

Mackenzie Valley
Review Board



Terms of Reference

EA1314-01

Jay-Cardinal Project

Dominion Diamond Ekati Corporation

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Mackenzie Valley Review Board

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1 Introduction

1.1 Overview

This document outlines the information required for the environmental assessment of the Jay – Cardinal Project (also referred to as the “Project”), specifically the initial open pit mining and subsequent underground development by Dominion Diamond Ekati Corporation (DDEC or “the developer”) of the Jay and Cardinal kimberlite pipes. The proposed Project is an extension project to the existing Ekati Mine and the development of these pipes will rely on the mining infrastructure located at the existing Misery site and will provide feed to the processing plant at the Ekati mine site. These facilities are within the Wek’eezhii Settlement Area and the Project is anticipated to provide an additional 10 to 20 years of mine life. This document is divided into the following sections:

- Section 1 – Introduction, including the reasons for environmental assessment referral, the legal context, and the *Terms of Reference* development process;
- Section 2 – General requirements of the *Developer’s Assessment Report*;
- Section 3 – Scope considerations including scope of development and scope of assessment including minimum geographic scope and temporal boundaries for consideration of impacts¹ of the proposed development on valued components;
- Section 4 – Assessment methodology
- Section 5 – Description of existing environment
- Section 6 – Development description
- Sections 7-12 – Key lines of inquiry, subjects of note and other requirements,
- Appendices - Appendix A: Scope of Development and Appendix B: Guidelines for Monitoring and Management Programs.

The *Terms of Reference* will direct the developer to organize existing material, and conduct additional study and analysis as appropriate, in order to submit a “stand-alone” *Developer’s Assessment Report* (DAR). That report will then be used to inform all interested parties concerning the proposed development during the analytical phase of the environmental assessment².

1.2 Referral to environmental assessment

DDEC has applied to develop two open pit mines in order to extract the Jay and Cardinal kimberlite pipes, noting the possibility of further mining underground later in the mine life. The pipes are located within Lac du Sauvage in the southeastern portion of the Ekati mine block. The kimberlite would be processed at the existing Ekati processing plant, which is

¹ Any reference to “impact(s)”, “change(s)”, “effect(s)” and similar words in this document refers to project-related deviations from baseline conditions for a valued component or expected conditions without the project, as may be appropriate to the context.

² The role of the Developer’s Assessment Report and associated next steps in the environmental assessment are identified in the Work Plan issued by the Review Board as a companion document to the Terms of Reference.

approximately 25 km northwest of the proposed Project site and approximately 150 km east of the community of Wekweètì.

In October 2013, the Wek'eezhii Land and Water Board received applications for a Type A Water Licence W2013L2-0002 and Land Use Permit W2013D-0007 for the Jay-Cardinal Project. The developer as part of its application submitted a Project Description of the proposed development extension. The Wek'eezhii Land and Water Board initiated a preliminary screening of the Jay-Cardinal Project according to Section 124 of the *Mackenzie Valley Resource Management Act (MVRMA)*.

On November 21, 2013, Aboriginal Affairs and Northern Development Canada referred the Jay-Cardinal Project and all associated applications to environmental assessment under paragraph 126(2)(a) of the *MVRMA* because the Project might have a significant adverse impact on the environment.

The Review Board notified DDEC on November 22, 2013, that the development had been referred to environmental assessment.

1.3 Legal context and the *Terms of Reference* development process

This environmental assessment is subject to the requirements of Part 5 of the *MVRMA*. Section 3 of the Review Board's *Environmental Impact Assessment Guidelines* describes the environmental assessment process in detail. That document, as well as the Review Board's *Rules of Procedure*, other guidelines, reference bulletins, and relevant policies applicable to this assessment are available online (www.reviewboard.ca) or by contacting the Review Board staff.

In accordance with Section 115 of the *MVRMA*, the Review Board must conduct an environmental assessment of the proposed development with regard for the protection of the environment from significant adverse impacts, and the protection of the social, cultural and economic well-being of Mackenzie Valley residents and communities. Subsection 114(c) of the *MVRMA* further requires the Review Board to ensure that concerns of the Aboriginal peoples and the general public are taken into account. Accordingly, the Review Board has developed these *Terms of Reference* based on an examination of information from the following sources:

- comments from reviewers on the developer's draft *Terms of Reference*;
- technical scoping meeting in Yellowknife;
- community scoping meetings in Yellowknife, Behchoko and Lutsel K'e;
- all information on the public registry in relation to the Jay-Cardinal Project; and,
- review Board experience in the conduct of environmental assessment.

2 Developer’s Assessment Report general requirements

The Final *Terms of Reference* document describes the general information required on a subject-by-subject basis. The developer is encouraged to consider the information gaps identified and questions raised by interested parties on the public record in scoping submissions and comments on the draft *Terms of Reference* when determining the level of detail required in its *Developer’s Assessment Report* for specific issues covered in this Final *Terms of Reference*.

The developer is encouraged to seek clarification from the Review Board in writing if specific requirements in the *Terms of Reference* are unclear. If the developer finds that an item cannot be addressed, the developer should provide a rationale.

2.1 Presentation of material

The Review Board encourages the developer to present information in its *Developer’s Assessment Report* in user-friendly ways. The use of maps, aerial photographs, development component/valued component interaction matrices, full explanation of figures and table, and an overall commitment to plain language is encouraged. When it is necessary to present complex or lengthy documentation to satisfy the requirement of the *Terms of Reference*, the developer should make every effort to simplify its response in the main body of the text and place supporting materials in appendices. DDEC will produce a total of 10 printed copies of its *Developer’s Assessment Report* for the Review Board and parties. DDEC will also produce all electronic documents in pdf format with a maximum file size of 10 MB.

