Up Program

A Follow-up Program is designed to verify the accuracy of the effects assessment and to determine the effectiveness of the measures implemented to mitigate the adverse effects of the project. The EIS will describe the proposed Follow-up Program in sufficient detail to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them), and to confirm both the assumptions and the effectiveness of mitigation. The Follow-up Program will include specific commitments that clearly describe how the proponent intends to implement them.

The Follow-up Program will be designed to incorporate baseline data, compliance data (such as established benchmarks, regulatory documents, standards or guidelines) and real time data (such as observed data gathered in the field). The proponent will describe the reporting methods to be used, including frequency, methods and format.

The effects predictions, assumptions and mitigation actions that are to be tested in the follow-up program must be converted into field-testable monitoring objectives. The monitoring design must include a statistical evaluation of the adequacy of existing baseline data to provide a benchmark against which to test for project effects, and the need for any additional pre-construction or pre-operational monitoring to establish a firmer project baseline.

The Follow-up Program will include a schedule indicating the frequency and duration of effects monitoring. This schedule is to be developed after an evaluation of the length of time needed to detect effects given estimated baseline variability, likely magnitude of environmental effect and desired level of statistical confidence in the results (Type 1 and Type 2 errors).

The description of the Follow-up Program will include any contingency procedures/plans or other adaptive management provisions as a means of addressing unforeseen effects or for correcting exceedances as required to comply or to conform to benchmarks, regulatory standards or guidelines.

The Follow up Program will also be designed to monitor the implementation of mitigation measures resulting from Aboriginal consultation, including:

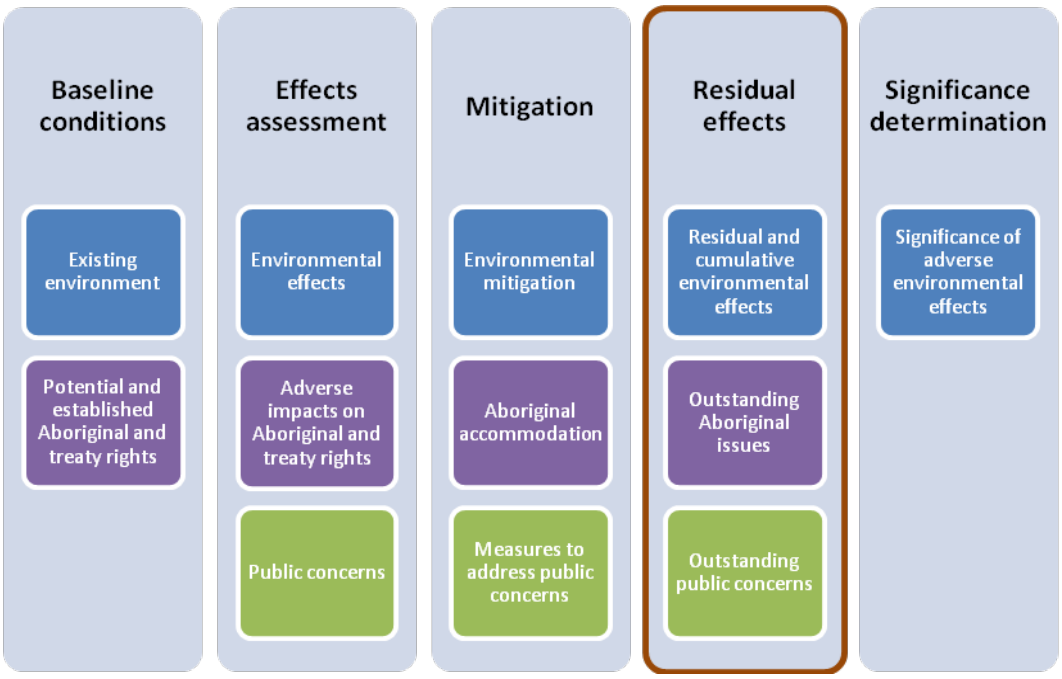
- Verifying predictions of environmental effects with respect to Aboriginal peoples, as well as residual impacts that could not be addressed within the context of the EA;
- Determining the effectiveness of mitigation measures as they relate to environmental effects with respect to Aboriginal peoples in order to modify or implement new measures where required;
- Supporting the implementation of adaptive management measures to address previously unanticipated adverse environmental effects with respect to Aboriginal peoples or unanticipated adverse impacts to Aboriginal rights;
- Verifying measures identified to prevent and mitigate potential adverse effects of the project on potential or established Aboriginal and Treaty rights; and
- Providing information that can be used to improve and/or support future EAs and Aboriginal consultation processes.

Where appropriate, the Follow-up Program can also encompass measures identified to address public concerns identified in section 11.3.

11.5 Proponent commitments

Proponent commitments identified in the EIS, including environmental mitigation measures to address public and Aboriginal peoples concern, and Follow-up Program elements, may be considered for inclusion as conditions in the EA decision statement and/or as part of other compliance and enforcement mechanisms. Each commitment will be specific, achievable, measurable and verifiable, and described in a manner that avoids ambiguity in intent, interpretation and implementation.

12 RESIDUAL EFFECTS



12.1 Residual and cumulative environmental effects

12.1.1 Residual environmental effects

After having established the technically and economically feasible mitigation measures, the EIS will present any residual environmental effects of the project on the biophysical and human environments after these mitigation measures have been taken into account. The residual effects, even if very small or deemed insignificant will be described.

12.1.2 Cumulative environmental effects

The proponent will identify and assess the project's cumulative effects using the approach described in the Agency's "Operational Policy Statement: Addressing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act*"[9].

Cumulative effects are defined as changes to the environment due to the project combined with the existence of other works or other past, present and reasonably foreseeable physical activities. Cumulative effects may result if:

- Implementation of the project being studied caused direct residual negative effects on the environmental components, taking into account the application of technically and economically feasible mitigation measures; and/or,
- The same environmental components are affected by other past, present or reasonably foreseeable physical activities.

[9] Visit the Canadian Environmental Assessment Agency's website at: http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=1F77F3C2-1

The EIS will describe the analysis of the total cumulative effect on a VC over the life of the project, including the incremental contribution of all current and proposed physical activities, in addition to that of the project. The EIS will include different forms of effects (e.g., synergistic, additive, induced, spatial or temporal) and identify impact pathways and trends.

The EIS will include a narrative discussion of existing projects in the vicinity of the proposed project. The narrative will include the description of any existing studies of changes to the environment resulting from those projects that are similar to potential changes resulting from the project, including any mitigation measures that were implemented, and any long term monitoring or follow up program that was conducted. The effectiveness of those mitigation measures and key results of monitoring or follow-up programs will be described. This narrative discussion should include historical data, where available and applicable, to assist interested parties to understand the potential effects of the project and how they may be addressed.

The cumulative effects assessment may consider the results of any relevant study conducted by a committee established under section 73 or 74 of CEAA, 2012.

12.1.3 Summary of residual environmental effects

In addition, the EIS will summarise the residual environmental effects (including cumulative environmental effects) identified in relation to the categories of environmental effects specified in sections 10.1.2 and 10.1.3:

- Changes to components of the environment within federal jurisdiction;
- Changes to the environment that would occur on federal or transboundary lands;
- Changes to the environment that are directly linked or necessarily incidental to federal decisions;
- Effects of changes to the environment on Aboriginal peoples; and
- Effects of changes to the environment that are directly linked or necessarily incidental to federal decisions.

12.2 Outstanding Aboriginal issues

This section will describe, from the perspective of the proponent, the potential adverse impacts on potential or established Aboriginal and Treaty rights and related interests that have not been fully mitigated as part of the environmental assessment and associated consultations with Aboriginal groups. This includes potential adverse impacts (on potential or established Aboriginal and Treaty rights and related interests) that may result from the residual and cumulative environmental effects described in section 10.2.

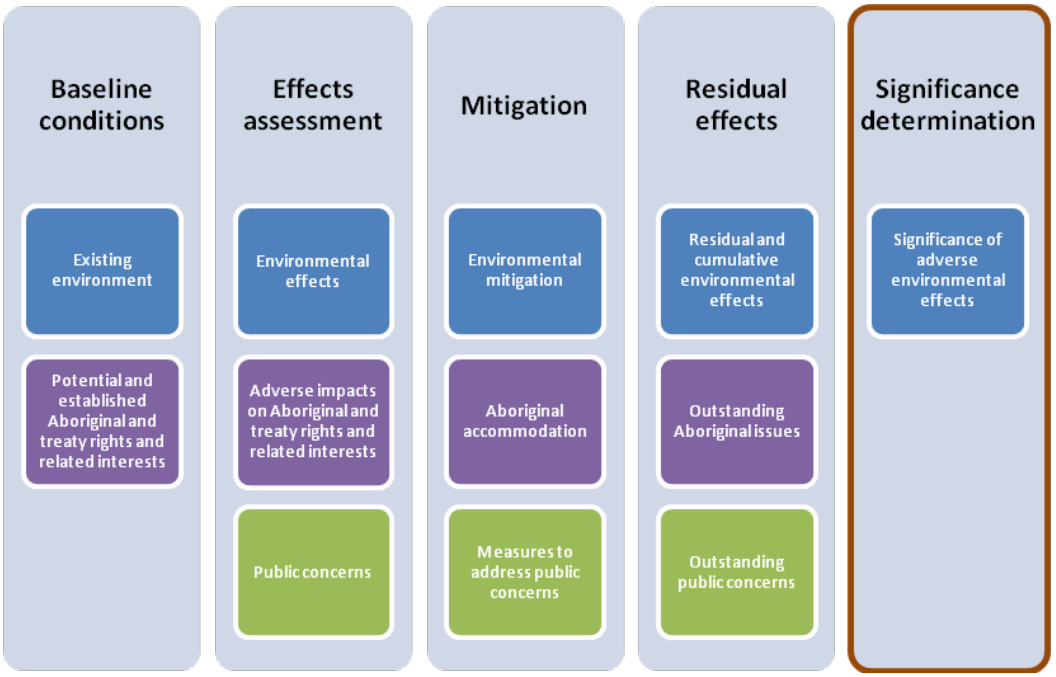
The information in this section will assist the Crown in assessing the adequacy of consultation and accommodation as set out in the "Updated Guidelines for Federal Officials to Fulfill the Duty to Consult" (2011)[10].

12.3 Outstanding public concerns

This section will describe the outstanding public concerns in relation to the project that have not been resolved as a result of changes to the project, mitigation measures, or public consultation.

[10] Visit the Aboriginal Affairs and Northern Development Canada website at: www.aadnc-aandc.gc.ca/eng/1100100014680/1100100014681

13 SIGNIFICANCE DETERMINATION



13.1 Significance of adverse environmental effects

13.1.1 Methodology

This section will provide a detailed analysis of the significance of the residual environmental effects (including cumulative environmental effects) that are considered adverse, using the approach described in the Agency's "Reference Guide: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects"[11].

The EIS will identify the criteria used to assign significance ratings to any predicted adverse effects. It will contain clear and sufficient information to enable the Agency, technical and regulatory agencies, Aboriginal groups and the public to review the proponent's analysis of the significance of effects. The proponent will define the terms used to describe the level of significance.

The following elements should be used in determining the significance of residual effects:

- Magnitude;
- Geographic extent;
- Duration and frequency;
- Reversibility;
- Ecological and social context; and
- Existence of environmental standards, guidelines or objectives for assessing the impact.

[11] Visit the Canadian Environmental Assessment Agency's website at: www.ceaa-acee.gc.ca/default.asp?lang=En&n=D213D286-1&offset=&toc=hide

In assessing significance against these criteria the EIS will, where possible, employ relevant existing regulatory documents, environmental standards, guidelines, or objectives such as prescribed maximum levels of emissions or discharges of specific hazardous agents into the environment. The EIS will contain a section which explains the assumptions, definitions and limits to the criteria mentioned above in order to maintain consistency between the effects on each VC.

Where significant adverse effects are identified, the EIS will set out the probability (likelihood) that they will occur, and describe the degree of scientific uncertainty related to the data and methods used within the framework of its environmental analysis.

13.1.2 Summary of significant adverse environmental effects

In addition, the EIS will summarise the significant adverse environmental effects identified in relation to the categories of environmental effects specified in sections 10.1.2 and 10.1.3:

- Changes to components of the environment within federal jurisdiction;
- Changes to the environment that would occur on federal or transboundary lands;
- Changes to the environment that are directly linked or necessarily incidental to federal decisions;
- Effects of changes to the environment on Aboriginal peoples; and
- Effects of changes to the environment that are directly linked or necessarily incidental to federal decisions.

14 SUMMARY TABLES

The EIS will contain a series of tables summarising the following key information:

- Potential environmental effects (section 10.1), adverse impacts on potential or established Aboriginal and Treaty rights and related interests (section 10.2) and public concerns (section 10.3);
- Proposed mitigation measures and commitments (section 11.5) by proponent to address potential impacts on environment, (section 11.1), Aboriginal rights (section 11.2) and public concerns (section 11.3), and Follow-up Program (section 11.4);
- Potential residual and cumulative environmental effects (section 12.1) and the significance of the residual environmental effects (section 13.1) ; outstanding Aboriginal issues (section 12.2) and outstanding public concerns (section 12.3);
- Comments from the public and responses;
- Comments from Aboriginal groups and individuals and responses; and
- Relationship of the identified Valued Components (section 7.1.1) to Aboriginal groups' potential or established Aboriginal and Treaty rights and related interests (section 9.2).

The summary tables will be used in the EA Report prepared by the Agency. Proponent commitments may be considered for inclusion as conditions in the EA decision statement and/or as part of other compliance and enforcement mechanisms.

15 BENEFITS TO CANADIANS

15.1 Changes to the project since initially proposed

The EIS will include a summary of the changes that have been made to the project since originally proposed, including the benefits of these changes to the environment, Aboriginal peoples, and the public.

15.2 Benefits of the project

The EIS will include a section describing the predicted environmental, economic and social benefits of the project. This information will be considered in assessing the justifiability of the significant adverse environmental effects, if necessary.

16 MONITORING PROGRAM AND ENVIRONMENTAL MANAGEMENT PLANS

The goal of a monitoring program is to ensure that proper measures and controls are in place in order to decrease the potential for environmental degradation during all phases of project development, and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety. In the EIS, the proponent will describe the monitoring activities at all stages of the project, the proponent's proposed commitment to implementing these activities and the resources provided for this purpose. The program will need to provide the key information such as contacts, protocols, measured parameters, deadlines, intervention in case of non-compliance of legal requirements and production of monitoring reports.

The finalization of a detailed monitoring program will occur through consultation with federal and provincial government agencies, Aboriginal groups, the public and other stakeholders. This may occur after the environmental assessment but will be consistent with the information presented in the EIS. Pertinent legislation, regulations, industry standards, documents and legislative guides will be used in the development of the monitoring program.

Environmental management plans (EMPs) are an example of a tool that can be used to ensure that proper measures and controls are in place in order to decrease the potential for environmental degradation during all phases of project development, and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety. The EMPs will serve to provide guidance on specific actions and activities that will be implemented to decrease the potential for environmental degradation during construction and operation, and to clearly define the proponent's ongoing environmental commitment.

APPENDIX AE

Newfoundland and Labrador
Environmental Impact Statement Guidelines
for the Joyce Lake Direct Shipping Iron Ore Project

ENVIRONMENTAL IMPACT STATEMENT GUIDELINES

for the

JOYCE LAKE DIRECT SHIPPING IRON ORE PROJECT

Prepared by:

The Newfoundland and Labrador Department of Environment and Conservation

November 2013

Table of Contents

Glossary of Acronyms and Abbreviations

ACCDC	Atlantic Canada Conservation Data Centre
ARD	Acid Rock Drainage
BACT	Best Available Control Technology
CEAA	*Canadian Environmental Assessment Act*
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
EC	Environment Canada
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
EPR	Environmental Preview Report
HC	Health Canada
NLDOEC	Newfoundland and Labrador Department of Environment and Conservation
NLEPA	Newfoundland and Labrador *Environmental Protection Act*
NLESA	Newfoundland and Labrador *Endangered Species Act*
NPAG	Non-Potentially Acid Generating
NO_x	Nitrogen Oxides
PAH	Polycyclic Aromatic Hydrocarbon
PAG	Potentially Acid Generating
$PM_{2.5}$, PM_{10}	Particulate Matter (subscript indicates size threshold, in microns)
t/d	Tonnes per day
t/yr	Tonnes per year
TMF	Tailings Management Facility
SAR	Species at Risk
SARA	*Species at Risk Act*
SO_2	Sulphur Dioxide
VEC	Valued Ecosystem Component
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

Labec Century Iron Ore (the Proponent) proposes to develop a direct shipping iron ore mine in western Labrador (the Project). The mine property is located approximately 20 kilometres northeast of the Town of Schefferville, Québec.

The Project is located entirely within Labrador and includes construction, operation and rehabilitation and closure of an open pit, water management, waste rock disposal areas, processing infrastructure, a tailings management facility (TMF), ancillary infrastructure to support the mine and process plant and a rail transportation component.

The mine will produce up to four million tonnes of iron ore fine and ore concentrate per year. The iron ore products will be transported via a new haulage road and new rail loop which will tie into the existing rail (owned by Tshiuetin Rail Transportation Inc) to the port Sept-Îles.