The *Developer’s Assessment Report* will be submitted as a stand-alone document. Relevant information and analyses from any previous project description should be incorporated into the *Developer’s Assessment Report* and combined with the supplementary material and analyses required by this *Terms of Reference*. Further, any information referenced will be made accessible.

2.2 Incorporation of traditional knowledge

The Review Board values and considers both traditional knowledge and scientific knowledge in its deliberation. In addition, subsection 115(c) of the *MVRMA* provides as a guiding principle for the Review Board the importance of conservation to the well-being and way of life of the Aboriginal peoples of Canada to whom Section 35 of the *Constitution Act 1982* applies and who use an area of the Mackenzie Valley. DDEC will make all reasonable efforts to provide assistance in the collection and consideration of traditional knowledge relevant to the Jay-Cardinal Project. DDEC will make all reasonable efforts to incorporate traditional knowledge from Aboriginal culture holders as a tool to collect

information on and evaluate the specific impacts required in this *Terms of Reference*. The developer should refer to the Review Board’s *Guidelines for Incorporating Traditional Knowledge into the Environmental Impact Assessment Process*³ and community/culture group-specific traditional knowledge protocols.

2.3 Public engagement

Engagement with potentially affected communities (i.e., Ekati Mine IBA groups), governments, and the Independent Environmental Monitoring Agency should be considered in this section. Aboriginal groups, government agencies, and other interested parties may have information useful to the conduct of this impact assessment and all reasonable efforts should be made to engage with them. The use of interpreters during meetings with aboriginal communities is encouraged. The Review Board encourages the developer to continue to meet with these groups outside the environmental assessment process, and to place any information from those discussions they consider may be relevant to the Review Board’s decision on the public record. The following items are required for consideration of public engagement:

- an updated engagement log, reviewed and jointly agreed upon with parties if possible, describing dates, individuals, and organizations engaged with, the mode of communication, discussion topics, and positions taken by participants;
- all commitments and agreements made in response to issues raised by the public and Aboriginal groups during these discussions, and how these commitments altered the planning of the proposed Jay–Cardinal Project;
- all issues that remain unresolved, documenting any further efforts envisioned by the parties to resolve them;
- description of all methods used to identify, inform, and solicit input from potentially-interested parties, and any plans DDEC has to keep engagement moving forward;
- discussion of the implications for environmental monitoring and management of any relevant agreement between the developer and other interested parties; and,
- how DDEC has engaged or intends to engage, traditional knowledge holders in order to collect relevant information for establishing baseline conditions and assessing the effects of potential impacts and the design of monitoring programs, as well as a summary table indicating where and how in subsequent sections (7 to 12) traditional knowledge was incorporated, and who was consulted (see Review Board’s *Guidelines for incorporating Traditional Knowledge into the Environmental Impact Assessment Process*).

³ Available at
http://www.reviewboard.ca/upload/ref_library/1247177561_MVReviewBoard_Traditional_Knowledge_Guidelines.pdf

2.4 Summary materials

The following summary materials are required:

- plain language, non-technical summaries of the *Developer's Assessment Report* in English, Chipewyan, Inuinnaqtun, Tlicho and Weledeh;
- a concordance table that cross references the items in the *Terms of Reference* with relevant sections of the *Developer's Assessment Report*; and,
- a commitments table listing all mitigation measures the developer will undertake, including but not limited to those described in the Project application. These should be organized by subject (e.g., water quality, wildlife) for ease of reference.

2.5 Developer

The following information is required regarding DDEC as well as its subsidiary companies, related corporations and joint venture partners:

- a summary of the corporate history and operational experience in Canada and the Northwest Territories;
- how the developer will ensure that DDEC and its contractors and subcontractors honour commitments made by DDEC and an analysis of DDEC's compliance with its existing Socio-economic Agreement;
- environmental performance records since operations began at the Ekati mine and during associated prior exploration. This will include discussion of regulatory compliance, for example, regarding land use permits and water licences. List situations where compliance was breached, the issue and cause, and how and when it was mitigated to the regulator's satisfaction; and,
- a description of any corporate policies, codes of practice, programs or plans concerning DDEC's environmental, sustainable development, community engagement, and workplace health and safety commitments or policies.

3 Scope considerations

3.1 Scope of development

Under Subsection 117(1) of the *MVRMA*, the Review Board determines the scope of development for every environmental assessment it conducts. The scope of development consists of all the physical works and activities required for the Project to proceed. Appendix A outlines a minimum listing of project components for the scope of development for this environmental assessment.

Within this document the term “Jay-Cardinal Project”, “Project”, “development”, or all other related words collectively represent the project components, activities, or structures that are required to undertake the development of the Jay and Cardinal kimberlite pipes that have not been previously assessed as part of the *NWT Diamond Project Report of the Environmental Assessment Panel dated June 1996 or the Report of Environmental Assessment on the Proposed Development of Sable, Pigeon, and Beartooth Kimberlite Pipes February 2001*. Where this document refers to the “Jay-Cardinal site”, that means the area covered by Ekati’s mineral claims and mining leases at, adjacent to, or near Lac du Sauvage.