The Project requires Environmental Assessment (EA) under both the *Newfoundland and Labrador Environmental Protection Act* (*NLEPA*) and *Canadian Environmental Assessment Act* (*CEAA*), specifically, the preparation of an Environmental Impact Statement (EIS). These requirements are discussed in further detail in Section 2.2.

1.1 Purpose of the Environmental Impact Statement Guidelines

These guidelines have been prepared by the Government of Newfoundland and Labrador to identify for the Proponent the nature, scope and minimum information and analysis required in preparing its EIS. The EIS is intended to address the legislative requirements of the province.

These guidelines shall not be regarded as either restrictive or exhaustive. Concerns other than those identified herein may arise during the investigations associated with the EIS. The provincial government is prepared to provide advice and assistance throughout the preparation of the EIS with regard to the identification of environmental concerns and appropriate assessment methodology.

"Environment" includes:

a) air, land and water;
b) plant and animal life, including human life;
c) the social, economic, recreational, cultural and aesthetic conditions and factors that influence the life of humans or a community;

d) a building, structure, machine or other device or thing made by humans;
e) a solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of humans; or
f) a part or a combination of those things referred to in subparagraphs (a) to (e) and the interrelationships between 2 or more of them.

"Environmental effect" means: a change in the present or future environment that would result from an undertaking;

"Minister" means: the provincial Minister of Environment and Conservation.

1.2 Guiding Principles

1.2.1 Environmental Assessment as a Planning Tool

Environmental assessment is a planning tool used to ensure that projects are considered in a careful and precautionary manner in order to avoid or mitigate the possible adverse effects of development on the environment. EA also encourages decision makers to take actions that promote sustainable development and thereby achieve or maintain a healthy environment and a healthy economy.

The EA of this project shall, in a manner consistent with the purposes above:

- consider and evaluate alternatives to the Project and alternative means of carrying out the Project that are technically and economically feasible;
- document public and Aboriginal consultation activities in a manner that is transparent and accessible;
- propose measures to avoid or mitigate adverse environmental effects;
- propose measures to enhance or prolong beneficial environmental effects;
- describe residual environmental effects that are beneficial or harmful that are likely to be caused by the undertaking regardless of the proper application of all control, mitigation, enhancement and remedial measures to be proposed in the EIS;
- assess the cumulative environmental effects of the Project in combination with other projects and activities that have been or will be carried out;

- predict whether or not the project, in combination with other projects or activities that have been or will be carried out, is likely to cause significant adverse environmental effects after mitigation measures are implemented;
- specifically list and cite all sources of information in the EIS;
- outline the design of studies necessary to provide additional information for the preparation of the EIS;
- address concerns identified during the public information sessions or through consultations with Aboriginal organizations by including within the EIS specific responses to those concerns and, where appropriate, specific proposals for measures to deal with them; and
- as soon as they have been completed, provide copies of all reports or studies undertaken in order to satisfy these guidelines.

1.2.2 Local Knowledge and Aboriginal Traditional Knowledge

Local knowledge and Aboriginal traditional knowledge refers to the broad base of knowledge held by individuals and collectively by communities that may be based on spiritual teachings, personal observation and experience or passed on from one generation to another through oral and/or written traditions.

Local knowledge and Aboriginal traditional knowledge, in combination with other information sources, can help in achieving a better understanding of potential effects of projects. Local knowledge and Aboriginal traditional knowledge may, for example, contribute to the description of the existing physical, biological and human environments, natural cycles, resource distribution and abundance, long and short-term trends and the use of lands and water resources. It may also contribute to project site selection and design, identification of issues, the evaluation of potential effects and their significance, the effectiveness of proposed mitigation, cumulative effects assessment and the consideration of follow-up and monitoring programs.

Aboriginal traditional knowledge, which is rooted in the traditional life of Aboriginal people, has an important contribution to make to an EA. Certain issues relevant to the review process are firmly grounded in Aboriginal traditional knowledge such as harvesting, use of lands and resources for traditional purposes, cultural well-being, land use and heritage resources.

Although the basis for Aboriginal traditional knowledge and science-based knowledge can differ, they may on their own or together, contribute to the understanding of these issues.

The EA will promote and facilitate the contribution of local knowledge and Aboriginal traditional knowledge to the review process and recognize that approaches to local knowledge or Aboriginal traditional knowledge, customs and protocols may differ among communities and persons with respect to the use, management and protection of this knowledge.

The Proponent shall incorporate into the EIS the local knowledge and Aboriginal traditional knowledge to which it has access or that it may reasonably be expected to acquire through appropriate due diligence, in keeping with appropriate ethical standards and without breaching obligations of confidentiality.

1.2.3 Sustainable Development

Sustainable development, as defined in the *Newfoundland and Labrador Sustainable Development Act* (to be proclaimed) means development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. The EIS shall consider the extent to which the Project would meet this objective.

EA provides a systematic approach for identifying, predicting and evaluating the potential environmental effects of projects before decisions are made. In addition, EA provides the means to identify mitigation measures for adverse effects. EA enables the integration of environmental factors into the planning and decision-making process in a manner that promotes sustainable development and contributes to decision making that can ultimately provide net ecological, economic and social benefits to society. Moreover, a project that is supportive of sustainable development strives to incorporate citizen participation into decision-making.

The EA of the Project, including its alternative means, shall take into account the relationships and interactions among the various components of the ecosystems, including the extent to which biological diversity may be affected by the Project and how the Project meets the needs of the present as well as future populations.

1.2.4 Precautionary Approach

One of the purposes of EA is to ensure that proponents consider the Precautionary Principle. If a project has the potential to cause a threat of serious or irreversible damage to the environment, the Proponent must take all reasonable environmental protection measures to protect the environment, even if full scientific knowledge is lacking.

The Proponent shall indicate how the precautionary principle was considered in the design of the Project in at least the following ways:

- demonstrate that all aspects of the Project have been examined and planned in a careful and precautionary manner in order to ensure that they would not cause serious or irreversible damage to the environment, especially with respect to environmental functions and integrity, considering system tolerance and resilience and/or the human health of current or future generations;
- outline and justify the assumptions made about the effects of all aspects of the Project and the approaches to minimize these effects;
- evaluate alternative means of carrying out the Project and compare them in light of risk avoidance and adaptive management capacity;
- in designing and operating the Project, demonstrate that priority has been given to strategies that avoid the creation of adverse effects;
- develop contingency plans that explicitly address accidents and malfunctions;
- identify any proposed follow-up and monitoring activities, particularly in areas where scientific uncertainty exists in the prediction of effects or effectiveness of proposed mitigation measures; and
- present public views on the acceptability of all of the above.

2.0 THE ENVIRONMENTAL ASSESSMENT PROCESS

2.1 Contacts for the Environmental Assessment

Newfoundland and Labrador contacts for the EA are:

Brenda Rowe (Chair)
Environmental Scientist
Environmental Assessment Division
Department of Environment and Conservation
PO Box 8700
St. John's NL A1B 4J6

John Pennell (Co- Chair)
Environmental Scientist
Environmental Assessment Division
Department of Environment and Conservation
PO Box 8700
St. John's NL A1B 4J6

(709)729-2553 (709)729-4295
browe@gov.nl.ca johnpennell@gov.nl.ca

2.2 Environmental Assessment Requirements

2.2.1 Newfoundland and Labrador Environmental Protection Act

Any mining of a mineral as defined in the *Mineral Act* in Newfoundland and Labrador is subject to EA under the *NLEPA* and *Environmental Assessment Regulations.* The Environmental Assessment Division of the Newfoundland and Labrador Department of Environment and Conservation (NLDOEC) administers the process including:

- consulting at every stage with interested government departments, the public and aboriginal organizations;
- evaluating submissions by proponents and reviewers including aboriginal organizations;
- advising the Minister on potential environmental effects prior to decisions; and
- monitoring released projects to ensure compliance and effectiveness of mitigation.

An undertaking that is subject to the NLEPA is required to be registered for examination by the NLDOEC. The registration outlines the proposed project and describes how it will affect the bio-physical and socio-economic environments. The Registration is referred to provincial and federal government departments and to appropriate Aboriginal governments and organisations for review and comment. The Registration is also publicly available for comment. At the conclusion of the review period, the Minister advises the Proponent whether the undertaking has been released from further assessment or will require an Environmental Preview Report (EPR), an EIS, or if it has been rejected. On December 13, 2012, the Minister advised Labec Century Iron Ore that an EIS is required.

2.2.2 Delegated EIS Preparation

Pursuant to the requirements of Section 51(1)(b) of the NLEPA, the Proponent has been delegated the task of preparing the EIS. The EIS should be prepared according to these guidelines. Once completed, the Proponent shall submit printed and electronic copies of the EIS to the involved provincial agencies (number of copies to be determined). In addition, the Proponent shall make printed copies of the EIS and the Plain language Summary (PLS) of the EIS available at public viewing centers (to be designated) in the project vicinity.

In accordance with the requirements of NLDOEC, baseline studies will be conducted to define baseline conditions and to support the evaluation of environmental effects and/or the

development of mitigation measures as well as monitoring and follow up programs. Baseline studies are discussed further in Section 4.15.

2.3 Provincial - Federal Cooperation

The Governments of Newfoundland and Labrador and Canada intend to conduct respective EA reviews in a cooperative manner, but retain separate decision making. The process will feature separate EIS guidelines, separate Aboriginal consultation processes and practices, and separate public comment periods. However, the Proponent shall submit a singular EIS that is intended to fulfill the requirements of both jurisdictions.

2.4 Consultation

Aboriginal organizations and the public will have several opportunities to participate in the EA process and provide their views on the potential environmental effects of the Project. These are outlined in Table 1.

Table 1 Aboriginal and Public Participation Opportunities

Opportunity	Duration
Comment on Draft EIS guidelines	40 days
Comment on Proponent's EIS or Plain Language Summary (PLS)	50 days
Comment on any additional EIS requirements, i.e., Addendum (if required by the Minister)	50 days

Electronic and hard copy versions of documents will be provided by the Proponent and made available for Aboriginal and public review by NLDOEC. Key documents will be available on the NLDOEC Environmental Assessment webpage.

Public comment periods will be announced in newspapers and on the NLDOEC Environmental Assessment webpage mentioned above. Interested parties may contact the Newfoundland and Labrador EA contacts identified in Section 2.1 for further information regarding comment periods.

The Proponent is required to provide current information about the project to the public and especially to the communities likely to be most affected by the project as early as possible in the review process. This will ensure that all parties have an opportunity to gain an understanding of the proposed Project and may facilitate their continued involvement in the

EA process. During the preparation of the EIS, the Proponent must hold public information sessions to provide information concerning the Project to the people whose environment may be affected by the undertaking. The Proponent must record and respond to the concerns of the local communities regarding the potential environmental effects of the Project. Appendix A provides additional information on the notification requirements for the information sessions.

2.4.1 Aboriginal Consultation

The Government of Newfoundland and Labrador (NL) is committed to consulting Aboriginal organizations when NL contemplates making land and resource development decisions that have the potential to adversely impact asserted or proven Aboriginal rights.

NL strives for a practical consultation process that helps to ensure that land and resource development decisions minimize or, where reasonably practicable, eliminate potentially adverse impacts on asserted or proven Aboriginal rights.

NL also aims to maintain, foster and improve effective working relationships among Aboriginal organizations, the Proponent and NL.

In particular, NL's consultation process is intended to produce better communication, stronger relationships and easier resolution of issues among Aboriginal organizations, the Proponent and NL.

Consultation should be conducted with the objective of helping ensure that land and resource development decisions minimize or, where reasonably practicable, eliminate adverse impacts on asserted rights.

For clarity, the Province will consult only those Aboriginal organizations which have asserted or proven Aboriginal rights in the Project area.

To assist the consultation processes, the EIS must describe the concerns raised by Aboriginal organizations in respect of the Project and where applicable, how they have been or will be considered and, where appropriate, addressed. This should include a summary of discussions,

as well as issues or concerns raised and any asserted or proven Aboriginal rights, as conveyed to the Proponent by Aboriginal representative organizations or NL.

The Proponent must ensure that it engages with Aboriginal organizations whose asserted Aboriginal rights or any rights established pursuant to a final land claim agreement to which NL is a party may be adversely impacted by the Project. In preparing the EIS, the Proponent must ensure that it provides sufficient, early notification; and timely, updated information to Aboriginal organizations to ensure they are reasonably informed about the Project. The Proponent shall also discuss with Aboriginal organizations the most practical and appropriate method of consultation. This will require the Proponent to provide up-to-date information describing the Project to the relevant Aboriginal organizations, and especially to the communities likely to be most affected by the Project. The Proponent shall also involve Aboriginal organizations in determining how best to deliver that information (e.g. the types of information required, formats, and the number of community meetings required).

The EIS must document any potentially adverse environmental effects on asserted Aboriginal rights or on any rights established pursuant to a final land claim agreement to which NL is a party that would be caused by a Project-induced change in the environment, as well as any measures taken or recommended that would prevent, mitigate, or otherwise address these effects. NL will use this information towards fulfilling its duty to consult Aboriginal organizations about the Project. In addition to Proponent-involved Aboriginal engagement, NL may undertake additional engagement activities directly with Aboriginal representative organizations.

2.4.2 Record of Aboriginal and Public Consultation

The EIS must describe all Aboriginal and public consultation activities undertaken by the Proponent prior to, during, or planned after the EA. It should describe key stakeholder groups, summarize comments heard, identify key issues of concern raised by Aboriginal organizations and the public and the Proponent's responses.

3.0 SCOPE OF PROJECT, FACTORS TO BE CONSIDERED AND SCOPE OF THE FACTORS

3.1 Scope of Project

The EIS will examine all activities and physical works associated with the construction, operation, rehabilitation and closure of the proposed Project, as described in the Proponent's project description dated October 2012, amended November 2012 and February 2013 including, but not limited to, the activities listed in Section 3.1.1.

3.1.1 Labrador

The mine and associated facilities and infrastructure will be located wholly within Labrador. The Labrador component of the project will include construction, operation, rehabilitation and closure of the following components:

- an open pit including dewatering infrastructure to dewater Joyce Lake and to manage groundwater levels;
- waste rock disposal areas and overburden stockpiles;
- low grade ore stockpiles, run of mine ore stockpiles and final product stockpiles;
- dry processing infrastructure (crushing and screening system);
- wet processing infrastructure (to be determined);
- tailings management facility (TMF);
- ancillary infrastructure to support the mine and process plant (gate and guardhouse, reclaim water pumphouse, truck wash bay and shop, fuel and used oil storage, fuel distribution system, power generation, transmission lines, explosives magazine storage, administration/office buildings, maintenance offices, warehouse area and employee facilities, sewage and water treatment units);
- mobile mining and support equipment;
- floating and overland conveyer system option (to be determined);
- access and haulage roads, including ice bridges;
- rail transportation component including rail loop construction to connect the haulage road to the Tshiuetin Rail Transportation Inc. rail system.

3.2 Factors to be Considered

The EIS shall consider:

- cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out;

- the significance of the environmental effects;
- comments from Aboriginal organizations and from the public, that are received in accordance with NLEPA regulations or practice;
- local knowledge and Aboriginal traditional knowledge;
- the requirements of a follow-up program for the Project; and
- the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future.

3.3 Scope of the Factors to be Considered

In addition to the factors listed above, the EIS shall document any additional issues or concerns that may be identified through regulatory, stakeholder, Aboriginal and public consultation.

The assessment of environmental effects shall focus on valued ecosystem components (VECs). A VEC is a component or attribute that is important for its ecological, legal, scientific, cultural, economic or aesthetic values. VECs for the project should be selected based on defined criteria and their selection justified. The assessment shall consider potential environmental effects that the Project may have on each VEC.

In considering VECs, the Proponent will recognize that:

- the value of a component not only relates to its role in the ecosystem, but also to the value placed on it by humans;
- culture and way of life of those using the area affected by the Project may also be considered as VECs; and
- functional relationships within the environment may also be considered as VECs.

The EIS will define the study areas and time frames, or spatial and temporal boundaries used in the analysis of environmental effects, including cumulative effects. It is expected that the spatial and temporal boundaries shall vary between VECs to reflect the nature of both the VEC and the predicted effects. Temporal and spatial boundaries must reflect:

- the geographic range over which the project's environmental effects may occur, recognizing that some effects shall extend beyond the project area;
- timing/scheduling of project activities;
- natural variations of each VEC;

- the time required for recovery from an impact; and
- cumulative effects of other projects and activities to VECs.

The VECs to be considered must include:

- atmospheric environment;
- landforms, soils, snow and ice;
- water resources (surface water and ground water);
- wildlife;
- species at risk and designated species;
- historic and cultural resources;
- other current and future use of lands and resources; and
- economy, employment and business.

The Proponent may add other VECs. In addition, the EIS shall include a consideration of key organisms that live off or rely on bio-physical VECs during their life cycle. Rationale for the selection of the above VECs, as well as a proposed study approach, is provided in Section 4 of these guidelines and is to be presented in the EIS for all VECs. The EIS shall describe, in detail, study methods and analytic methods, including incorporation of information gathered through consultation and Aboriginal traditional knowledge.

4.0 PREPARATION OF THE EIS

The EIS is a statement of the Proponent's environmental conclusions and commitments related to the Project; it must be explicitly endorsed by the Proponent.

The EIS shall employ the clearest language possible. However, where the complexity of the issues addressed requires the use of technical language, a glossary defining technical words and acronyms shall be included. The Proponent must also prepare a Plain Language Summary (PLS) to accompany the EIS. The PLS is described in Section 4.2 and will be used to facilitate Aboriginal consultation and aid public review of the conclusions of the EIS.

The EIS shall be a stand-alone document upon which a critical review can be undertaken. Where external sources of information or data are used, they shall be referenced within the body of the EIS and listed completely at the end. Where conclusions that are critical to the assessment of environmental impacts are cited from other reports, the EIS shall provide sufficient detail of the originating data and analysis to enable a critical review of that material and submit reference material as an appendix to the EIS.

It is recommended that the EIS be presented in the sequence outlined in these Guidelines. If a different sequence is used, the EIS shall include a Table of Concordance to these Guidelines, so that information requirements identified herein can be easily located in the EIS. The EIS shall refer to, rather than repeat, information previously presented in other sections of the document. However, it is important that underlying limitations, uncertainties and assumptions of all environmental predictions, especially those that support major statements or conclusions, be described in the body of the EIS rather than simply referencing supporting studies. A key subject index is to be provided giving locations in the text by volume, section and sub-section.

The EIS shall provide charts, diagrams and maps wherever useful to clarify the text, including a depiction of how the developed Project sites will appear from both an aerial and terrestrial perspective. Where possible, maps shall use common scales to allow for comparison and overlay of mapped features and shall indicate common and accepted local place names. Where technically feasible, provide geographic information in standard Geographic Information System (GIS) mapping (digital) format. The EIS and all associated reports and studies shall use System International (SI) units of measure and terminology throughout.

The following sections describe the different topics to be addressed in the EIS. The EIS must provide sufficient information to allow readers to understand the potential environmental effects of the Project, focusing on the most significant potential effects as identified by the Proponent and through these guidelines. The EIS must provide an acceptable rationale for not fully addressing any issue identified in the guidelines and must highlight key impacts that require more intensive investigation.

Section 4 is organized into two parts:

- PART I: CONTENT OF THE EIS describes the layout and required content of the EIS; and

- PART II: DETAILED GUIDANCE ON SELECT ENVIRONMENTAL COMPONENTS provides an overview of the recommended studies and approach for each VEC.

The information included in this document is not intended to be exhaustive and additional detail, studies, or examination of additional components may be required.

PART I: CONTENT OF THE EIS

4.1 Executive Summary

The EIS should begin with an Executive Summary, including a concordance table that describes where each information requirement of the EIS Guidelines has been addressed in the EIS.

4.2 Plain Language Summary

In order to enhance understanding of the EIS and facilitate consultation activities, a Plain Language Summary (PLS) of the EIS must be prepared. The PLS will summarize the Project and the major findings and conclusions of the EIS. It must be a stand-alone document no longer than approximately 50 pages, excluding annexes and appendices. It should clearly describe the Proponent, the Project (including rehabilitation and closure activities), and the environmental impacts of the Project. Maps at appropriate sizes and scales must be included to clearly show the location of all Project components and/or environmental components. As the name implies, the PLS should avoid unnecessary use of technical terms or jargon and be written so that an average reader with no specialist knowledge of mining or EA can comprehend the Project, the analysis of environmental effects, the conclusions reached, and the supporting rationale. The PLS should be organized as follows:

Introduction

- Project Overview
- Environmental Assessment Process
    - Purpose of the EIS
    - Provincial EA Requirements

Project Description

- Purpose of and Need for the Project
- Project Description
    - Location
    - Components
    - Activities
    - Schedule

Scope of the Assessment

- Scope of the Project
- Factors to be Considered
- Scope of the Factors
    - Identification of VECs
    - Spatial and Temporal Boundaries

Project Alternatives

- Alternatives to the Project
- Alternative Means of Carrying out the Project
    - Description of Alternative Means
    - Environmental Effects of Technically and Economically Feasible Alternative Means
    - Selection of a Preferred Alternative Means

Consultation

- Aboriginal and Public Consultation and Engagement Activities undertaken for the EA (Proponent and Government)

Existing Environment

Environmental Effects Assessment

- Method and Approach
- VECs (impact matrix should be provided)
    - Potential Environmental Effects
    - Mitigation Measures
    - Residual Environmental Effects
    - Government, Aboriginal and Public Comments and Proponent's Response
- Effects of the Environment on the Project
    - Method and Approach
    - Potential Effects
    - Mitigation
    - Residual Effects
    - Government, Aboriginal and Public Comments and Proponent's Response
- Effects of Possible Accidents or Malfunctions
    - Method and Approach
    - Potential Effects
    - Mitigation
    - Residual Effects
    - Government, Aboriginal and Public Comments and Proponent's Response
- Effects on Capacity of Renewable Resources
- Cumulative Environmental Effects
    - Approach
    - Scoping
    - Potential Cumulative Effects
    - Mitigation Measures
    - Residual Effects
    - Government, Aboriginal and Public Comments and Proponent's Response

Follow-Up Program

Benefits of the EA to Newfoundlanders and Labradoreans

Overall Conclusions of the Proponent

It is understood that the Proponent can only provide Government, Aboriginal and Public comments and the Proponent's responses to the extent known at the time of writing, as there will be further comment periods after the EIS.

4.3 Project Introduction

4.3.1 The Proponent

The EIS shall:

- identify the Proponent and the name of the legal entity that would develop, manage and operate the Project;
- provide contact information for the Proponent (e.g., name, address, telephone, facsimile, e-mail);
- explain corporate and management structures, as well as insurance and liability management related to the Project;
- explain corporate environmental, Aboriginal relations and community relations policies;
- specify how the Proponent would ensure that corporate policies are implemented and respected for the Project;
- summarize key elements of its environmental management system and how it would be integrated into the Project; and
- identify key personnel, contractors and/or sub-contractors responsible for preparing the EIS. The qualifications of biologists conducting surveys for migratory birds, species at risk and species of conservation concern and wetland delineations should be provided in an appendix to the EIS.

4.3.2 Project Overview

The EIS shall briefly summarize the development proposal. If the Project is part of a larger sequence of projects, the EIS shall outline the larger context and present the relevant references, if available. The Project location should be described in the context of surrounding land uses and infrastructure. The intent of this overview is to provide the key

components and the location of the Project, rather than a detailed description, which shall follow as described in Section 4.3.4 of this document.

4.3.3 Regulatory Framework and the Role of Government

The EIS should identify, the EA process and the government bodies involved in the assessment. It should also describe the process used to determine the requirement for the provincial EA. In addition, the EIS shall:

- identify the environmental regulatory approvals and legislation that are applicable to the Project at provincial and municipal levels, including:
    - activities requiring regulatory approval;
    - names of permits or regulatory approvals;
    - names of legislation applicable in each case; and
    - names of the regulatory agencies responsible for each permit or approval;
- identify environmental government policies, resource management, planning or study initiatives pertinent to the Project and discuss their implications;
- identify any relevant Land Use Plans, Land Zoning and/or Community Plans;
- describe land tenure in the vicinity of the Project;
- identify and delineate major components of the Project and identify those being applied for and constructed within the jurisdiction of these approvals processes under provincial legislation; and
- provide a summary of the regional, provincial and/or national objectives, standards or guidelines that have been used by the Proponent to assist in the evaluation of any predicted environmental effects.

4.3.4 Non-Government Participants in the Environmental Assessment

The EIS shall identify the main participants in the EA including Aboriginal organizations, community groups and environmental organizations.

4.3.5 Land Claims Agreements and Interim Agreements

The EIS shall identify any publicly available agreements or arrangements entered into between the Proponent and/or the Government of Newfoundland and Labrador and/or Aboriginal organization(s) in the context of land claims and, where applicable, address how they may affect or be affected by the Project. This includes the Tshash Petapen (New Dawn)

Agreement and the Labrador Innu Land Claims Agreement-in-Principle, which is not legally binding but forms the basis of negotiation of a final agreement.

4.3.6 Other Registrations

The Proponent shall indicate whether any other registrations have previously been submitted in relation to this Project, or are to be submitted for EA in the future as a result of this Project.

4.4 Project Description

4.4.1 Purpose of and Need for the Project

The EIS shall state the purpose of the Project, from the Proponent's perspective and clearly describe the need for the Project (i.e., the problem or opportunity the Project is intended to solve or satisfy). This is the fundamental rationale for the Project and provides the context for the consideration of alternatives to the Project.

The statement of the Project's justification shall be presented in economic terms, shall provide a clear description of methods, assumptions and conclusions used in the analysis and shall include an evaluation of the following:

- current and forecasted iron ore demand;
- market opportunities, forecasts and expected evolution;
- risks to the Project, including market prices and schedule delays, interest rates and other risk factors relevant to the decision to proceed with the Project; and
- projected financial benefits at the regional, provincial and national levels.

4.4.2 Alternatives to the Project

The EIS must include an analysis of alternatives to the Project; describing functionally different ways to meet the Project's need and purpose. The EIS shall:

- identify the alternatives to the Project that were considered;
- develop criteria to identify the major environmental, economic and technical costs and benefits of the alternatives; and
- identify the preferred alternatives to the Project based on the relative consideration of the environmental, economic and technical costs and benefits.

The level of detail for this analysis must be sufficient to allow the reader to understand the alternatives and how they compare to the Project. The analysis of alternatives to the Project is to provide clearly described methods and criteria for comparing alternatives and sufficient information for the reader to understand the reasons for selecting the preferred alternative and for rejecting others. This analysis shall include a description of the conditions or circumstances that could affect or alter these choices, such as market conditions, regulatory changes and other factors, either prior to construction or during the life of the Project.

The EIS shall include a comparative analysis of the environmental effects and technical and economic feasibility of alternatives that led to the choice of the selected Project alternative. The EIS shall demonstrate how the preferred alternative contributes to sustainable development. The Proponent shall include an evaluation of the thresholds for economic viability of the Project and considerations respecting the timing of phases and components of the Project.

In assessing alternatives, the Proponent is encouraged to take into account any potentially adverse impacts of the technically and economically feasible alternatives on asserted or proven Aboriginal rights.

4.4.3 Project Location

The EIS shall provide a concise description of the geographical setting in which the Project shall take place. The description shall focus on aspects of the environment that are important for understanding the potential environmental effects of the Project, including:

- any existing designated or planned environmentally sensitive or significant areas; national, provincial and regional parks; protected natural areas and watersheds; ecological reserves; wetlands; riverine and lacustrine fish habitats; mature and interior forest habitat for migratory birds; and habitats of provincially designated species, including critical habitat for the designated species; areas of concentration of other wildlife; and other sensitive areas and habitat;
- the current and future land use in the area and the relationship of the Project facilities and components with any existing or future land use including traditional, private and crown lands; and

- a description of the nearest potentially sensitive human receptors such as residences, cabins, sacred sites, places of worship, etc. and of local communities that may be affected by project activities.

The location of the mine site and transportation corridors shall be described and clearly indicated on maps of appropriate scale. The location map should include the boundaries of the proposed site and transportation corridors, major existing infrastructure, municipal drinking water supply areas (protected and unprotected) if applicable, adjacent land uses and important environmental features. In addition, site plans/sketches and photographs showing project location, site features and the intended locations of project components should be included.

4.4.4 Project Description

4.4.4.1 Facilities and Components

The EIS shall describe all of the Project's facilities and components in detail, focusing on those with the most potential for environmental interactions and risk (e.g., Project "footprint" wastes and emissions and associated zones of influence). As appropriate to convey the information (i.e., environmental interactions), the EIS shall present descriptions, locations, plans, figures and/or drawings for each facility, including:

- tailings management facilities;
- waste rock storage (including discussion of ore contaminants (e.g. manganese) that may affect processing and volume of waste rock);
- all effluent generation, treatment systems, handling and discharge locations, as well as all anticipated effluents and contaminants, including ammonia residue from blasting operations;
- air emission sources (e.g. diesel generators, equipment, roads, waste rock/tailings lift-off, crushing, grinding, process heaters, blasting, conveyors, etc.);
- ambient air sampling stations and their locations;
- noise sources, expected noise levels and noise monitoring locations;
- sources and frequency of vibrations;
- water control structures or diversions that may be required to facilitate the Project;
- transmission lines, including towers, poles and aerial crossings over water bodies;
- bridges and watercourse crossings (including conveyors) along proposed access roads and railway, including any preliminary designs for crossing structures;

- permanent and temporary access infrastructure (including road and rail) to be constructed;
- fuel storage systems, including secondary containment (dykes) and a list of fuels;
- any quarries that are contemplated as part of the Project; and
- viewscapes that could be affected by the Project.

4.4.4.2 Activities

The EIS shall include descriptions of the construction, operation, maintenance, foreseeable modifications, including the expansion and lengthening of the operations and, where relevant, rehabilitation and closure of sites and facilities associated with the Project. Detailed descriptions of activities to be carried out during each phase of the Project should include the location, magnitude and scale of each activity, including labour force requirements. A schedule must be provided, showing time of year, frequency and duration of project activities.

The description of the construction and operation activities shall include:

- estimates of emission quantities (t/yr);
- solid waste, hazardous waste and waste reduction strategies;
- spill potentials and prevention strategies (e.g. hydraulic hose ruptures, fuelling mishaps, tank failure); and
- re-vegetation strategy for tailings storage or other areas.

The EIS should describe proposed means to treat waste resulting from the Project and/or the capacity of contractors to do so.

The EIS should describe any regular maintenance that may be required for proposed bridges, transmission lines and conveyors installed over navigable waterways. Activities involving periods of increased environmental disturbance or the release of materials into the environment are to be highlighted.

The level of detail in the description of the Project's facilities and activities shall be sufficient to enable prediction of environmental effects.

4.4.4.3 Labour Force Requirements

The EIS shall include descriptions of the construction, operations, rehabilitation and closure labour force requirements, including:

- the National Occupation Classification (NOC) 2006 codes (at the 4-digit level) associated with each position for all phases of the Project, including the number of positions associated with each NOC 2006 code;
- qualifications, certifications and other requirements, including the need for, location and availability of related training opportunities (e.g., post-journeyperson training) associated with key positions for all phases of the Project;
- the approximate timelines for each of the positions during the construction and operations phases of the Project, including the number of positions for each 4-digit NOC 2006 code throughout the Project at specified time intervals (monthly, or at least quarterly) to show levels of employment throughout the Project timeline;
- whether the positions are full-time equivalent or actual positions. If they are actual positions, the breakdown of full-time and part-time or full-year and part-year positions;
- an estimate of the number of apprentices (by level) and journeypersons required;
- the estimated percentage of the hired workforce from Newfoundland and Labrador;
- the estimated percentage of hired workforce from Labrador, by gender;
- the estimated percentage of hired Aboriginal workforce, by gender; and
- strategies for recruitment.

4.4.5 Alternative Means of Carrying out the Project

The EIS must identify and describe alternative means of carrying out the Project that are technically and economically feasible. The analysis shall describe:

- the alternative means considered, whether they are technically and economically feasible and the rationale for rejecting alternatives;
- a description of the conditions or circumstances that could affect or alter these choices, such as market conditions, regulatory changes and other factors, either prior to construction or during the life of the Project;
- the environmental effects of the technically and economically feasible alternatives, in sufficient detail to allow comparison with the effects of the Project; and

- the preferred means of carrying out the Project based on the relative consideration of environmental effects including the criteria and rationale for their selection.

Any potentially adverse impacts of the technically and economically feasible alternative means on asserted or proven Aboriginal rights must also be identified.

The EIS shall analyze and compare the design alternatives for the Project in relation to their environmental and social costs and benefits, including those alternative means that cost more to build and/or operate but which result in reduced adverse environmental effects or more durable social and economic benefits.

At a minimum, the discussion of alternative means of carrying out the Project shall include:

- tailings management;
- waste rock storage management and location;
- transportation, including alternative rail routes outside municipal water supply areas;
- power;
- dewatering options at Joyce Lake;
- contracting or lengthening of the operations;
- labour supply; and
- mining methods (e.g., open pit versus others).

4.5 Description of the Existing Environment

The EIS shall provide a description of the biophysical and socio-economic environments that could be affected by the Project, both in the immediate vicinity and beyond. This shall include the components of the existing environment and environmental processes, their interrelations and interactions, as well as their variability over time scales appropriate to the effects analysis. The level of detail shall be sufficient to:

- identify, assess and determine the significance of adverse environmental effects that may be caused by the Project;
- identify and characterize the beneficial effects of the Project; and
- provide the data necessary to enable effective follow-up.

The baseline description shall characterize environmental conditions resulting from historical and present activities in the local and regional study area. The physical and biological

environments shall be described based on an ecosystem approach that considers both scientific and traditional knowledge and perspectives regarding ecosystem health. The EIS must identify and justify the selected indicators and measures of ecosystem health (i.e., measurable parameters). These indicators should be transferable to future project monitoring and other follow-up.

In assessing impacts to the biological environment, the EIS shall consider the resilience of relevant species populations, communities and their habitats. It shall summarize all pertinent historical information on the size and geographic extent of relevant animal or floral populations as well as density, based on best available information. Where little or no information is available and when appropriate, specific studies shall be designed to gather information on species populations and densities that could be adversely affected by the Project. Habitat at regional and local scales must be defined when mapping aquatic and terrestrial vegetation types and/or communities.