In the *Developer’s Assessment Report*, (see Section 6) the developer is required to fully describe all required facilities and activities for the development, including any not listed in Appendix A. The new facilities, infrastructure, and activities proposed as part of the Ekati Diamond Mine extension will be described for all phases of the Project: construction, operation, and closure. Details on changes, if any, to existing facilities, infrastructure, or activities to accommodate the Project will also be provided. The Review Board may amend the scope of development at any time during the environmental assessment.

3.2 Scope of assessment

The scope of assessment defines which issues will be examined in the environmental assessment. The scope of assessment includes all potential impacts on valued components of the biophysical and human environment (for example, wildlife species or heritage resources) from the development, by itself and in combination with other past, present and reasonably foreseeable future developments.

To determine the scope of assessment, the Review Board considered the Jay-Cardinal Project Description, including the DDEC draft *Terms of Reference* and comments from reviewers on the draft *Terms of Reference*. Review Board- hosted community scoping sessions in Yellowknife, Behchoko and Lutsel K’e as well as a technical scoping session in Yellowknife also informed the scope of assessment.

3.2.1 Valued components

The following is a preliminary listing of valued components to be used in the assessment of impacts from the Project on biophysical, social, economic and cultural values:

- air quality;
- surface hydrology;
- water quality and aquatic life other than fish;
- fish;
- groundwater;
- permafrost;
- physical terrestrial environment (soils, eskers and vegetation);
- archaeology (heritage sites);
- carnivores (wolverine, grizzly bears, wolves);
- breeding birds;
- species at risk;
- archaeology and heritage sites;
- land use and traditional land use;
- employment and economy (socio-economic and employment);
- human health.

The key lines of inquiry and the subjects of note provide information on the selection of valued components. Key lines of inquiry and subjects of note are interdisciplinary and may involve more than one valued component. The developer will provide a rationale for which valued components were selected.

3.2.2 Issues prioritization

The purpose of scoping is not only to identify issues, but also to prioritize them and if possible focus required additional work on the most important issues. DDEC will consider all the items described in Sections 7 - 12 because every issue identified in this *Terms of Reference* requires serious consideration and substantive analysis to demonstrate whether the development is likely to be the cause of, or contribute to, significant adverse impacts.

Data collection and analyses for each discipline-specific assessment presented in the *Developer's Assessment Report* should be at a level of detail appropriate for other interested parties to understand the technical material prior to any technical sessions on these topics.

3.2.3 Key lines of inquiry

Key lines of inquiry are areas of concern that have been identified as requiring the most attention during the environmental impact assessment and the most rigorous analysis and detail in the *Developer's Assessment Report*. Key lines of inquiry are identified to ensure a comprehensive, detailed analysis of the issues that were identified as bringing about

potential significant public concern regarding the proposed development. The developer will provide a standalone assessment to facilitate public evaluation for all identified key lines of inquiry. Assessment work will encompass project-specific effects, potential additive effects considering potential accidents and malfunctions, and potential cumulative effects. key lines of inquiry are stand-alone sections in the DAR.

Four key lines of inquiry pertaining to the biophysical environment and one key line of inquiry for the human environment were identified for the Ekati Mine extension:

1. impacts to water quality and quantity;
2. impacts to fish and fish habitat;
3. impacts to caribou;
4. analysis of alternative means; and
5. maximizing benefits and minimizing impacts to communities.

3.2.4 Subjects of note

The developer will consider other valued components described in Section 7 and 8 as subjects of note. Every issue identified in this *Terms of Reference* requires a sufficient analysis to demonstrate whether the development is likely to cause significant adverse impacts. These subjects of note need to be considered by the developer but are of lower priority than the key lines of inquiry. Subjects of note are stand-alone sections in the DAR.

3.3 Developer's assessment boundaries

The developer will provide a description, map, and rationale for all of the chosen geographical and temporal boundaries used during its impact assessment. Certain minimum requirements and other instructions to assist in the determination of appropriate boundaries are discussed in Section 3.2 of the *Terms of Reference*. Separate boundaries may be required for cumulative effects assessment.

The developer will describe and provide rationale for:

- an overall environmental assessment study area and the rationale for its boundaries;
- DDEC's chosen spatial boundaries for the assessment of potential impacts for each of the valued components considered; and,
- the temporal boundaries chosen for the assessment of impacts on each valued component.

3.4 Geographic scope

The geographic scope will include all areas that may be affected by activities within the Jay-Cardinal Project scope of development. The geographic scope for each valued component will be appropriate for the characteristics of the valued component, or the impact and

nature of the impact source. For example, consideration of impacts on air should reflect the airshed, wind patterns and mobility of airborne contaminants, while the habitat ranges of wildlife using the area may be relevant from a project specific and cumulative effects perspective. All of these areas together will be considered in the environmental assessment study area, which will be further defined by the developer in its *Developer's Assessment Report* (see Section 3.3). The developer will provide rationale for the spatial boundaries it selects for the assessment of potential mine-related impacts on each valued component. The minimum geographic scope will include the following areas:

- the Ekati mine's mineral and surface leases and mining claims in the area of the Jay – Cardinal site, sub-surface working, and reasonable impact footprint radius centered on the site;
- the Jay-Cardinal site access roads, roads connecting the site to the Misery Haul Road, the Misery Haul Road, as well as a reasonable impact footprint corridor, including any portions of watercourses that may be affected;
- the Paul Lake watershed, Duchess Lake and upstream waterbodies that may be impacted by the Project, Lac du Sauvage, the drainage area of Lac du Sauvage, the outflow from Lac du Sauvage to Lac de Gras, and Lac de Gras to the point where reasonably foreseeable Project-related impacts can be predicted to cease;
- any watershed into which discharge water will be released and downstream to the point where reasonable foreseeable Project-related impacts cease to occur, including those on water quality, water quantity, fisheries, and the human environment;
- any underground aquifers leading to Lac de Gras from the Jay–Cardinal Project;
- the habitat of any potentially affected species, including species-at-risk and migratory species, possibly affected by the Project, and for the purposes of a cumulative effects assessment, the range or local population of any potentially affected species should be considered. The developer will provide rationale for how either range or local population was chosen for the analysis; and,
- the Tibbit to Contwoyto Winter Road.