Habitat use at regional and local scales should be characterized by type of use (e.g. breeding, migration, feeding, nursery, rearing, wintering), frequency and duration. Emphasis must be on those species, communities and processes most sensitive to project impacts. However, the interrelations of these components to the greater ecosystem and communities of which they are a part must be indicated. The EIS must address issues such as habitat, nutrient and chemical cycles, food chains and productivity, to the extent that they are appropriate to understanding the effects of the Project. Range and probability of natural variation over time must also be considered.

The EIS must provide a description of the rural, Aboriginal and urban communities likely to be affected by the Project, including demographic, economic, social and community health information. If the information available from government or other agencies is insufficient or no longer representative, the Proponent shall complete the description of the environment with current surveys and studies.

The EIS shall indicate the Project's proximity to sensitive features such as residences, cabins, public drinking water supplies, sacred sites, places of worship and locations of hunting and gathering activities (i.e. country foods collection). Depending on the type of potential effect

the Project may have on these receptors, appropriate baseline evaluation should be undertaken (e.g. baseline noise, air quality, drinking water, country foods evaluation).

The EIS must also describe existing geology, geochemistry, soils and terrain at the mine site and in the immediate vicinity.

The EIS must explain any extrapolation, interpolation or other manipulation applied to the baseline data used to describe environmental conditions in the study area. Any information gaps from a lack of previous research or practice shall be described indicating information that is not available or existing data that cannot accurately represent environmental conditions in the study area over four seasons. If data gaps remain, the Proponent shall describe its efforts to resolve the data gaps, including any direct consultation with groups, individuals and others.

4.6 Effects Assessment

The EIS shall contain a comprehensive analysis of the Project's predicted effects on the environment, including cumulative effects that are likely to result from the Project in combination with other projects or activities that have been or are known to be carried out. The assessment shall include, but not be limited to the effect of any environmental change on health, socio-economic conditions and heritage values and on the current and future use of land and resources by Aboriginal organizations. Potential effects from all components of the Project at the site and within the Project's zone of influence shall be discussed. The EIS shall predict the Project's effects during all project phases (e.g., construction, operation, maintenance, foreseeable modifications, closure, decommissioning and reclamation) and describe them using appropriate criteria.

The environmental effects assessment in the EIS shall be based on best available information and methods. The methods employed shall be clearly explained. All conclusions must be substantiated and the supporting logic clearly traceable. The Proponent is encouraged to make use of existing information relevant to the Project. When relying on existing information to meet the requirements of various sections of the EIS Guidelines, the Proponent must either include the information directly in the EIS or clearly direct (e.g. through cross-referencing) the reader to where it may obtain the information. When relying on existing information, the Proponent must also comment on how the data have been applied to the

Project, clearly separate factual lines of evidence from inference and state any limitations on the inferences or conclusions that can be drawn from them according to the criteria for information quality set out in the EIS Guidelines. For instance:

- assumptions should be clearly identified and justified;
- all data, models and studies must be documented such that the analyses are transparent and reproducible;
- the uncertainty, reliability and sensitivity of models used to reach conclusions must be indicated;
- conclusions should be substantiated; and,
- the studies should be prepared using best available information and methods.

Modeling methods and equations presented must include information on margins of error and other relevant statistical information (e.g., confidence intervals, possible sources of error).

The Proponent shall prepare a table describing the proposed Project's anticipated effects, which shall enable the reader to review and consider those effects.

Views of the public and Aboriginal organizations relative to the EA, including any perceived changes in the environment from the Project, must be acknowledged and considered. In considering the local social and economic effects of the Project, the Proponent shall have due regard for the attitudes, beliefs and perceptions of local residents and how these are grounded in their culture, social organizations and historical experience. The EIS shall clearly articulate how relevant issues raised by the public or Aboriginal organizations have been considered, including any changes to the Project, or mitigation or follow-up measures arising from such consideration.

4.6.1 Accidents and Malfunctions

The EIS shall identify and describe accidents and malfunctions that may occur as a result of project activities, including an explanation of how those events were identified, potential consequences (including potential environmental effects), worst case scenarios and the effects of these scenarios and assess the significance of associated environmental effects.

The EIS should identify potential accidents, malfunctions, unplanned events (e.g., premature or permanent shutdown), or emergency situations that could be associated with all phases of

the Project. This includes accidents and malfunctions associated with all modes of transportation used for project activities such as, product spills during loading of ships, train derailments, fuel transportation and storage, resource road conflicts with wildlife and other users as well as the probabilities and hazards associated with them. If air travel to the site is being considered as a regular project occurrence, proposed safeguards and responses to possible incidents should be addressed.

The EIS shall also identify the safeguards that will be established to protect against such occurrences and the contingency/emergency response procedures to be in put in place should an accident/malfunction occur. The factors which contribute to the uncertainty of detecting and mitigating impacts associated with accidents and malfunctions must be assessed.

Given the potential for accidents and malfunctions to impact the province, the EIS should discuss how an accident scenario would be handled (e.g., notification, response etc.).

4.6.2 Capacity of Renewable Resources

The EIS shall consider the capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future. The EIS shall identify any VECs predicted to experience significant adverse residual environmental effects, describe how the Project could affect their sustainable use and describe the criteria used in the analysis.

4.7 Avoidance and Mitigation Measures

Mitigation is the elimination, reduction or control of the adverse environmental effects of the Project. It includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. The EIS must consider measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project. The approach to mitigation shall be premised on a preference for avoidance and reduction of effects at their source, including modifying the Project design, or relocating its components, where technically and economically feasible.

The EIS shall describe the standard mitigation practices, policies and commitments that constitute technically and economically feasible mitigation measures and that will be applied.

The Proponent, where possible, should refer to similar situations where the proposed mitigation has proven to be successful. Mitigation failure should be discussed with respect to risk and severity of consequence.

The EIS shall describe the Proponent's environmental protection plan (EPP) and the environmental management system through which it will be delivered. The EPP shall provide an overall perspective on how potentially adverse effects would be minimized and managed over time. In addition, the EIS shall describe the relationship between the EPP and the waste and tailings management plans. The Proponent shall describe its commitments, policies and arrangements directed at promoting beneficial or mitigating adverse socioeconomic effects and explain how it will ensure compliance among its contractors and sub-contractors and how compliance will be audited and enforced.

The EIS shall specify the actions, works, minimal disturbance footprint techniques, best available technology, corrective measures or additions planned during the Project's phases (construction, operation, modification, decommissioning, abandonment or other undertaking related to the Project) to eliminate or reduce the significance of adverse effects. The EIS shall also present an assessment of the effectiveness of the proposed technically and economically feasible mitigation measures. The Proponent shall discuss the application of the Precautionary Principle in the identification of mitigation measures. The Precautionary Principle is defined in Section 1.2.4.

If there are technically and economically feasible mitigation measures that were considered and rejected, the EIS must discuss these and explain why they were rejected. Trade-offs between cost savings and effectiveness of the various forms of mitigation must be justified. The Proponent must identify who is responsible for the implementation of these measures and the system of accountability.

Should the Project be released the Proponent must ensure that measures are taken to avoid or lessen any potential adverse effects, regardless of their significance, on designated species, their critical habitat or the residences of individuals of those species. Potential effects must be monitored and mitigation must be consistent with any applicable recovery strategy and action plans. The EIS must include information that will allow the Province to meet this requirement.

In addition, the EIS will identify the extent to which technology innovations will help mitigate environmental effects. Where possible, it will provide detailed information on the nature of these measures, their implementation and management, as well as whether follow-up will be required.

4.8 Cumulative Effects Assessment

The EIS must include an analysis of cumulative effects of the Project in combination with other projects or activities that have been or will be carried out . The objective of an EA is not to define two classes of environmental effects, rather, a single set of environmental effects that take into account the aggregate effect of the Project in the context of other foreseeable developments and activities acting upon the environment should ultimately be identified.

The analysis of cumulative effects must consider different types of effects (e.g., synergistic, additive, induced, spatial or temporal) and identify impact pathways and trends. The EIS shall assess the significance of the residual cumulative environmental effects that remain after mitigation has been implemented. Notably, a cumulative effect on a VEC may be important even if the effects of the Project on the VEC are not significant.

The EIS shall:

- identify and justify the VECs that will constitute the focus of the cumulative effects assessment. For greater certainty, cumulative effects must be assessed in relation to each VEC for which a residual impact of the Project is predicted to be adverse and likely (regardless of the significance of the impact). The assessment should examine the likelihood, nature and extent of the predicted cumulative effects of the Project in combination with other projects and activities that have been or will be carried out. It may be appropriate, during the course of the EA, to refine the definition of VECs selected for cumulative effects assessment.
- present a justification for the spatial and temporal boundaries of the cumulative effects assessment. The boundaries for the cumulative effects assessment will depend on the VECs being considered (e.g., will generally be different for different VECs). The boundaries for the cumulative effects assessment will also generally be different from (larger than) the boundaries for assessing effects of the Project;

- describe and justify the choice of projects and selected activities for the cumulative effects assessment. These shall include past activities and projects, those being carried out and future projects or activities likely to be carried out;
- describe the mitigation measures that are technically and economically feasible;
- determine the significance of the residual cumulative effects; and
- assess the effectiveness of the measures applied to mitigate the cumulative effects. In cases where measures exist that are beyond the scope of the Proponent's responsibility that could be effectively applied to mitigate these effects, the Proponent shall identify these effects and the parties that have the authority to act. In such cases, the Proponent shall summarize the discussions that took place with the other parties in order to implement the necessary measures over the long term.

The following projects (as well as planned expansions and extensions) may interact cumulatively with the Project:

- Iron Ore Company of Canada (Labrador Operation);
- Kami Iron Ore Project - Alderon;
- Wabush Mines - Cliffs Resources;
- Mount Wright Mine – ArcelorMittal;
- Bloom Lake Mine - Cliffs Resources;
- Schefferville Area Iron Ore Mines (James, Redmond and Houston Properties) - Labrador Iron Mines;
- DSO Iron Ore Project – Tata Steel Minerals Canada;
- Lower Churchill Generation Project; and
- Maritime Transmission Link Project.

These and other projects and activities (e.g., road development, tourism etc.) should be considered in assessing cumulative effects to VECs. Notably, the cumulative effects assessment should be focused on key VECs and their potential stressors, rather than on providing detailed descriptions of other projects.

The methods used to scope and assess cumulative impacts should be clearly described in the EIS, demonstrating how conclusions have been reached.

4.9 Effects of the Environment on the Project

The EIS should describe the climatic conditions at the Project site and in local and regional study areas and provide a description of seasonal variations and trends in climatic conditions, to allow the assessment of effects on the Project. Any use of off-site data must be described. An analysis of the data to determine the degree the data represents the conditions at the Project site must be included. The use of the data should be qualified with an understanding of local and regional variability and the geographic locations of any onsite and offsite meteorological stations. The geographic locations of any onsite and offsite meteorological stations must be provided. Climate data should also be provided and taken into account when evaluating impacts of the Project on air quality, hydrology and water management. The influence of local and regional topography or other features that could affect conditions in the study area should also be considered, as appropriate. Specifically, the EIS shall include a description of the following components:

- Physiography: topography, drainage network;
- Climate: historical records of total precipitation (rain and snow), mean, maximum and minimum temperatures;
- Geological context: bedrock and surficial cover stratigraphy and composition, geotechnical properties and structural geology features such as fractures and faults, in the mine area and where major project infrastructures and earthworks are proposed (e.g. mine open pit, infrastructures, cutting and tunnelling locations along the railway route etc.);
- Hydrogeological context: hydrogeological characteristics of the different geological units (hydraulic conductivities, porosity, storage coefficients); groundwater geochemistry and groundwater levels for the areas that will be disturbed by major project components;
- Streamflow data records (levels and yields) of surroundings lakes, rivers and brooks; and
- Geotechnical properties of Quaternary sediments, such as slope stability and bearing capacity of facility foundations and the railway line route under both static and dynamic conditions, including ground ice and thermal conditions.

The EIS must predict how local conditions and natural hazards, such as severe and/or extreme weather conditions and external events (e.g., flooding, ice jams, rock slides, landslides, fire, outflow conditions and seismic events) could adversely affect the Project and how this in turn could affect the environment (e.g., environmental emergencies due to extreme environmental conditions). The EIS should describe measures that will be implemented to prevent and respond to such events. The EIS should discuss the sensitivity of the Project to changes in climate and related environmental parameters, including total annual rainfall, total annual snowfall, frequency and/or severity of precipitation extremes, watercourse levels and stream flow.

In addition, the EIS shall discuss:

- potential geotechnical and geophysical hazards within the Project area, including potential seasonal subsidence, seismicity and faulting, risks associated with cut/fill slopes and constructed facilities. Where appropriate, the assessment should be supplemented by illustrations such as maps, figures, cross sections and borehole logs;
- potential effects on foundation stability of major Project components from geological fractures and faults and associated implications of these features on project planning and engineering design. Those Project components assessed shall include, but are not limited to railway embankments, tunnels, major watercourse crossings and open pits;
- potential effects of the groundwater level on mining operations; and
- potential effects of climate change on the Project including, but not limited to, the impact of extreme weather events associated with climate change.

The EIS must provide measures and strategies to mitigate the potential effects of the environment on the Project.

4.10 Environmental Management

4.10.1 Planning

The EIS shall describe the proposed Environmental Management Plans (EMPs) for all stages of the Project and include a commitment by the Proponent to implement the EMPs, should the Project proceed. EMPs must be developed in provincial government agencies, Aboriginal organizations, the public and other stakeholders. This may occur after the EA, but must be

consistent with the information presented in the EIS. Pertinent legislation, regulations, industry standards, documents and legislative guides shall be used when developing EMPs.

The EIS shall also outline a preliminary decommissioning and reclamation plan for the Project. The plan must address ownership, transfer and control of the different project components, as well as the responsibility for monitoring and maintaining structures. The EIS shall include a conceptual discussion of how decommissioning of permanent facilities may occur.

4.10.2 Follow-Up Program

The EIS must include a framework upon which follow-up, including effects monitoring, would be based throughout the life of the Project, including the post-closure phase. A follow-up program must be designed to verify the accuracy of the effects predictions and to determine the effectiveness of the measures implemented to mitigate the adverse environmental effects of the Project.

The follow-up program must be designed to incorporate pre-project baseline information, as well as compliance data (e.g., established benchmarks, regulatory documents, standards or guidelines) and real-time data (e.g., observed data gathered in the field). Effects predictions, assumptions and mitigation actions that will be tested as part of the follow-up program must be framed as field-testable monitoring objectives. The monitoring design should include a statistical evaluation of the adequacy of existing baseline data, to provide a benchmark against which to test for project effects and the need for any additional pre-construction or pre-operational monitoring to augment baseline data.

A schedule for follow-up frequency and duration is required after an evaluation of the length of time needed to detect effects, given estimated baseline variability, likely magnitude of environmental effect and desired level of statistical confidence in the results (Type 1 and Type 2 errors).

The description of the follow-up program should include;

- the requirements and objectives of the follow-up program;
- a description of the main components of the program, each monitoring activity under that component and the objectives of each monitoring activity (i.e., confirmation of mitigation, confirmation of assumptions and verification of predicted effects);

- a schedule for the finalization and implementation of the follow-up program;
- a description of the roles and responsibilities for the program and its review process, by government, Aboriginal organizations and the public;
- a discussion of possible involvement of independent researchers;
- any contingency procedures/plans or other adaptive management provisions for dealing with unforeseen effects, or situations where benchmarks, regulatory standards or guidelines are exceeded; and
- a description of how results will be managed and reported.

Sufficient detail shall be provided to allow independent judgment as to the likelihood that the follow-up program will provide the quantity and quality of information required to achieve its objectives.

In addition, the NL *Endangered Species Act* contains provisions requiring that measures are taken to monitor adverse effects of a project on wildlife species or critical habitat of a species that is designated as threatened, endangered, or extirpated. If potential adverse effects on a listed wildlife species or its critical habitat are identified, a monitoring plan must be developed to identify the circumstances under which corrective measures may be needed to address any issue or problem identified through the monitoring (i.e., if unanticipated effects occur or the importance of effects is greater than anticipated). The monitoring plan should clearly describe how government departments responsible for the species in questions would be engaged in reviewing proposed adaptive management measures, in the event that mitigation measures are not effective.

4.11 Significance of Residual Adverse Environmental Effects

The EIS must describe any expected residual (post-mitigation) effects of the Project on the biophysical and human environments, after technically and economically feasible mitigation measures have been applied. The residual effects, even if deemed not significant, should be described. The EIS shall provide sufficient detail so that the environmental effects of the Project and the degree to which they can be mitigated, can be clearly understood.

The criteria for evaluating the significance of the residual effects (including cumulative effects) shall be described, including pre-defined significance thresholds for each VEC (e.g. existing provincial regulatory and industry standards and guidelines). The criteria may

include: magnitude; duration and frequency; ecological or socioeconomic context; geographic extent; and degree of reversibility. Professional expertise and judgment may also be applied. The EIS must contain enough detail to enable readers to follow the reasoning and process by which the Proponent assessed the significance of effects.

The EIS must state the Proponent's conclusion, for each VEC, as to whether the Project in combination with the cumulative effects of other projects and activities is likely to cause significant adverse effects. Residual effects significance criteria shall be presented for each VEC in the EIS along with the analysis to support the conclusion of significance.