The geographic scope of assessing impacts to the human environment includes the First Nations, Métis, and Inuit organizations in the communities of Gameti, Wekweeti, Whati, Behchoko, Yellowknife, Dettah, N'idilo, Lutsel K'e and Fort Resolution, and the Wek'eezhii Settlement Area as a whole and those residents in or making traditional use of any part of the environmental assessment study area. This also includes the communities of Kugluktuk, Bathurst Inlet and Umingmaktok, Nunavut. Together, these groups are described in this document as “potentially-affected communities”.

In its response to Section 3.3 the developer is required to define and provide rationale for the specific spatial boundaries, it used to examine the potential impacts on each of the valued components in its impact assessment.

3.5 Temporal scope

The developer will use temporal boundaries for this environmental assessment according to potential long-term impacts on valued components, rather than on a single generic timeline. In all cases, the temporal boundary may not end with the duration of the operating phase of the Jay-Cardinal Project.

For project-specific (that is, non-cumulative) impacts, the temporal scope will include all phases of the Jay-Cardinal Project lifespan including construction, operation, closure and reclamation, and extends until no potentially significant adverse impacts are predicted. For cumulative impacts, the temporal scope includes the period of the effects of past, present and reasonably foreseeable future projects that are predicted to combine with the impacts of the Jay-Cardinal Project.

The developer will place special focus on the consideration of time during the development when activities are particularly intense (such as during the initial construction phase) or when valued components are particularly sensitive to potential impacts (such as during wildlife migration periods, or spawning and incubation periods for fish, key harvesting periods, and annual cultural gatherings). The developer will also give special attention to appropriate temporal boundaries for considering any impacts that may require long-term monitoring and management after closure, such as when water quality criteria are met to allow for the reconnection of the re-watered Lac du Sauvage with the surrounding watershed and the re-establishment of an aquatic ecosystem in Lac du Sauvage.

In its response to Section 3.3 the developer is required to define and provide rationale for the specific temporal boundaries it used to examine the potential impacts on each of the valued components in its impact assessment.

3.6 Other scope of assessment considerations

The scope of assessment set out in these *Terms of Reference* may be re-examined at any time by the Review Board if new information emerges.

The scope of assessment will include an examination of cumulative effects. This will involve considering impacts from other past, present, and reasonably foreseeable future developments or human activities that combine with the impacts of the Jay-Cardinal Project to affect the same valued components. Such cumulative effects will be assessed at a spatial and temporal scale appropriate to the particular effect or valued component under consideration.

4 Assessment methodology

4.1 Impact assessment steps and significance determination factors

In order to facilitate the consideration of the specific questions posed in this section, the developer is required to address the following impact assessment steps. In assessing impacts on the biophysical environment, the *Developer's Assessment Report* will for each subsection:

- identify any valued components used and how they were determined;
- identify the natural range of background conditions (where historic data are available), and current baseline conditions, and analyze for discernible trends over time in each valued component, where appropriate, in light of the natural or existing variability for each;
- identify any potential direct and indirect impacts on the valued components that may occur as a result of the proposed development, identifying all analytical assumptions;
- identify and evaluate any proposed mitigation measures as to their technical and economic feasibility to reduce the predicted impacts and discuss constraints, uncertainties and implementation challenges to the effective use of the proposed measures and clearly identify all mitigation commitments;
- predict the likelihood of each impact occurring after the committed to mitigation measures are implemented, providing a rationale for the confidence held in the prediction. The developer will also present the predictions in a manner that facilitates the formulation of testable questions for future follow-up programs, as well as textually and schematically indicate the pathways of predicted impacts;
- compare the predicted impacts to pre-development conditions or to conditions without the Project as appropriate. Include a description of any plans, strategies or commitments to avoid, reduce or otherwise manage and mitigate the identified potential adverse impacts, with consideration of best management practices in relation to the valued component or development component in question;
- describe techniques such as models utilized in impact prediction including techniques used where any uncertainty in impact prediction was identified;
- identify, and provide an opinion on the significance of any residual adverse impacts predicted to remain after any mitigation measures and indicate the methodologies for reaching such conclusions; and,
- identify any monitoring, evaluation, and adaptive management plans required to detect potential unexpected changes as well as to ensure that predictions are accurate, and if not, to proactively manage against developing adverse impacts when they (or unexpected changes) are encountered.

The developer will describe how the predicted impacts are expected to arise from the proposed development. This will include describing the mechanisms for cause and effect and providing supporting references (including where traditional Knowledge was used). Where professional judgement has been used in determining impacts, this will be made clear. DDEC will also provide a discussion on the uncertainty involved with each prediction.

For each predicted impact, the developer will also describe:

- the nature or type of the impact;
- the geographical range of the impact;
- the timing of the impact (including duration, frequency and extent);
- the magnitude of the impact (what degree of change is expected);
- the reversibility of the impact; and,
- the likelihood and certainty of the impact.

4.2 Developer’s opinion on significance of impacts

The above will be used by the developer as a basis for its justification of significance for potential impacts from this Project. If a determination is made that significant adverse impacts are not likely, the developer will provide a narrative statement that identifies what, in its opinion, the threshold for significance would be. It is acknowledged that quantitative thresholds for all components may not be feasible.

The Review Board will make ultimate determinations of significance after considering all the evidence on the public record later in the environmental assessment. For more information on the above required descriptions refer to Section 3.11 of the Review Board’s *Environmental Impact Assessment Guidelines* available on the Review Board’s public registry.

5 Description of the existing environment

A detailed description of the existing environment is required, including current status and trends for all valued components. Wherever possible, the developer is responsible for providing a clear picture of what typical environmental conditions currently exist in the environmental assessment study area prior to the start of this environmental assessment. This will include relevant data collected as part of the existing monitoring programs at the Ekati site, including the Surveillance Network Program, the Aquatic Effects Monitoring Program, the Air Quality Monitoring Program and the Wildlife Effects Monitoring Program. The data presentation will consider baseline/background conditions, the natural variability of background conditions, and to the extent possible differentiate between natural background conditions, current environmental conditions, and effects from past development activities, such as exploration, the existing Ekati mine operation, or the existing Diavik mine operation.

In addition, the developer will provide a description of the methods used to acquire the information used to describe baseline/background conditions. This description will distinguish between techniques used to measure parameters in the field from information derived from the utilization of models. DDEC will provide complete references for historical data and indicate how and when historical data were used as a basis for conclusion(s).

The developer should provide the following assessment of its baseline information in describing the existing environment:

- an assessment of the adequacy of the existing baseline dataset in terms of geographic coverage, certainty and how recently it was collected, whether there are any trends apparent, veracity of techniques, Quality Assurance/Quality Control and any other relevant matter; and
- a plan to supplement the baseline information before construction if necessary.

The following description should be at a level of detail sufficient to allow for a thorough assessment of Project effects. Describe the biophysical and human environment within the relevant environmental assessment study areas as follows:

5.1 Biophysical environment

1. The physical location of the proposed development (with maps), including ecozone(s) and ecoregions(s);
2. Ambient air quality, including baseline concentrations of criteria air contaminants (total suspended particulates, particulate matter, [PM₁₀, PM_{2.5}], nitrogen oxides, sulphur dioxide and carbon monoxide) including dioxins and furans;

3. Baseline ambient noise levels throughout the year, differentiating between those associated with DDEC’s current activities at the Project site, including exploration activities, and background noise;
4. Climatic conditions, including but not limited to climate trends and extremes in temperature, precipitation, and wind patterns;
5. Current and historical data on surface water and groundwater quality for the Jay – Cardinal Project site, and downstream, including a reasonable neighbouring area of Lac de Gras. DDEC will include the overall range of natural variability of background conditions. DDEC will also include reference waterbodies in the analysis and a rationale for their selection. While describing baseline conditions for water quality, DDEC will include but not be limited to reporting on the following parameters:
 - a. metals (total and dissolved – full suite including mercury);
 - b. physicals (pH, conductivity, turbidity, hardness, alkalinity);
 - c. dissolved oxygen;
 - d. total suspended solids;
 - e. total dissolved solids;
 - f. major ions (chloride, calcium, sulphate, fluoride);
 - g. total inorganic and organic carbon;
 - h. nutrients (phosphorous – total, dissolved and orthophosphorus, ammonia, nitrate, nitrite, total kjeldahl nitrogen);
 - i. hydrocarbons; and,
 - j. any other parameter in the existing Ekati Water Licence.
6. Hydrology and hydrogeology, including surface water and groundwater amounts, directions of flow, likely surface points/discharge area (for groundwater), and maps and descriptions of associated watersheds, both in the local area of the Project site as well as downstream, including a reasonable neighbouring area of Lac de Gras. Discussion should focus in particular on:
 - a. water quantity, with sufficient data to capture spatial and temporal variation. To this end provide watershed boundaries, including groundwater and surface drainage patterns, and surrounding water bodies likely to experience changes to water quantity due to the Project,
 - b. seasonal and annual variation in groundwater and surface water quantity, including trends over time and extreme events (e.g., high flows),
 - c. the relative contribution of water from the Jay – Cardinal site to the volume of the surrounding watershed and the downstream environment,
 - d. surface water and groundwater flow regimes associated with the Jay – Cardinal Project site, and,
 - e. relationship between the groundwater regime and permafrost and active layer conditions, including a characterization of those conditions, and how permafrost and active layer changes influence hydrogeology.
7. Aquatic habitat and aquatic organisms in the environmental assessment study area. Include water bodies on the site, and surrounding water bodies likely to experience

changes to water quality due to the Project, including upstream and downstream to the extent of predicted impacts. Describe the following key aquatic species:

- a. fish bearing water bodies that the Project may affect, including upstream and downstream to the extent of potential impacts including a reasonable neighboring area of Lac de Gras;
 - b. seasonal and life cycle movements;
 - c. local and regional abundance and distribution;
 - d. key riparian habitat, particularly for any proposed areas for water intake or outfall;
 - e. known or suspected sensitive habitat areas for different development stages and times of year;
 - f. the food chain that supports the species, and that the species supports;
 - g. identification of key species that would serve as biological indicators for change before change reached higher trophic levels; and,
 - h. any known issues currently affecting fish and other aquatic life forms in the area;
8. Describe any, and all, connectivity – temporary or continuous – between the various water bodies at the Jay-Cardinal Project site;
 9. Wildlife (including resident and migratory bird species), wildlife habitat and movement/migration corridors. Special emphasis will be placed on key harvested species including caribou, grizzly bears and furbearers. Where available, the following information is required for each species:
 - a. population trends, including abundance, distribution and demographic structures for the local population(s) with the potential to be impacted,
 - b. habitat requirement, including identification of local areas of important habitat, attributes of the seasonal habitats that relate to how the species use them (e.g., travel routes, forage) and sensitive time periods,
 - c. current and historic movement and migration routes, patterns, and timing including typical patterns and the range of known variation for the entire range of the Bathurst caribou herd including within the vicinity of the Project and along the Tibbit to Contwoyto Winter Road,
 - d. factors known or suspected to be currently affecting the species in the environmental assessment study area (e.g., harvesting, disease),
 - e. known or suspected sensitivities to human activities, and,
 - f. gaps in current knowledge of the species such as the impacts of disturbance on behaviour or abundance;
 10. Wildlife at risk occurring in the environmental assessment study area. The developer will:
 - a. identify any species present or potentially present in the environmental assessment study area that are listed under Schedule 1 of the federal *Species at Risk Act (SARA)*, including but not limited to peregrine falcon, grizzly bear, and aquatic species,

- b. identify any species present or potentially present in the Project area assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and,
 - c. describe each species in terms of the requirements listed in item #9 above;
- 11. Vegetation and plant communities, including identification of any areas where rare plants are known or suspected to be present;
- 12. Terrain, surficial geology, structural geology, mineralogy, bedrock geology (type, depth, composition, and permeability), seismic activity records and risk factors, permafrost locations and types within the environmental assessment study area. In particular:
 - a. describe the structure, permeability, stability, and other relevant characteristics of the area,
 - b. describe the permafrost conditions at the site, including thermal conditions and ground ice/moisture contents of underlying material, particularly if maintenance of frozen conditions is required,
 - c. identify the geological and chemical composition of the ore body, the host rock and kimberlite pipes at the site including potential for acid rock drainage;
 - d. describe and map the ground composition underlying the proposed site including a bathymetry map of Lac du Sauvage and the areas to be flooded,
 - e. identify the location, amounts, and type of granular material deposits including information on ground ice,
 - f. describe existing fractures and faults at the Project site,
 - g. describe the ground conditions under and around the access road proposed, with emphasis on identifying areas susceptible to erosion, and permafrost instability, and,
 - h. include maps, cross-section and figures to illustrate geological features including eskers, where appropriate;
- 13. Physical and chemical makeup of:
 - a. soils, within a reasonable established radius around the site, and at reasonably established far-field points with the intention of establishing a baseline to track potential impacts from mine-related emissions,
 - b. shoreline characterization of Lac du Sauvage, Duchess Lake or other waterbodies impacted by the dewatering of Lac du Sauvage and other areas to be flooded or affected by flooding;
 - c. water body sediments in potentially affected water bodies (i.e., from direct or indirect [e.g., aerial] deposition including particle size analysis, total metals, dioxins and furans), including baseline concentrations; and,
 - d. Baseline mercury levels in sediments of the Paul Lake watershed including areas to be flooded from dyke construction and diversion-channelling, a receiving area of Lac de Gras downstream of the Paul Lake watershed, locations in Lac du Sauvage.

5.2 Human environment

1. Physical infrastructure present in the environmental assessment study area, including habitations, roads, buildings, quarries, power lines, and industrial works;
2. Available information pertaining to the Project area from land use planning in the region of potentially affected communities;
3. The availability and average training or skill levels of people in the region of potentially affected communities and other Aboriginal and Northern resident regional labour pool
4. Identify existing barriers to employment and identify initiatives for improvement;
5. The local and regional business capacity including specific identification of Aboriginal business capacity available to support the Project;
6. Current socio-economic conditions and relevant trends in the potentially-affected communities and in the region, of potentially affected communities as a whole, using appropriate indicators of well-being and quality of life;
7. Description of current community well-being including information about the capacity, availability, and affordability, where relevant, of local services and infrastructure (i.e., housing, training, education, day care services, health care, etc.).
8. A summary of historic and present land use in the study area, including identification of traditional land use groups, areas used, and traditional travel routes and timings. This summary will include a description of the current use of Lac du Sauvage for traditional, commercial, or recreational pursuits;
9. Traditional harvesting activities, including harvest restrictions, relevant species (wildlife, fish and plants), observed trends, and any traditional values expressed about harvested species;
10. Changes in the traditional way of life and household function due to employment at the mine;
11. Description of impact on cultural and traditional values, traditional lifestyles, in affected communities;
12. Known physical heritage resource locations, areas of high potential for undiscovered physical heritage resources and cultural values associated with the environmental assessment study area;
13. Other past and current economic activities in the environmental assessment study area as appropriate; and,
14. The number of full-time job equivalents and person years of work associated with the Jay-Cardinal Project, broken down by life cycle phase.