4.12 Economic and Social Benefits of the Project

Information on the predicted economic and social benefits of the Project should be presented. This information shall be considered by the Government in assessing the justifiability of any significant adverse environmental effects, if necessary. The Proponent must demonstrate prudent resource management in compliance with Section 6.(1b) of the *Mining Act*, to the satisfaction of the Minister of Natural Resources.

4.13 Benefits of the EA to Newfoundland and Labrador

The EIS must describe how the EA process for the Project benefits to Newfoundlanders and Labradoreans, focusing on aspects such as:

- maximized environmental benefits: What expected environmental benefits will be created as a result of the project being assessed?;
- contribution of the EA to sustainable development: Describe how the EA process for the Project is expected to contribute to the concept of sustainable development for a healthy environment and economy;
- Aboriginal consultation: How is Aboriginal consultation throughout the EA expected to influence the Project design and the environmental effects analysis?;
- public participation: How is public participation in the EA expected to influence the Project design and the environmental effects analysis?;
- technological innovations: Are new technologies expected to be developed to address environmental impacts that could be used for other projects?;
- increases in scientific knowledge: Is any new scientific information expected to be collected through the EA or follow-up that could benefit the assessment of other projects?; and

- community and social benefits: Describe any expected changes in project design that would result in indirect benefits to communities and/or social benefits (e.g., enhanced access to wilderness areas for recreation).

4.14 Assessment Summary and Conclusions

The EIS must summarize the overall findings of the EA, with emphasis on the main environmental issues identified. It must predict the likely significance of adverse environmental effects, including accidents and malfunctions, caused by the Project.

For all VECs, the EIS must include a table that summarizes:

- the Project's potential adverse environmental effects;
- proposed mitigation and compensation measures;
- proposed follow-up;
- potential residual effects;
- potential cumulative effects;
- potential effects of accidents and malfunctions on the VEC;
- applicable standards or guidelines;
- comments from the public and responses;
- comments from Aboriginal organizations and individuals and responses;
- relationship of the VEC to an Aboriginal group's asserted or proven Aboriginal rights; and
- commitments made by the Proponent, including the timing and responsibility of each.

PART II: DETAILED GUIDANCE ON SELECT ENVIRONMENTAL COMPONENTS

The following sections provide an overview of the proposed studies and approach to be undertaken in the EIS for each VEC. Detailed study approaches and analytic methods and assumptions shall be provided in the EIS.

4.15 Baseline Studies

Due to the complexity particular to a number of the VECs likely to be affected by the Project, it has been determined that stand alone baseline studies will be required. These baseline studies are required to support the evaluation of environmental effects, the development of mitigation measures and monitoring and follow up programs. Where new information becomes available, additional baseline studies may be required.

Baseline studies should generally have the following format:

- Rationale/Objectives: In general, the baseline studies should be conducted to obtain all required data for use in determining the potential for significant effects on a the VEC as well as for monitoring and follow-up programs.
- Study Area: The boundaries of the study area shall be defined depending on the characteristics of the VEC being investigated.
- Methods: Methods shall be proposed by the Proponent, in consultation with resource agencies, as appropriate. The methods used in each baseline study shall be described in the EIS.
- Study Outputs:
    - Study outputs shall be proposed by the Proponent. Information and data generated shall be sufficient to adequately predict the effects on the VEC and to determine monitoring and follow-up requirements.
    - Identification of information sources.
    - Appendix of raw data in electronic tabular form for the bio-physical baseline studies.

The baseline studies, in their entirety should be incorporated into the EIS document as appendices.

4.16 Atmospheric Environment

The effects of the Project on atmospheric environment will be assessed within the area that can reasonably be affected by the Project, based on the distance to sensitive receptors. Boundaries for assessing the cumulative effects of the Project in combination with other projects and activities that have been or will be carried out may be different from (larger than) the boundaries for assessing the effects of the Project.

4.16.1 VEC Definition and Rationale for Selection

Atmospheric environment is defined as ambient air quality and the acoustic and visual environments (noise, vibrations, light) within the vicinity of the Project. Atmospheric environment has been selected as a VEC based on:

- protection of human health and safety, as well as ecological health and aesthetics;
- potentially sensitive human and wildlife receptors;
- provisions of the *Air Pollution Control Regulations* under the NLEPA; and

- the potential for greenhouse gas emissions.

4.16.2 Potential Project-VEC Interactions

Potential Project-VEC interactions include:

- Effects on ambient air quality due to;
    - particulate matter (e.g. dust) and other potential air contaminants during construction activities (including the of rail lines);
    - particulate matter (e.g. dust) and other contaminant releases during the operations phase including those potentially caused by:
        - mining operations;
        - fines and concentrate storage;
        - handling or loading and unloading;
        - road dust (e.g., vehicle use on-site and off-site);
        - dust along rail lines;
        - emissions from blasting;
        - tailings dust lift-off; and
        - vehicle emissions, including rail locomotives;
- Effects on ambient sound levels associated with:
    - construction activities (both at the mine and off-site);
    - mining and concentrating operations (including blasting) and transportation of fines and concentrate on-site;
    - vehicles/trucks in noise-sensitive areas;
    - transportation of fines and concentrate from the site to the rail loop; and
- Effects as a result of vibrations associated with:
    - construction-related activities, such as blasting or heavy equipment movement on-site or off-site;
    - mining and concentrating operations (including blasting) and transportation of fines and concentrate; and
- Effects of artificial lighting at the Project site during operation on nearby residents and the environment.

4.16.3 Existing Environment

The EIS must describe the following:

- ambient air quality in the Project areas and, for the mine site, the results of a baseline survey of ambient air quality, focusing on the contaminants $PM_{2.5}$, PM_{10} and NO_x;
- current ambient noise levels at both sites and within the local area, including the results of a baseline ambient noise survey. Information on typical sound sources, geographic extent and temporal variations must be included; and
- existing ambient light levels at the Project site and at any other areas where Project activities could have an effect on light levels. The EIS should describe night-time illumination levels during different weather conditions and seasons.

4.16.4 Effects Assessment and Mitigation

The adverse environmental effects of the Project on the atmospheric environment must be assessed for all phases of the Project. In addition, the effects of potential accidents and malfunctions and cumulative effects associated with other industrial use of the area, must be assessed.

All potential Project emissions must be estimated, including greenhouse gases (GHG) and an emissions inventory table must be included in the EIS, listing emission sources, operating periods, pollution control equipment (where applicable), predicted stack concentrations and total emissions. Typical construction and operation-related emissions include, but are not limited to, particulates (PM_{10} and $PM_{2.5}$) and metals in dusts and fuel combustion by-products such as sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and metals. Potential odours from Project emissions at a local level (i.e. near Project equipment) must be discussed and assessed. GHG quantities are to be expressed in carbon dioxide equivalents (t/yr) and should be compared with provincial and national totals and mining sector totals.

Modeling shall be conducted in accordance with the requirements of the *Air Pollution Control Regulations* of the NLEPA and the following NLDOEC guidance documents:

- *Guidance for Plume Dispersion Modeling* (GD-PPD-019.2); and
- *Determination of Compliance with the Ambient Air Quality Standards* (GD-PPD-009.4)

Air dispersion modelling conducted in accordance with the above guidelines shall be summarized in the EIS. Air quality modeling shall provide meteorological data (e.g., wind data

– for example wind roses) and examine scenarios whereby air quality in nearby communities that could be affected by the cumulative effects of the Project in combination with other projects and activities in the area.

Modeling shall include the $PM_{2.5}$ and PM_{10} fraction of particulate matter, NO_x emissions from operational equipment and any other emissions of concern that are identified. The modeling should specify all assumptions with respect to emission rates and dust control applications. The analysis must reflect the requirements and standards contained in pertinent legislation, policies, guidelines and directives relating to the atmospheric environment (e.g. National Ambient Air Quality Objectives, Canada Wide Standards, applicable provincial ambient air quality criteria).

The crusher plant and any other significant particulate emission sources will be required to have Best Available Control Technology (BACT) for dust suppression. A description of proposed emission controls should be included in the EIS. The EIS should indicate whether and how air quality in local municipalities will be monitored and with whom any resulting data would be shared.

The EIS must assess potential noise and vibration impacts to the environment and local communities. Specifically, the EIS must:

- identify and quantify potential noise and vibration sources during construction and operation phases;
- identify potential receptors and describe the proximity of identified receptors to the Project area, including identifying and describing whether particular receptors may have a heightened sensitivity to noise and vibration exposure (e.g., workers accommodations near the mine installations and residents along the Tshiuetin Rail Transportation Inc. rail line) or expectation of peace and quiet (e.g., recreational areas);
- include a map illustrating estimated noise and vibration levels from the Project at key receptors;
- describe whether there is a potential for adverse effects associated with Project-related vibrations (e.g., potential for damage to nearby residences, domestic wells, ice cover on nearby lakes); and

- describe mitigation and management measures related to noise and vibration including the conditions for mitigation and evaluate Project compliance with appropriate noise guidelines.

The EIS must identify sources and types of variation in Project-related light levels by providing information on duration, frequency and levels of light emissions. It should provide an assessment of effects of night-time light levels on wildlife. In addition, the EIS must evaluate how light disturbances could impact individuals and communities and their commercial and recreational activities, including tourism.

Technically and economically feasible mitigation measures must be proposed to reduce or minimize adverse effects. The EIS will provide a prediction of adverse residual effects, including cumulative effects and their significance.

4.17 Landforms, Soils, Snow and Ice

4.17.1 VEC Definition and Rationale for Selection

Landforms, soils and snow are defined as the landforms, soils, snow and ice within the vicinity of the Project or that could be affected by the Project. They have been included as a VEC because of their importance to project planning and potential to be impacted by project activities.

4.17.2 Potential Project-VEC interactions

Potential Project-VEC interactions include:

- Acid Rock Drainage/Metal Leaching arising from Project activities;
- impacts to the quality or quantity of soils;
- impacts to snow and ice; and
- impacts of landform and soils on the Project.

4.17.3 Existing Environment

The description of the existing environment in the EIS shall include:

- existing unique or valuable landforms (e.g., eskers, fragile landscapes, wetlands), including details regarding their ecological functions and distribution in the local study area;

- geomorphology and topography at areas proposed for construction of major project components, including the type, thickness and distribution of soils as applicable;
- bedrock lithology, morphology, geomorphology and soils where earthworks are proposed;
- potential for ground and rock instability (e.g., slumping, landslides and potential slippage) at areas planned for Project facilities and infrastructure;
- suitability of topsoil and overburden for use in the re-vegetation of surface-disturbed areas; and
- sites of palaeontological or palaeobotanical significance.

4.17.3.1 Acid Rock Drainage and Metal Leaching

If there is a potential for Acid Rock Drainage/Metal Leaching (ARD/ML) to occur as a result of the Project, the EIS should include an investigation of the associated potential from overburden, mine waste rock, ore and tailings. This investigation should include:

- population assessments for each lithological/alteration/waste management unit. Assessments should account for vertical and horizontal distribution, as well as sampling biases, to proper characterization over the unit's range of variability;
- a chronology of ARD/ML investigations and the design of an ARD/ML and mineralogy and elemental analysis characterization program, including all static and kinetic test work conducted to date. The rationale, advantages and disadvantages of, detailed description, sample selections and methodology for all test work;
- predictions of the ARD/ML potential of all materials (bedrock and surficial) to be disturbed or created during all phases (construction, operation, decommissioning, reclamation and post-closure) of the proposed Project. This must include an interpretation of the results, an estimation of risk for the onset of ARD for each lithological/alteration/waste management unit and mine component, metal leaching and the predicted drainage chemistry for each mine component, including the types and concentrations of major trace elements; and
- clear, concise cross-sections which relate the ARD/ML assessment (static/kinetic sample locations and results), geology and development plans and reference Mine Environment Neutral Drainage (MEND) guidelines.

4.17.4 Effects Assessment and Mitigation

In conducting the analysis, the EIS shall consider pertinent acts, best practices, policies, guidelines and directives. The EIS shall provide a description of measures to mitigate effects and list potential residual effects and their significance. The discussion should include a list of:

- rehabilitation measures for borrow sources;
- an erosion and sediment control plan; and
- measures to mitigate changes to local drainage patterns.

Specifically, the EIS shall discuss the following:

- general impact on landform as a result of Project development, borrow resource extraction, with a focus on sensitive landforms and those serving as wildlife habitat;
- implications to the Project planning and design of baseline information related to terrain conditions;
- potential impacts on the stability of terrain in the vicinity of Project facilities and infrastructure. Discussion should focus on the potential for impacts arising from surface disturbances due to construction (e.g., overburden stripping, cuts/fills) and any associated implications for Project design and management of Project components, including railway embankments, tunnels, access roads, watercourse crossings, ore/waste rock piles, etc.;
- the potential for the occurrence, frequency and distribution of terrain hazards, including snow drifts and snow banks, as a result of construction activities (e.g. cut/fill, extraction of construction materials);
- potential for soil erosion, including stream bank erosion, resulting from surface disturbances associated with the construction, operation and maintenance of Project components;
- proposed commitments to preserve, store and reuse soil (including humus layers and organic soils), as applicable for site rehabilitation;
- potential contamination of soils due to the deposition of air emissions and airborne fugitive dust-fall from the Project;
- potential contamination of snow (e.g., due to runoff from tailings, emissions or other sources); and

- potential for the Project to impact ice on local lakes (e.g., impact of the ice road and the potential for blasting to cause cracking).

4.17.4.1 Acid Rock Drainage and Metal Leaching

The ARD/ML prediction information (based on MEND guidelines) and historical site databases and experience will be used to assess the potential leachate risks and determine mitigation requirements for the Project. Additional information should be provided for:

- mine waste rock, tailings, ore characterization, volumes, segregation/disposal methods, mitigation/management plans, contingency plans, operational and post-closure monitoring and maintenance plans;
- the feasibility of successfully segregating Potentially Acid Generating (PAG) and Non-Potentially Acid Generating (NPAG) waste materials during operations, proposed geochemical segregation criteria and identification of operational methods that will be required to achieve geochemical characterization during operations (i.e., geochemical surrogates, on site lab, procedures needed etc);
- sensitivity analysis to assess the effects of imperfect segregation of waste rock;
- estimates of potential lag time to ARD/ML onset for PAG materials (including various waste rock, tailings, ore) and ability to fully saturate appropriate PAG materials during operation and post-closure based on regional experience, if any;
- pit water chemistry (existing, during operation, post-closure) and pit closure management measures (e.g., flooding). This should include geochemical modeling of pit water quality in the post-closure period;
- surface and seepage water quality from the mine waste rock stockpiles, other stockpiles and other infrastructure during operation and post-closure; and
- ARD/ML prevention/management strategies under a temporary or early closure scenario, including ore.

The manual produced by the Mine Environment Neutral Drainage (MEND) Program, entitled, *MEND Report 1.20.1, Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials, Version 0 - December 2009* will be used to formulate ARD/ML prediction.

4.18 Water Resources

The effects of the Project on water resources will be assessed within the local drainage areas that can be reasonably expected to be affected by the Project. Boundaries for assessing the

cumulative effects of the Project in combination with other projects and activities that have been or will be carried out may be different from (larger than) the boundaries for assessing the effects of the Project.

4.18.1 VEC Definition and Rationale for Selection

Water resources include the quality and quantity of groundwater and surface water resources in the vicinity of the Project. It has been selected as a VEC because of:

- its importance to ecosystem function and human use (including potable water supplies; recreational use and protection of aquatic life);
- concerns regarding potential for release of hazardous materials on-site and potential contamination associated with mine and process water management;
- possible lowering of water table and effects on surface water / groundwater interactions (e.g., wetlands); and,
- provisions of the NL *Water Resources Act*.

4.18.2 Potential Project-VEC Interactions

Potential Project-VEC interactions include:

- effects related to mine water management as well as effects on water quality from effluent discharges and seepage;
- potential ammonia contamination from incomplete combustion of exploded materials (e.g. directly to surface waters, or to groundwater via bedrock fractures);
- effects on water quantity and hydrology/hydrogeology;
- effects of dewatering Joyce Lake;
- effects related to mine water use (demand);
- effects of accidents and malfunctions; and
- erosion and sedimentation, including dust deposition.

4.18.3 Existing Environment

4.18.3.1 Groundwater

For the mine site, the EIS must describe the hydrogeologic conditions at the mine site. It must examine all available existing hydrogeology information required to assess the effects of the Project. Where knowledge gaps exist, the Proponent must collect additional baseline information and provide it in the EIS.

The EIS must include:

- a review of the physical geography and the geology of the Project area as it pertains to local and regional groundwater flow systems in the mine area (see list in Section 4.9);
- the physical and geochemical properties of hydrogeological units, such as aquitards and aquifers (see list in Section 4.9);
- groundwater levels and a piezometric map for each aquifer;
- bedrock fracture sizes and orientations in relation to groundwater flow, including any preferential flow paths for groundwater (both shallow and deep);
- hydrogeologic maps and cross-sections for the mine area that outline the extent of aquifers, including stratigraphy, piezometric levels at different depths (to estimate vertical hydraulic gradients and show confined aquifers)/ potentiometric contours; locations of wells, boreholes, springs, lakes and streams; groundwater flow direction;
- groundwater flow patterns and chemistry, identifying recharge and discharge areas and identifying groundwater interaction with surface waters;
- evaluation of discharge rates; and
- assessment of groundwater quality in the different aquifers.

Baseline information must include existing water supply wells (if any) identified within the area of influence of the Project property.

4.18.3.2 Surface Water

The EIS should describe surface water quality, hydrology and sediment quality within the area of influence of the Project. The baseline should provide the basis for the assessment of potential effects to surface water, presenting the range of water and sediment quality and surface water hydrology. A time-series graph of key variables and stream flows must be provided to illustrate patterns and variability. The full range of stream flow characteristics, in addition to mean values, should be described.

Furthermore, the EIS must:

- include delineation of drainage basins, at appropriate scales;
- describe and present monitored hydrological data, such as water levels and flow rates in local streams and selected local lakes;

- describe and assess hydrological regimes, including monthly, seasonal and year-to-year variability, normal flows , low flows, environmental (maintenance) flows and flood flows for selected return period flood events;
- include flows or design peak flows for selected periods for the Project area, bridge and culvert design at stream crossings for access roads and railway lines and an assessment of potential ice problems;
- describe the interactions between surface water and groundwater flow systems under pre-development conditions and potential impacts on these interactions during the various phases of the Project;
- describe any local and regional potable surface water if any; and
- provide seasonal water quality field and lab analytical results and interpretation at several representative local stream and lake monitoring stations established at the Project site.

4.18.4 Effects Assessment and Mitigation

The adverse environmental effects of the Project on Water Resources must be assessed for all phases of the Project and potential accident scenarios. With respect to accident scenarios, the discussion of impacts to both ground and surface water resources must include an analysis of impacts of malfunctions and accidents events, taking into account:

- the proposed ice roads across Iron Arm;
- transportation of fuel for the Project (e.g., mine trucks, boilers). The EIS must describe potential accidents and malfunctions associated with the transportation and storage of fuel along the rail and on the Project site; and
- the management, storage and disposal of used oil and associated potential for malfunctions and accidents events.

4.18.4.1 Groundwater

The EIS must assess the effects of the Project on groundwater at the mine site. The effects assessment should provide a quantitative groundwater analysis to determine how Project-related facilities and activities will affect groundwater flows, quality and quantity, such as any effects to nearby lakes and streams, during all Project phases, including day-to-day operations and for malfunctions and accidental events. The assessment should describe the duration, frequency, magnitude and spatial extent of any effects and outline the need for mitigation and/or monitoring measures. Seepage rates, locations, quality and direction into

or from the pit, overburden/waste rock/ore stockpiles, TMF, settling pond and effects on groundwater stream flows and groundwater quality within the Project area should be assessed. Potential seepage to existing water bodies should be assessed (in relation to potential effects to fish and fish habitat, including baseflow recharge from groundwater). Mitigation strategies should be proposed.

The environmental considerations, including effects on groundwater resources that have influenced the location and management of proposed groundwater monitoring and water supply wells, shall be provided.

In summary, the following components should be provided:

- a monitoring plan for groundwater levels and quality, before, during and after the Project;
- estimation of water inflows into the open pit and withdrawal rates from the open pit;
- assessment of a hydrological budget, including runoff, evapotranspiration and recharge rates under the various operation phases of the mine;
- a description of the duration, frequency, magnitude and spatial extent of any effects to surface and groundwater resources caused by the Project (e.g., use maps and cross-sections developed in Section 4.18.3.1 to show effects); and
- a description of potential cumulative and residual effects of the Project on water resources and their significance.

The EIS must also specify what groundwater supply wells, if any, are proposed on site as part of the Project and how they will be constructed and located in relation to the various mining activities in order to minimize effects on groundwater quality.

The analysis must be based on acts, policies, guidelines and directives relating to groundwater quality and quantity, such as the *Guidelines for Canadian Drinking Water Quality (*1996*)*. The EIS must describe measures to mitigate effects on groundwater quality and quantity and predict adverse residual effects and their significance.

4.18.4.2 Surface Water

The EIS must assess the effects of the Project on surface water quality and quantity within the Project's zone of influence. Potential watershed management impacts associated with

the creation of the tailings management facility must be described. The assessment should describe the duration, frequency, magnitude and spatial extent of any effects and outline the need for mitigation and/or monitoring measures. The analysis of impacts to surface water should include malfunctions and accidents events. The EIS shall:

- include a detailed environmental water balance for the mine site, focused on predicted water balance inputs/outputs for a climate normal condition, dry- and wet-year conditions undertaken for major Project facilities including the Joyce Lake open pit, waste rock and low grade ore storage areas, tailings disposal area and processing area. For Project areas whose footprint will expand over time, the EIS will assess the respective change in environmental water balance over Project life including the decommissioning and post-closure period;
- provide a detailed operational and post-closure water balance for mine water management plan identifying Project water demands/uses and water source(s), potential effects on water sources and proposed mitigation to avoid or minimize effects;
- identify water and sediment quality objectives ,including the receiving water criteria of the Canadian Council of Ministers of the Environment (CCME) including the *Canadian Environmental Quality Guidelines for the Protection of Aquatic Life* for and the *Guidelines for Canadian Drinking Water Quality*, as applicable;
- provide a overview on the closure plans at Joyce Lake;
- describe the potential for the phenomenon known locally as "Red Water" to be associated with tailings management and associated impacts to water; and
- The assessment should detail how proposed effluent is predicted to mix in the receiving environment for effluents discharged from the Project.

In conducting the analysis, the Proponent should consider pertinent acts, policies, guidelines and directives relating to surface water quality and quantity. The EIS must describe technically and economically feasible measures to mitigate effects to surface water quality and quantity and predict adverse residual effects and their significance. The EIS should also address what measures would be taken by the Proponent if water quality or quantity were to be affected by the Project.

4.19 Wildlife and Their Habitats and Protected Areas

The effects of the Project on wildlife and their habitats will be assessed within the Project footprint (i.e. cleared areas) and areas that could reasonably be affected by the Project activities. The potential effects of the Project on protected areas will also be assessed. Boundaries for assessing the cumulative effects of the Project in combination with other projects and activities that have been or will be carried out will generally be different from (larger than) the boundaries for assessing the effects of the Project.

4.19.1 VEC Definition and Rationale for Selection

Wildlife and their habitat refers to migratory and non-migratory species that are potentially feeding, breeding, moving and/or migrating through the Project area. Protected areas include all lands protected by municipal, provincial or federal legislation, policy or agreements. It has been selected as a VEC because of the need to protect ecosystems, species diversity, important habitats and ecosystems. In addition, species and other ecosystem components are important to local residents, regional stakeholders and regulatory authorities (i.e., municipal, provincial and federal) for recreation, economic and/or management considerations.

4.19.2 Potential Project-VEC Interactions

Potential Project-VEC interactions include:

- habitat loss or degradation due to construction and operation of Project facilities and associated infrastructure;
- effects on the physical condition of individuals due to emissions/discharges from the Project;
- mortality due to construction, operation and/or decommissioning and/or accidents and malfunctions during these Project phases;
- disruption of feeding, breeding, movement and/or migratory patterns due to noise, lights and/or presence of Project facilities and;
- impacts of the Project to protected areas.

4.19.3 Existing Environment

The EIS must describe migratory and non-migratory birds (including waterfowl, raptors, shorebirds, marsh birds and other landbirds), ungulates, furbearers, amphibians, small mammals and their habitat at the Project site and within the local and regional areas. The

results of any baseline surveys must be included. In addition to the surveys/reports the Proponent is required to submit all raw data.

4.19.3.1 Wildlife

Wildlife includes:

- Non-migratory birds include waterfowl, raptors, shorebirds, marsh birds and other landbirds;
- Ungulates include boreal sedentary or migratory caribou populations in the region and moose; and
- Small mammals and furbearers eg. species such as black bear, wolf, marten, red fox, beaver and otter.

Other wildlife and their habitat that could be impacted by Project activities must be characterized using existing data, supplemented by surveys as appropriate. The Proponent should contact the NLDOEC for further detail on the information requirements.

The EIS should give particular consideration to areas of concentration of migratory animals, such as breeding, denning and/or wintering areas, as well as breeding areas of species low in number and high in the food chain (e.g. furbearers such as black bear and wolf).

4.19.3.2 Protected Areas

The description of the existing environment must include consideration of existing or proposed protected areas, special management areas and conservation areas in the regional study area. The EIS must note the size of protected areas, the ecological region(s) they represent and any important biotic or abiotic feature(s) which may be affected by the Project (e.g., as a result of noise or visual stimulus). In addition, the EIS shall address the value of the protected areas, relating both to their environmental attributes and to the value placed on them by humans (e.g., cultural and social values, aesthetics).

4.19.4 Effects Assessment and Mitigation

The adverse environmental effects of the Project on wildlife and their habitats should be assessed for all phases of the Project and for malfunctions and accidental events. The EIS shall present an analysis of the Project's effects on habitats, giving consideration to and demonstrating linkages to predicted physical and biological changes resulting from the

Project. Management tools (i.e., federal and provincial laws and policies, guidance and provincial or regional strategies and plans) applicable to the protection of wildlife and/or wildlife habitat must be considered in the EIS. The EIS must:

- quantify and describe overall loss or alteration of terrestrial habitat that could result from the Project and its effect on key species. Where possible, rank habitat quality for each VEC species so that the loss of high-quality habitat can be assessed in the context of its regional availability. Regional boundaries for assessment of relative habitat loss should be based on major watershed boundaries and eco-sections;
- assess the Project's potential effects on wildlife behaviour, such as feeding, breeding, migration and movement, with respect to:
    - physical hazards and attractants for wildlife (e.g., roads, pits and other structural features),
    - chemical hazards and attractants for wildlife (e.g., identified contaminants of potential concern) and
    - sensory disturbance causing wildlife attraction or deterrence (e.g., noise, light and human presence;
- assess the potential effects on species known to be important to Aboriginal organizations; and
- describe the potential siltation associated with tailing management and the impacts on wildlife and habitat.

The EIS must describe technically and economically feasible measures to mitigate effects on wildlife and their habitats and predict adverse residual effects and their significance. This includes plans and predictions for re-vegetation of the Project area, taking into account growth rates of local vegetation.

The EIS must evaluate the potential environmental effects of the Project on the environmental, cultural, social and aesthetic values of the protected areas that could be affected by the Project. The analysis should include consideration of:

- effects on protected areas and their abiotic and biotic features, including impacts of dust and tailings on waterbodies in and flowing in/out of protected areas;
- the potential for isolation of flora and fauna within protected areas, due to habitat alteration and loss; and

- measures to mitigate the effects of the Project on the environmental, cultural and social benefits of protected areas.

4.20 Species at Risk and Designated Species

The effects of the Project on animal and plant Species at Risk (SARs) and Designated Species under the NLESA will be assessed within the Project footprint (i.e. cleared areas) and areas that could reasonably be affected by the Project activities. Boundaries for assessing the cumulative effects of the Project in combination with other projects and activities that have been or will be carried out will generally be different from (larger than) the boundaries for assessing the effects of the Project.

4.20.1 VEC Definition and Rationale for Selection

SARs include:

- species that are listed under the *Species at Risk Act* (SARA) and relevant provincial legislation such as the NL *Endangered Species Act* (ESA); and
- species recommended for legal listing by COSEWIC, the NL Species Status Advisory Committee (SSAC) and ranked by the Atlantic Canada Conservation Data Centre (ACCDC) as S1, S2, or S3 or general status (NL Department of Environment and Conservation – Wildlife Division General Status of Wildlife Ranks)as maybe at risk or undetermined.

Preservation of SARs is important for maintaining ecological integrity and species biodiversity. There are also legislative and policy requirements to protect SARs and their habitats. For example, the NLESA requires EAs to identify any adverse effects on a listed species or its critical habitat be identified and that measures be taken to mitigate and monitor those effects. Measures undertaken must be consistent with applicable federal recovery strategies, federal action plans, or provincial recovery plans.

4.20.2 Potential Project-VEC Interactions

Potential Project-VEC interactions for SARs include:

- habitat loss or degradation due to construction and operation of Project facilities and associated infrastructure;
- effects on the physical condition of individuals due to emissions/discharges from the Project;

- mortality associated with construction, operation and/or decommissioning and/or accidents and malfunctions during all Project phases; and
- disruption of feeding, breeding, movement and/or migratory patterns due to noise, lights and/or presence of Project facilities.

Project activities that will result in clearing of or disturbance to natural vegetation, or ground disturbance (e.g., grubbing, grading and excavation) may affect rare plant species by:

- altering or destroying individual rare plants, or habitat capable of supporting rare plant species;
- altering preferred habitat due to changes in surface water hydrology (e.g., ponding, surface water runoff patterns);
- destroying plants, or reducing health conditions of individuals and/or their habitat due to soil erosion, structural soil changes, or soil contamination; or
- displacing rare plants due to non-native and invasive species introduction.

4.20.3 Existing Environment

As background for the analysis of the Project's effects on SARs, the EIS must:

- identify all SARs that may be affected by the Project, using existing data and literature as well as surveys to provide current field data, including raw data, as appropriate;
- provide assessments of regional importance, abundance and distribution that optimize the ability to detect all species at risk and sufficient survey effort to obtain comprehensive coverage; and
- identify residences, seasonal movements, movement corridors, habitat requirements, key habitat areas, identified critical habitat and/or recovery habitat (where applicable) and general life history of SARs that may occur in the Project area, or be affected by the Project.

The following information sources on species at risk and species of conservation concern should be consulted:

- SARA (www.sararegistry.gc.ca);
- NLESA;
- COSEWIC;

- SSAC;
- NLDOEC – Wildlife Division General Status of Wildlife Ranks;
- ACCDC;
- Québec *Loi sur les espèces menacées ou vulnérables*;
- Relevant Government agencies;
- Local naturalist and interest groups; and
- Aboriginal organizations.

4.20.4 Effects Assessment and Mitigation

The EIS should identify the adverse effects of the Project on SARs, including individuals, critical habitat, recovery habitat, important habitat and residences of species listed under SARA and NLESA, species recommended for legal listing by COSEWIC, the SSAC, as well as adverse effects on species of conservation concern ranked by the ACCDC as S1, S2, or S3.

The EIS should describe specific measures that will be taken to avoid or reduce adverse effects and to monitor them (consistent with any applicable federal recovery strategy, federal action plans and/or provincial recovery/management plan). The effects analysis must include project-specific impacts and cumulative effects on SARs and their critical habitat, recovery habitat, important habitat and/or residences. The likely significance of the Project's potential adverse environmental effects on SARs and species of conservation concern must be predicted.

Analysis must take into account pertinent acts, policies, guidelines and directives relating to species at risk, such as:

- *Addressing Species at Risk Act Considerations Under the Canadian Environmental Assessment Act for Species Under the Responsibility of the Minister responsible for Environment Canada and Parks Canada* (SARA-CEAA, 2010);
- *The Species at Risk Act Environmental Assessment Checklists for Species Under the Responsibility of the Minister Responsible for Environment Canada and Parks Canada;*
- *Support Tool for the Required Information Elements Under the Species at Risk Act for Environmental Assessments Conducted Under the Canadian Environmental Assessment Act (Environment Canada – Parks Canada 2010);*

- *Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada (Environment Canada 2004);* and
- *Newfoundland and Labrador: A Provincial Policy Regarding the Conservation of Species at Risk.*

4.21 Historic and Cultural Resources

The effects of the Project on historic and cultural resources must be assessed.

4.21.1 VEC Definition and Rationale for Selection

Historic resources are defined pursuant to the NL *Historic Resources Act*, as a work of nature or of humans that is primarily of value for its archaeological, prehistoric, historic, cultural, natural, scientific or aesthetic interest, including an archaeological, prehistoric, historic or natural site, structure or object.

The Project must give consideration of the effect of any change in the environment caused by the Project on physical and cultural heritage, as well as any structure, site or thing that is of historical, archaeological, palaeontological or architectural significance. Palaeontological resource means a construct, structure or work of nature consisting of or being evidence of prehistoric multi-cellular organisms and palaeontological resources that are designated by regulation. These resources are important for their historic, cultural, spiritual and scientific value.

4.21.2 Potential Project-VEC Interactions

Potential Project-VEC interactions are related to disturbance to and loss of, archaeological sites resulting from site clearing, grubbing and grading activities.

4.21.3 Existing Environment

The EIS must identify any terrestrial and aquatic areas within the Project footprint that are known to contain features of historical, archaeological, palaeontological, architectural, spiritual or cultural significance. A description of the nature of the features located in those areas must be provided. Informant interviews must be conducted with individuals familiar with the Project Area. Particular attention must be given to Aboriginal cultural, archaeological and historic resources, in consultation with Aboriginal organizations. The

potential for archaeological and historic resources to be present in the Project areas must be assessed and presented.

4.21.4 Effects Assessment and Mitigation

The adverse environmental effects of the Project on historic and cultural resources will be assessed for all phases of the Project, as well as for accidents and malfunctions. The analysis should include an archaeological impact assessment of the Project area. The EIS must provide technically and economically feasible measures to mitigate effects and predict adverse residual effects and their significance, taking into consideration pertinent legislation (i.e., NL *Historic Resources Act*), policies, guidelines and directives. The analysis should include an archaeological impact assessment of the proposed Project areas, with particular emphasis on the mine site and associated infrastructure (i.e., roads, railway).

4.22 Other Contemporary Use of Lands and Resources

The effects of the Project on other contemporary use of lands and resources will be assessed within the Project property boundaries and along the right-of-way of associated infrastructure.