6 Development description

The Jay-Cardinal Project is an extension project to the existing Ekati Mine. DDEC will ensure that a description of all its planned facilities and activities is included in the *Developer's Assessment Report*, including any proposed new facilities or activities not listed in Section 3.1 of the *Terms of Reference*. Further, the developer will provide a description of all existing facilities that will be used as part of this project, specifically details of any modification required accommodating the Project or refurbishing required extending the life of the facilities. In this section, DDEC is only asked to provide details on the Jay-Cardinal Project itself, not to comment on potential impacts from the development. For the purpose of an efficient and effective environmental assessment, the Review Board requires the developer to present the project description in its final configuration in the *Developer's Assessment Report*, or to apply this *Terms of Reference* to all alternatives under consideration.

Overall, DDEC will describe the proposed Jay-Cardinal Project, providing details of all works and activities throughout construction, operation, closure and reclamation, and long-term monitoring phases, with a description of major activities by phase. This level of description is required for all project components that are considered part of the proposed extension, including:

6.1 New infrastructure, facilities, and management plans

1. The estimated lifespan of the Jay-Cardinal Project broken down into construction, operation, closure and reclamation, and long-term monitoring phases, with a description of major activities by phase;
2. The direct physical footprint of the Project, with locations and descriptions of all structures and all above-ground and underground infrastructure to be constructed;
3. A list of all regulatory permits, licences and other authorizations required to carry out the development and the status of such instruments as publicly available at the time of the DAR filing;
4. Land tenure and any existing or anticipated agreements related to access to facilitate the proposed development;
5. A list of any other required development that needs to be constructed in order for the Project to proceed;
6. All open pit mining facilities required including: ramps, portals, declines, infrastructure (and the locations), machinery requirements, and water management facilities and methods;
7. All underground mining facilities including: ramps, ventilation system, underground infrastructure, and surface support infrastructure;
8. The mining, crushing (if applicable), and kimberlite transportation methods used;
9. A description of the expected spatial volume of the mine;

10. Mine rock management areas including location, underlying ground conditions and volume of waste rock over the life of the mine including a schedule that conceptually shows annual waste rock production by waste type, or other means of ensuring the availability of clean granite when needed;
11. The proposed new site access roads, including construction (width of right-of-way, road bed type and any specific features to facilitate wildlife movements) and maintenance schedule, required construction material, techniques to minimize erosion and bank instability and the expected number of trips on the road (including number and types of vehicles), water crossings, as well as the type and weight of loads, any related storage, transfer and handling, etc.;
12. Estimated processed kimberlite volumes over the life-of-Project, as well as supernatant volume with locations and conceptual schedules for its management and disposal;
13. A description of the proposed mine water management facilities, including storage capacity, operational life, distance to groundwater table, rock types, presence of faults, and any containment dams or dikes;
14. The total amount of water in cubic meters estimated to be collected from all water sources and eventually released into local watercourses, with consideration of changes during the life of the Jay-Cardinal Project and the range of seasonal fluctuations;
15. A description of the construction material required for the entire life-of-Project and the expected source(s) and ultimate removal or disposal plans of same;
16. A comprehensive water balance for the site, include a reference to total and available volumes of water sources, and description of the time of year the water will be withdrawn, pipelines, pumping stations and potential contingency measures such as water treatment;
17. The types and estimated amounts of explosives to be used, their storage, handling and application;
18. The location, contents, and estimated amounts of mined material, soil, and overburden at all surface storage facilities, along with estimated storage requirements, storage capacity limits, separation of material, and maintenance of materials to facilitate reclamation;
19. Location(s) of proposed activities of aggregate production and storage, with an estimate of the amount of aggregate that will be produced per year over the life of the mine, by location;
20. Energy requirements and generation sources including any transmission lines and substations;
21. Fuel storage facilities including a justification for the fuel storage container type selected, on-site fuel transport and handling procedures;
22. All other infrastructure and activities, including intensity and type of on-site vehicle traffic required;
23. The number of full-time job equivalents and person years of work associated with the Jay-Cardinal Project, broken down by life cycle phase; and,
24. Contracting and procurement information including, if known, a breakdown of the number and types of jobs that will be done by contractors.

6.2 Existing infrastructure, facilities, and management plans

For previously assessed, existing, and approved facilities that are to be used as part of the Project, DDEC will provide:

- a full description of the project component;
- how it will be used in the context of the proposed Project;
- capacity of existing facilities to handle the proposed Project; and,
- any changes to the existing infrastructure or facilities that will occur as a result of the proposed development.

Description of existing infrastructure and facilities will include:

1. Operation of the airstrip, frequency of use, type of aircraft, and estimated number of passengers and volume of material;
2. Operation of the kimberlite processing plant, including any required modifications or refurbishing to accommodate the Project;
3. A description of the relevant processed kimberlite management facilities;
4. A description of the relevant mine water management existing facilities;
5. Water intake locations, withdrawal methods, and estimated amounts of water required for all water sources for all on-site activities;
6. A description of waste disposal facilities (including landfills, land farms, oil treatment facilities, incineration facilities, other temporary waste management facilities) and management of all waste generated including storage and disposal plans;
7. A description of the type, volume, storage (location and method), handling, transport and disposal of all waste, as well as fuel, reagents and hazardous materials used on-site;
8. The storage location of processing reagents, including maximum volumes and concentrations to be stored on-site;
9. The water collection, management, and treatment systems and all their component parts and reagents, including drainage and other control structures, water and sewage treatment facilities, water storage facilities, and water transport components;
10. Worker transportation, especially those who live in communities without direct air transportation from their community and proposed work scheduling;
11. Workforce requirements to accommodate the Project; and
12. Information on the management and operations of the existing Tibbit to Contwoyto Winter Road and how operations may change in providing support to the development of the Jay-Cardinal Project.