4.22.1 VEC Definition and Rationale for Selection

Other contemporary use of lands and resources is defined as use of land and resources, including industrial uses, within the Project property boundaries and along the right-of-way of associated infrastructure. It was selected as a VEC due to its socio-economic importance. In particular, the Project area in Labrador is important to cabin owners and to area residents for recreational purposes.

4.22.2 Potential Project-VEC Interactions

Potential Project-VEC interactions will result from construction and operation activities that alter or destroy wildlife and fish habitat, contaminate country foods, contaminate drinking water supplies, result in restricted access, or modify the existing use of the Project area as a result of diminished air quality, changes to viewscapes, noise and other disturbances.

4.22.3 Existing Environment

The EIS must describe land use at the Project sites and within the regional areas. It should identify past, contemporary and any known planned land use(s) of the Project area that may be affected by the Project. Local land and resource users should be consulted to help

characterize existing land and resource use patterns. The aspects listed below are to be considered to the extent that they are applicable to the site of the Project in Labrador.

- **Residential and Recreational Property** The EIS must identify any property whose value may be adversely affected by any change in the environment caused by the Project. The occurrence of houses and cabins in the vicinity of the proposed mine site should be described, as well as any land identified for potential housing development. The discussion should include any impacts of the Project to local residents;
- **Outdoor Recreation and Tourism**: An overview of the current access and use of the mine site and surrounding areas for recreation and the tourist industry (e.g., berry picking, plant harvesting, hiking, snowshoeing, snowmobiling and snowmobile trails, parks, camping, recreational use of water bodies must be provided;
- **Hunting, Trapping and Guiding**: the current and projected value of the hunting, trapping and guiding industry close to or within the mine site must be provided;
- **Forestry:** The current forest resources and activities at the mine site should be identified;
- **Mineral Exploration:** The current mineral resources and exploration activities in the mine area must be identified;
- **Agriculture:** The EIS must identify current agricultural resources and activities, if any, that could be affected by the mine;
- **Labrador Rail Transportation:** Identify any railway construction and/or operation that is subject to the NL *Rail Service Act*;
- **Float Planes:** The EIS should describe current use of local lakes; and
- **Communication Towers:** The EIS should describe any potential impacts to communications towers.

4.22.4 Effects Assessment and Mitigation

The EIS must describe the adverse effects, including impacts of potential malfunctions and accidental events on existing and planned land and water uses, including the components identified in the previous section, that may arise from changes in the environment caused by the Project (e.g., noise/vibrations, air and water quality, visual and topographic characteristics of the area). The discussion should include consideration of:

- increased industrialization and changes to the visual landscapes for local communities, surrounding areas and along provincial roads and highways;
- the effects of noise, dust and visual impacts to recreation.

The analysis should take into consideration pertinent legislation, policies, guidelines and directives relating to land and resource use. The EIS must describe technically and economically feasible measures that would be employed to mitigate effects on other current and future use of lands and resources, as well as predicted adverse residual effects.

4.23 Economy, Employment and Business

The effects of the Project on economy, employment and business will be assessed at the provincial scale, in accordance with Newfoundland and Labrador requirements.

4.23.1 VEC Definition and Rationale for Selection

Economy, employment and business is defined as:

- economy of Labrador and the rest of the Province;
- taxes and royalties;
- gross domestic product (GDP);
- employment in Labrador and in the rest of the Province;
- skilled and unskilled labour supply in Labrador and the rest of the Province;
- expenditures in Labrador and the rest of the Province;
- employment equity and diversity including under-represented groups (e.g., women, persons with disabilities, aboriginal organizations);
- business capacity: goods and services; and
- economic activities related to tourism.

Understanding the Project's effects on economy, employment and business is fundamental to assessing socio-economic implications for the lives of residents and of revenues to governments.

4.23.2 Potential Project-VEC Interactions

The interaction of the Project with economy, employment and business is related to the Project's expenditures, employment and environmental impacts.

4.23.3 Existing Environment

Baseline conditions for economy, employment and business will be determined through a review of information from the Governments of Newfoundland and Labrador, and Canada and other relevant agencies and organizations (e.g., Chambers of Commerce and Boards of Trade; current Statistics Canada data and other available research data) within the region and potentially-affected Aboriginal communities. Where additional information is required, studies and/or interviews shall be conducted.

Baseline conditions will be characterized for:

- existing employment (e.g., by sector) and income conditions;
- skilled and unskilled labour supply;
- employment equity and diversity including historically under-represented groups (e.g., women, Aboriginal persons, persons with disabilities);
- GDP for Newfoundland and Labrador;
- income levels;
- sources of income;
- labour force indicators including labour force, employment, unemployment and employment, unemployment and participation rates;
- business and industry profile (including industries of specific importance such as mineral exploration and mining);
- tourism related activities; and
- business capacity, including women, Aboriginal persons and persons with disabilities.

4.23.4 Effects Assessment and Mitigation

The EIS must assess the effects of Project-related effects on economic, employment and business conditions and opportunities, as described in the above sections, focusing on the region, and potentially affected Aboriginal communities. The discussion should describe proposed grants or other benefits which could accrue to local towns/municipalities as a result of the Project.

Given the large number of workers required to complete the Project, the EIS must provide:

- expected impacts on the local labour force in Labrador, by gender, including impacts on the Aboriginal labour force; and

- technically and economically feasible measures to mitigate adverse effects and to optimize beneficial effects.

The EIS should describe potential impacts to tourism activities in local municipalities.

The EIS must include commitments to:

- provide quarterly reports to that meet the approval of the Minister of Advanced Education and Skills, during the construction phase, as well as for the duration of the operations phase, including information by gender on the following:
    - the number employed (by 4-digit NOC 2006),
    - the number of full-time/part-time employees,
    - the number of apprentices (by level) and journeypersons,
    - Aboriginal organizations, and
    - source of the workforce.

The EIS must include statements by the operator indicating their acknowledgment that the following documents must be finalized prior to the granting of EA release:

- A Gender Equity and Diversity Plan that meets the approval of the Minster of Natural Resources and the Minister Responsible for the Status of Women. The plan must include an employment plan and a business access strategy for women and for other under-represented groups, including Aboriginal persons, persons with disabilities and visible minorities. These plans will document the proponent's strategy to maximize Newfoundland and Labrador's participation for these groups in the development of the Joyce Lake iron ore deposit and future operations; and,

- A Newfoundland and Labrador Benefits Plan that meets the approval of the Minister of Natural Resources.

Pertinent acts, policies, guidelines and directives relating to economy, employment and business must be taken into account.

4.24 Commitments Made in the EIS

The EIS should provide a list of all commitments made regarding environmental mitigation, monitoring and follow-up. Each commitment must be cross-referenced to the section of the EIS where it has been made.

Data and Information Sources

Canadian Environmental Assessment Agency. 2012. *Canadian Environmental Assessment Act* and Regulations. http://laws-lois.justice.gc.ca/eng/acts/C-15.21/index.html

Guidelines for Canadian Drinking Water Quality. 1996. (http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2010-sum_guide-res_recom/index-eng.php)

Environment Canada. 2004. Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada. First Edition, Canadian Wildlife Service, Environment Canada. 68 Pages

Environment Canada – Parks Canada. 2010. *The Species at Risk Act Environmental Assessment Checklists for Species Under the Responsibility of the Minister Responsible for Environment Canada and Parks Canada – Support Tool for the Required Information Elements Under the Species at Risk Act for Environmental Assessments Conducted Under the Canadian Environmental Assessment Act*: http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=DA30C3BC-F7ED-45F2-868B-17A0B33B6FDF

The Government of Newfoundland and Labrador's Aboriginal Consultation Policy on Land and Resource Development Decisions ("The Policy") April 2013 http://www.exec.gov.nl.ca/exec/igas/publications/aboriginal_consultation.pdf

Newfoundland and Labrador Department of Environment and Conservation. *Guidance for Plume Dispersion Modeling* (GD-PPD-019.2)

Newfoundland and Labrador Department of Environment and Conservation. *Determination of Compliance with the Ambient Air Quality Standards* (GD-PPD-009.4)

Newfoundland and Labrador *Endangered Species Act*: http://assembly.nl.ca/Legislation/sr/statutes/e10-1.htm

Newfoundland and Labrador *Environmental Protection Act*: http://assembly.nl.ca/Legislation/sr/statutes/e14-2.htm#58

Newfoundland and Labrador *Historic Resources Act*:
http://assembly.nl.ca/Legislation/sr/statutes/h04.htm

Newfoundland and Labrador *Mineral Act*:
http://assembly.nl.ca/Legislation/sr/statutes/m12.htm

Newfoundland and Labrador *Rail Service Act*:
http://assembly.nl.ca/Legislation/sr/statutes/r01-2.htm

Newfoundland and Labrador *Sustainable Development Act*:
http://assembly.nl.ca/Legislation/sr/statutes/s34.htm

Newfoundland and Labrador *Water Resources Act*:
http://assembly.nl.ca/Legislation/sr/statutes/w04-01.htm

SARA-CEAA Guidance Working Group (Canada). 2010. *Addressing Species at Risk Act considerations under the Canadian Environmental Assessment Act for Species Under the Responsibility of the Minister Responsible for Environment Canada and Parks Canada*.
http://www.registrelep-sararegistry.gc.ca/document/dspDocument_e.cfm?documentID=2100

Appendix A: Public Notices

Under the provisions of the *Environmental Assessment Regulations 2003*, Section 10 and where the approved Guidelines require public information session(s), the following specified public notification requirements must be met by the Proponent prior to each meeting:

Public Notice

Public Information Session on the Proposed

Name of undertaking

Location of undertaking

Shall be held at

Date and Time

Location

This session shall be conducted by the Proponent,

Proponent name and contact phone number,

as part of the environmental assessment for this Project,

to describe the activities associated with and to provide an opportunity for all interested persons to request information or state their concerns.

ALL ARE WELCOME

Minimum information content of public advertisement - (Proponent to substitute appropriate information for italicized items).

Minimum newspaper ad size: 2 column widths.

Minimum posted ad size: 7" x 5"

Minimum newspaper ad coverage: Weekend preceding meeting and 3 consecutive days prior to meeting date; to be run in newspaper locally distributed within meeting area or newspaper with closest local distribution area.

Minimum posted ad coverage: Local Town or City Hall or Office and local Post Office, within town or city where meeting is held, to be posted continually for 1 full week prior to meeting date.

Any deviation from these requirements for any reason must receive prior written approval of the Minister of Environment and Conservation.

APPENDIX AF

Sample Greenhouse Gas Emission
Calculations and Supporting Data

Appendix AF Sample Calculations & Supporting Data

This appendix includes information used to estimate the greenhouse gases (GHGs) from the Project (for both construction and operation), such as the activity data used in the calculations and sample calculations for each source.

Carbon Dioxide Equivalent

Emissions from each of these specific GHGs have been estimated and multiplied by their 100-year global warming potential (GWP) so they can be reported in units referred to as carbon dioxide equivalents or CO_{2e}. The CO_{2e} based in the GWPs is the standardized way to report GHG emissions.

The GWP (National Inventory Report [NIR], Environment and Climate Change Canada [ECCC] 2020a) of these GHGs applied in this assessment are as follows:

- Carbon Dioxide (CO_2) = 1.0
- Methane (CH_4) = 25
- Nitrous Oxide (N_2O) = 298

On this basis, carbon dioxide equivalents for the Project are calculated as:

$$CO_{2e} = (mass\ CO_2 \times 1.0) + (mass\ CH_4 \times 25) + (mass\ N_2O\ \times 298)$$

For example, for stationary combustion from operations, including and diesel combustion, the following sample calculation shows the conversion of the each GHG species emissions to CO_{2e}:

$$CO_{2e} = \left(13{,}796\frac{\text{tonnes}}{\text{year}}\ CO_2 \times 1.0\right) + \left(0.4\frac{\text{tonnes}}{\text{year}}\ CH_4 \times 25\right) + (0.1\frac{\text{tonnes}}{\text{year}}N_2O\ \times 298)$$

$$CO_{2e} = 13{,}836\frac{tonnes}{year}$$

Blasting

The GHG emissions from blasting were calculated using the following equation:

$$Emissions\ [\frac{tonnes}{year}] = Emission\ Factor\ \left[\frac{kg}{tonne\ ANFO}\right] \times\ Explosive\ Usage\ \left[\frac{tonne\ ANFO}{year}\right]$$

Where:

Emissions = Annual Emission Rate [tonne/year]
Emission Factor = Mining Association of Canada (MAC 2014) emission factor (0.189 kg CO_2/kg of ammonium nitrate/fuel oil [ANFO])
Explosive Usage = Total amount of ANFO explosive used per year provided by Century (2,367tonne/year ANFO emulsion blend plus 9 tonnes/year cast booster during construction; 4,900 tonnes/year ANFO emulsion blend plus 18 tonnes/year cast booster during operations)

It was assumed that the small quantities of cast booster (trinitrotoluene) could be added to the total ANFO usage. The following sample calculation presents the CO_2 emissions from blasting during operations:

$$Emissions\ CO_2 = 0.189\ \frac{kg\ CO_2}{tonne\ ANFO} \times\ 4{,}918 \frac{tomme\ ANFO}{year}$$

$$Emissions\ CO_2 = 929.4\ \frac{tomme}{year}$$

There are no expected emissions of CH_4 or N_2O from ANFO blasting.

Stationary Combustion

The GHG emissions from stationary combustion were calculated using the following equation:

$$Emissions\ \left[\frac{tonnes}{year}\right] = Emission\ Factor\ \left[\frac{kg}{kL}\right] \times\ Fuel\ Usage\ \left[\frac{L}{year}\right] \times Unit\ Convesion \left[\frac{1\ KL}{1{,}000\ L} \times \frac{1\ tonne}{1{,}000\ kg}\right]$$

Where:

Emissions = Annual Emission Rate [tonne/year]
Emission Factor = Emission factor, specific to GHG species and fuel type and presented in Table AF.1 [kg/kL]
Fuel Usage = Total amount of fuel (diesel) used for stationary combustion provided by Century and presented in Table AF.2 [L/year]

The stationary combustion emission factors (EFs) are presented in the following Table AF.1.

Table AF.1 Stationary Combustion Emission Factors

Fuel Type	CO_2 EF [kg/kL]	CH_4 EF [kg/kL]	N_2O EF [kg/kL]
Diesel	2,681	0.08	0.02
Source: 2020 Canada's Greenhouse Gas Quantification Requirements (ECCC 2020b)			

Diesel will be used in stationary combustion from pit lighting, pit dewatering, and generators during both construction and operation. Diesel will also be used in the crushing/screening plant during construction and to heat the truck shop during operations. The following table, Table AF.2, summarizes the diesel quantities that will be used for stationary combustion during construction and operations.

Table AF.2 Fuel Usage in Stationary Combustion

Fuel Type	Stationary Combustion Source	Fuel Usage [L/year]	
		Construction	Operations
Diesel	Tower Lights	70,080	70,080
	Water Pumps	157,680	315,360
	Generators	1,805,314	4,664,500
	Crushing/Screening Plant	656,500	-
	Truck Shop Heating System	-	96,000
	Total	**2,689,574**	**5,145,940**

The following sample calculation presents the CO_2 emissions from diesel stationary combustion during operations:

$$Emissions\ CO_2 = 2{,}681\frac{kg}{kL} \times\ 5{,}145{,}940\frac{L}{year} \times \frac{1\ kL}{1{,}000\ L} \times \frac{1\ tonne}{1{,}000\ kg}$$

$$Emissions\ CO_2 = 13{,}796\frac{tonnes}{year}$$

Similar to the above example for CO_2, CH_4 and N_2O would be estimated using their respective EFs.

On-Site Transportation

The GHG emissions from on-site transportation were calculated using the following equation:

$$Emissions\ \left[\frac{tonnes}{year}\right] = Emission\ Factor\ \left[\frac{g}{L}\right] \times\ Fuel\ Usage\ \left[\frac{L}{year}\right] \times Unit\ Conversion\left[\frac{1\ tonne}{10^6\ g}\right]$$

Where:

Emissions = Annual Emission Rate [tonne CO_2e /year]
Emission Factor = Emission factor, specific to GHG species and vehicle class and presented in Table AF.3 (NIR, ECCC 2020a)
Fuel Usage = Total annual amount of fuel used provided by Century for each specific vehicle/equipment

The on-site transportation EFs are presented in the following Table AF.3.

Table AF.3 Transportation and Mobile Equipment Emission Factors

Vehicle Class	CO_2 EF [g/L]	CH_4 EF [g/L]	N_2O EF [g/L]
Light-Duty Diesel Trucks (LDDTs)[a]	2,681	0.068	0.21
Heavy-Duty Diesel Vehicles (HDDVs)[a]	2,681	0.14	0.082
Off-Road Diesel Equipment [b]	2,681	0.073	0.02

Source: 2019 NIR (ECCC 2020a)
Notes:
[a] Emission factors used for on-road diesel vehicles with "Moderate Control"
[b] Emission factors used for off-road diesel >19 kW, Tier 1-3

The following sample calculation presents the CO_2 emissions from all off-road diesel equipment during operations:

$$Emissions\ CO_2 = 2{,}681\frac{g}{L} \times\ 5{,}209{,}309\frac{L}{year} \times \frac{1\ tonne}{10^6 g}$$

$$Emissions\ CO_2 = 13{,}966\frac{tonnes}{year}$$

Similar to the above example for CO_2, CH_4 and N_2O would be estimated using their respective EFs. Emissions for the other vehicle types were estimated following the same method but with their respective fuel usages and emission factors. The following Table AF.4 and Table AF.5 present the estimated fuel usages and associated GHG emissions for each individual vehicle and piece of mobile equipment from construction and operations, respectively.

Table AF.4 GHG Construction Emissions from Specific Equipment and Vehicles

Equipment	Model	Vehicle Type	Annual Fuel Usage (L)	GHG Emissions (tonnes/a)			
				CO_2	CH_4	N_2O	CO_{2e}
Shovel	CAT 6020B FSD	Off-Road Diesel	2,330,160	6,247	0.170	0.047	6,265
Haul truck, pre-production	CAT 777G / HD 785-7	HDDV	3,170,000	8,499	0.444	0.260	8,587
Drills	SANVIK D45KS DTH (8.5 in.)	Off-Road Diesel	998,640	2,677	0.073	0.020	2,685
Front-end loader	CAT 992K	Off-Road Diesel	240,900	646	0.018	0.005	648
Grader	KOM GD655-5 (14')	Off-Road Diesel	136,393	366	0.010	0.003	367
Track dozer	KOM D155AX-7 (equiv. CAT D8T)	Off-Road Diesel	898,776	2,410	0.066	0.018	2,417
Pre-split drill	Pre-Split: Panterra DI6400 (3 in.)	Off-Road Diesel	21,900	58.7	0.002	0.000	58.9
Water truck	Water Truck / CAT740 (30k l.) /USED	HDDV	153,300	411	0.021	0.013	415
Fuel/lube truck	Fuel/Lube Truck- 10kl fuel (GF40EFLT)	HDDV	87,600	235	0.012	0.007	237
Service truck	Service Truck 22,000 GVW, 250 hp	HDDV	32,850	88.1	0.005	0.003	89.0
Skid steer	Skid Steer (CAT 252B3)	Off-Road Diesel	13,140	35.2	0.001	0.000	35.3
Pick-up truck	Pick-up Truck (Ford F250) Crew Cab	LDDT	43,800	117	0.003	0.009	120
Tire changer	Tire Changer (Lift Truck with TM10 Attachment)	LDDT	13,140	35.2	0.001	0.003	36.1
			Total	**21,825**	**0.825**	**0.387**	**21,961**

Table AF.5 Operation Emissions from Specific Equipment and Vehicles

Equipment	Model	Vehicle Type	Annual Fuel Usage (L)	GHG Emissions (tonnes/a)			
				CO_2	CH_4	N_2O	CO_{2e}
Shovel	CAT 6020B FSD	Off-Road Diesel	2,207,520	5,918	0.161	0.044	5,936
Haul truck, pre-production	CAT 777G / HD 785-7	HDDV	7,095,600	19,023	0.993	0.582	19,222
Drills	SANVIK D45KS DTH (8.5 in.)	Off-Road Diesel	946,080	2,536	0.069	0.019	2,544
Front-end loader	CAT 992K	Off-Road Diesel	240,900	646	0.018	0.005	648
Grader	KOM GD655-5 (14')	Off-Road Diesel	136,393	366	0.010	0.003	367
Track dozer	KOM D155AX-7 (equiv. CAT D8T)	Off-Road Diesel	898,776	2,410	0.066	0.018	2,417
Pre-split drill	Pre-Split: Panterra DI6400 (3 in.)	Off-Road Diesel	43,800	117	0.003	0.001	118
Water truck	Water Truck / CAT740 (30k l.) /USED	HDDV	153,300	411	0.021	0.013	415

Equipment	Model	Vehicle Type	Annual Fuel Usage (L)	GHG Emissions (tonnes/a)			
				CO_2	CH_4	N_2O	CO_{2e}
Fuel/lube truck	Fuel/Lube Truck- 10kl fuel (GF40EFLT)	HDDV	87,600	235	0.012	0.007	237
Service truck	Service Truck 22,000 GWV, 250 hp	HDDV	32,850	88.1	0.005	0.003	89
Skid steer	Skid Steer (CAT 252B3)	Off-Road Diesel	13,140	35.2	0.001	0.000	35
Pick-up truck	Pick-up Truck (Ford F250) Crew Cab	LDDT	43,800	117	0.003	0.009	120
Tire changer	Tire Changer (Lift Truck with TM10 Attachment)	LDDT	13,140	35.2	0.001	0.003	36
Front-end loader	CAT 992K	Off-Road Diesel	722,700	1,938	0.053	0.014	1,943
Haul truck, bi-train	Haulmax 3900	HDDV	4,161,000	11,156	0.583	0.341	11,272
			Total	**45,032**	**2.00**	**1.06**	**45,398**

Electricity Consumption

The GHG emissions from electricity consumption (grid power) were calculated using the following equation:

$$Emissions\left[\frac{tonnes}{year}\right] = Emission\ Factor\left[\frac{g\ CO_{2e}}{kWh}\right] \times\ Annual\ Consumption\left[\frac{kWh}{year}\right] \times Unit\ Convesion\left[\frac{tonnes}{10^6\ g}\right]$$

Where:

Emissions = Annual Emission Rate [tonne/year]
Emission Factor = the electricity consumption emission factor for Newfoundland and Labrador (27 g CO_{2e}/kWh) from the 2019 NIR (ECCC 2020a)
Annual Consumption = annual estimated electricity consumption from the grid, provided by Century [kWh/year]

The following sample calculation presents the CO_{2e} emissions from electricity consumption during operations (year 3):

$$Emissions\ CO_{2e} = 27\ \frac{g\ CO_{2e}}{kWh}\ \times\ 31{,}766\frac{kWh}{year} \times \frac{1\ tonne}{10^6 g}$$

$$Emissions\ CO_{2e} = 0.86\frac{tonnes}{year}$$

Off-Site Shipping (Supplies & Products)

The GHG emissions from shipping (truck and rail) were calculated using the following equation:

$$Emissions\left[\frac{tonnes}{year}\right] = Emission\ Factor\left[\frac{g}{L}\right] \times\ Fuel\ Usage\left[\frac{L}{year}\right] \times Unit\ Convesion\left[\frac{1\ tonne}{10^6\ g}\right]$$

Where:
Emissions = Annual Emission Rate [tonne/year]
Emission Factor = Emission factor, specific to the mode of transportation and for the specific GHG species, presented in Table AF.6 [g/L]
Fuel Usage = Total amount of fuel used in transportation (shipping), estimated based on distance traveled and fuel consumption rates, presented in Table AF.7 and Table AF.8 [L/year]

The transportation EFs used for shipping are presented in the following Table AF.6.

Table AF.6 Shipping Transportation Emission Factors

Source Type	CO_2 EF [g/L]	CH_4 EF [g/L]	N_2O EF [g/L]
Diesel Train	2,671	0.15	1.00
Heavy-Duty Diesel Vehicles (HDDVs)[a]	2,681	0.14	0.082
Source: 2019 NIR (ECCC 2020a) [a] Emission factors used for on-road diesel vehicles with "Moderate Control"			

The fuel usage was estimated differently depending on the mode of transport.

For shipping via rail, the fuel usage was estimated using the average (689) revenue tonne-kilometre per litre of fuel from the United States Bureau of Transportation Statistics for 2019 (US BTS 2019) and the provided tonnes transported and distance. The estimated fuel usage from shipping via rail and the associated data used to calculate the fuel usages are presented in Table AF.7.

Table AF.7 Fuel Usage for Shipping via Rail

Phase	Description	Tonnes Shipped per trip	km per trip	Trips per Year	Fuel Usage per Year [L/year]
Construction	Port to rail loop - diesel fuel	576	565	32	19,914
	Port to rail loop - explosives	100	565	49	5,224
	Port to rail loop - Tires, parts, equipment and consumable supplies	100	565	52	5,543
	Port to rail loop - food	10	565	52	554
				Total Rail Fuel	31,235
Operations	Port to rail loop - diesel fuel	576	565	32	19,914
	Port to rail loop - explosives	100	565	49	5,224
	Port to rail loop - Tires, parts, equipment and consumable supplies	100	565	52	5,543
	Port to rail loop - food	10	565	52	554
	Rail loop to port - iron ore lump and fines	24,000	565	110	2,825,000
				Total Rail Fuel	2,856,235

For shipping via transport truck, fuel usage was estimated based on number of expected deliveries/ shipments, shipping distance, and fuel economy. The fuel economy used for truck transport was the average of the Canadian trucking industry (39.5 L/100 km) as reported by Natural Resources Canada (NRCan 2019). The estimated fuel usage from shipping via truck and the associated data used to calculate the fuel usages are presented in Table AF.8.

Table AF.8 Fuel Usage for Shipping via Truck

Phase	Description	Distance (2-way) [km]	Number of Trips per Year [trips/year]	Fuel Usage [L/year]
Construction	Rail loop to plant - diesel fuel	86	934	31,728
	Schefferville to plant - gasoline	60	3	71
	Rail loop to magazine - explosives	92	163	5,936
	Rail loop to plant - Tires, parts, equipment and consumable supplies	86	173	5,888
	Rail loop to plant - food	86	104	3,533
			Total Truck Fuel	47,156
Operations	Rail loop to plant - diesel fuel	86	934	31,728
	Schefferville to plant - gasoline	60	3	71
	Rail loop to magazine - explosives	92	163	5,936
	Rail loop to plant - Tires, parts, equipment and consumable supplies	86	173	5,888
	Rail loop to plant - food	86	104	3,533
	Plant to rail loop - iron ore lumps and fines	86	17,667	600,137
			Total Truck Fuel	647,292

The following sample calculation presents the CO_2 emissions from truck (HDDVs) shipping during operations:

$$Emissions\ CO_2 = 2{,}681 \frac{g}{L} \times 7647{,}292 \frac{L}{year} \times \frac{1\ tonne}{1000\ g}$$

$$Emissions\ CO_2 = 1{,}735.4 \frac{tonnes}{year}$$

Similar to the above example for CO_2 from truck shipping, emissions from rail shipping and emissions of CH_4 and N_2O would be estimated using their respective emission factors.

Employee Travel

The GHG emissions from employee flight travel were calculated using the following equation:

$$Emissions \left[\frac{tonnes}{year}\right] = Emission\ Factor \left[\frac{g}{L}\right] \times Fuel\ Usage \left[\frac{L}{year}\right] \times Unit\ Conversion \left[\frac{1\ tonne}{10^6\ g}\right]$$

Where:
Emissions = Annual Emission Rate [tonne/year]
Emission Factor = Emission factor, specific to the GHG species, presented in Table AF.9 [g/L]
Fuel Usage = Total amount of fuel used in transportation, estimated based on distance travelled and flight specifications [L/year]

The aviation EFs used for employee travel to site are presented in the following Table AF.9.

Table AF.9 Aviation Emission Factors

Fuel Type	CO_2 EF [g/L]	CH_4 EF [g/L]	N_2O EF [g/L]
Aviation Turbo diesel	2,560	0.029	0.071
Source: 2019 NIR (ECCC 2020a)			

Flight fuel usage was estimated using flight data (number of flights, origin/destination, distance, flight models), and model specifications (speed, fuel consumption) (Table AF.10).

Table AF.10 Flight Data and Plane Specifications

Phase	Description	Annual travel km	Assumed Model	Average Speed [km/hour]	Average Fuel Consumption [L/hour]	Fuel Usage [L/year]
Construction	FIFO management (From St John's)	618,800	De Havilland Dash 8-100[a]	440	600	278,460
Construction	FIFO construction average (from Labrador City)	664,200	Pilatus PC-12[b]	528	250	314,489
Operations	FIFO permanent (from Labrador City)	66,420	Pilatus PC-12[b]	528	250	31,449
	FIFO seasonal (from Labrador City	182,040	Pilatus PC-12[b]	528	250	86,193

[a] Commercial airline, assuming 1/3rd of the flight is occupied by employees. Flight specifications obtained from CemAir (2021) for the Dash 8-100.
[b] Chartered flight with only employees. Flight specifications obtained from Pilatus (2015) for the Pilatus PC-12

The following sample calculation presents the CO_2 emissions from FIFO management flights during construction:

$$Emissions\ CO_2 = 2{,}560\frac{g}{L} \times 278{,}460\frac{L}{year} \times \frac{1\ tonne}{1000\ g}$$

$$Emissions\ CO_2 = 712.9\frac{tonnes}{year}$$

Similar to the above example for CO_2 emissions of CH_4 and N_2O would be estimated using their respective EFs.

The GHG emissions from the electric bus transportation of employees to site were estimated using the same equation as for electricity consumption, as follows:

$$Emissions\left[\frac{tonnes}{year}\right] = Emission\ Factor\left[\frac{g\ CO_{2e}}{kWh}\right] \times Annual\ Consumption\left[\frac{kWh}{year}\right] \times Unit\ Convesion\left[\frac{tonnes}{10^6\ g}\right]$$

Where:
Emissions = Annual Emission Rate [tonne/year]
Emission Factor = the electricity consumption emission factor for Newfoundland and Labrador (27 g CO_{2e}/kWh) from the 2019 NIR (ECCC 2020a)
Annual Consumption = annual estimated electricity consumption from the grid to charge the electric buses, estimated by distance traveled and bus specifications [kWh/year]

The annual electricity consumption was estimated using the electricity per charge (220 kWh per charge) and the milage per charge (155 miles per charge) of the bus model (Lion Electric C), paired with the distance traveled (Lion Electric 2021). Table AF.11 presents this information and the estimated annual electricity used.

Table AF.11 Electric Bus Electricity Usage Data

Description	Rotations per year	Travel legs	Distance (km)	Example Model	Electricity per charge [kWh][a]	Kilometers per Charge [km][a]	Electricity per Year [kWh/year][a]
Local permanent	250	500	17	Lion Electric Lion C	220	249.4	7,497
Local seasonal	165	330	17	Lion Electric Lion C			4,948
[a]Lion C Electric Website (Lion Electric 2021)							

The following sample calculation presents the CO_2 emissions from employee transport to site via electric bus:

$$Emissions\ = 27\ \frac{g\ CO_{2e}}{kWh} \times 12{,}444\ \frac{kWh}{year} \times \frac{tonnes}{10^6\ g}$$

$$Emissions\ CO_{2e} = 0.34 \frac{tonnes}{year}$$

Wastewater Treatment

The CH_4 emissions from the treatment of wastewater during operations used the following equation for anaerobic treatment obtained from Western Climate Initiative Method Final Essential Requirements of Mandatory Reporting (2010):

$$Emissions\ CH_4 \left[\frac{tonnes}{year}\right] = Q\ \left[\frac{m^3}{year}\right] \times BOD_{5qave} \left[\frac{kg}{m^3}\right] \times B \left[\frac{kg\ CH_4}{kg\ BOD_5}\right] \times MCF \times 0.001\ [\frac{tonnes}{kg}]$$

Where:
Emissions = Annual Emission Rate [tonne/year]
Q = Annual volume of wastewater treated [m^3/year] based on average daily flowrate (150 m3/day) from the design specifications for the proposed system (Newterra 2014).
BOD_{5qave} = Average of quarterly determination of five-day biological demand of the wastewater [kg/m3], obtained from design specifications (Newterra 2014)
MCF = Methane correction factor for anaerobic decay, value of 0.8 for anaerobic applied

It was assumed that the anoxic tank could be conservatively assumed to be represented by the above equation for anaerobic wastewater treatment.

The following sample calculation presents the CH_4 emissions from wastewater treatment during operations:

$$Emissions\ CH_4 = 54{,}750 \frac{m^3}{year} \times 0.4\ \frac{kg\ BOD_5}{m^3} \times 0.06 \frac{kg\ CH_4}{kg\ BOD_5} \times 0.8 \times 0.001\ \frac{tonnes}{kg}$$

$$Emissions\ CH_4 = 1.05 \frac{tonnes}{year}$$

Land Clearing

The GHG emissions from land clearing (deforestation and revegetation) were estimated using the following equation:

$$Emissions\left[\frac{tonnes}{year}\right] = Immediate\ Emission\ Factor\left[\frac{Gg\ CO_{2e}}{ha}\right] \times\ Area\ Cleared\left[\frac{ha}{year}\right] \times Unit\ Conversion\left[\frac{1000\ tonnes}{Gg}\right]$$

Where:
Emissions = Annual CO_{2e} Emission Rate [tonne/year]
Immediate Emission Factor = sum of forest product emission factor [Gg CO_{2e}/ha] and "Other" emission factor [Gg C/ha converted to CO_{2e} using the molar ratio of 44/12 for CO_2/C] obtained from ECCC's Deforestation model and guidelines (ECCC 2020c) for the forest region 4 – Taiga Shield East.

The above equation assumed that all releases are immediate (no residual) and conservatively used instant oxidation approach which assumes that 100% of the forest products are immediately released as CO2. The area of land cleared was provided by Century for different site-areas and summed for a total of 409.1 hectares. The following sample calculation presents the CO2 emissions from land clearing during construction:

$$Emissions = [0.08573\frac{Gg\ CO_2}{ha} + \left(0.04795\frac{Gg\ C}{ha} \times \frac{44}{12}\right)] \times\ 409.1\frac{ha}{year} \times \frac{1000\ tonnes}{Gg}$$

$$Emissions = 107{,}015\ tonnes\frac{CO_{2e}}{year}$$

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