6.3 Development phases and schedule

The development description will also contain an overall schedule for the Project, describe the following in relation to development phases, and schedule:

- schedule for construction, operations, closure and long-term monitoring phases of the Project for both open pit and underground mining; and
- schedule for post-closure phase including estimated timeline for complete re-watering of Lac du Sauvage, reconnection with the surrounding watersheds and establishment of a healthy and self-sustaining aquatic ecosystem.

7 Assessment of environmental impacts and cumulative effects

The developer will be responsible for the identification and assessment of the project-specific effects of the development on the biophysical and human environment and for the assessment of cumulative effects resulting from the development in combination with past, present and reasonably foreseeable developments and activities.

7.1 Effects assessment

For each valued component described in this section, the following topics will be addressed, consistent with the methodology identified in Section 4 of these *Terms of Reference*.

- Identification of potential environmental effects:
The potential interactions of the development with the valued component and resulting potential environmental effects to the valued component will be identified. The developer will use science and traditional knowledge to present quantitative or qualitative parameters to measure potential environmental and cumulative effects on the valued component. The spatial and temporal boundaries for the assessment of effects on the valued component will be presented and justified.
- Mitigations and residual effects:
The developer will describe all mitigations that will be put into effect during project design, construction or operation to mitigate potential environmental effects. The developer will assess potential effects on the valued component after implementation of mitigations. Residual effects will be clearly identified and characterized based on methodology presented in DAR.
- Assessment of cumulative effects:
For each residual effect resulting from the development, the developer will assess the potential for cumulative effects resulting from a combination of effects of the development with effects from other past, present and reasonably foreseeable human activities and developments. The way in which a cumulative effect may occur and its potential spatial and temporal scope will be discussed. Residual cumulative effects will be identified. The developer will estimate the significance of residual project and cumulative environmental effects and identify mitigations that already exist or would be required for cumulative effects beyond those for project specific effects.

7.2 Cumulative effects

Pursuant to paragraph 117(2) (a) of the *MVRMA*, the Review Board considers cumulative effects in its determination. Cumulative effects are the combined effects of the development in combination with other past, present, or reasonably foreseeable future developments and human activities. The Jay-Cardinal Project site would sit in an area that has been impacted by past development. In addressing cumulative effects, the developer is encouraged to refer to the Review Board's *Environmental Impact Assessment Guidelines*.

Cumulative effects will be considered separately in each key line of inquiry and subject of note. Topics identified as a key line of inquiry will require greater detail in the cumulative effects analysis than topics identified as subjects of note. Cumulative effects will be considered for the following:

- water quantity and quality including any impacts on Lac de Gras;
- fish and fish habitat;
- caribou;
- air quality;
- grizzly bear, wolverine and species at risk
- impacts to the landscape;
- wildlife and wildlife habitat;
- terrain;
- cultural aspects; and
- employment and business opportunities.

The developer will conduct a scenario analysis of relative and potentially important projects in its cumulative effects assessment using both quantitative and qualitative methods. This will include potential access to projects using the entire Tibbit to Contwoyto Winter Road including projects to the north of the Ekati mine site.

Consideration should also be given to identifying means for DDEC, either on its own or cooperatively with others, to reduce or avoid any predicted cumulative effects. Current efforts towards cumulative effects assessment and management should be described, including DDEC's efforts to coordinate its monitoring and management to contribute towards a regional approach. Lessons learned from previous or current relevant cumulative effects initiatives should be discussed.

7.3 Key lines of inquiry

Key lines of inquiry are areas of concern that have been identified as requiring the most attention during the environmental impact assessment and the most rigorous analysis and detail in the *Developer's Assessment Report*. Key lines of inquiry are identified to ensure a comprehensive, detailed analysis of the issues that were identified as bringing about potential significant public concern regarding the proposed development. The developer

will provide a standalone assessment to facilitate public evaluation for all identified key lines of inquiry. Assessment work will encompass project-specific effects, potential additive effects considering potential accidents and malfunctions, and total estimated cumulative effects.

Four key lines of inquiry pertaining to the biophysical environment were identified for the Jay-Cardinal Project:

1. Impacts to water quality and quantity;
2. Impacts to fish and fish habitat;
3. Impacts to caribou; and
4. Analysis of alternative means.

7.3.1 Impacts to water quality and water quantity from project components

7.3.1.1 Impacts to water quality from project components

For the locally impacted watershed(s) and downstream water bodies, the extent of potential project impacts including cumulative effects in combination with the existing Ekati mine site and Daivik mine DDEC will provide a comparison of predicted contaminant levels during all project phases to pre-development or baseline conditions and describe the impacts to water quality.

In predicting impacts to water quality from the Jay-Cardinal Project, the developer will:

1. Identify and describe estimated amounts of contaminants from all potential sources at the Project site. Predict the likelihood and consequences of how each of the following, alone or in combination to leach metals, create acid rock drainage, or otherwise affect water quality:
 - construction activities including lake drawdown and water diversions;
 - mine operations including open pit and underground mining water sources;
 - waste rock management area runoff;
 - aggregate management area runoff;
 - operational water diversions and water management activities including rewatering;
 - pumping from the North Arm management facility;
 - discharge from any other sources including mercury leaching from soil or rock during flooding or re-watering activities; and,
 - estimated contaminants from Lac du Sauvage sources and contaminants from the Ekati mine site in combination with Diavik sources in Lac de Gras.
2. Predict the water quality of final effluent discharge to the environment during all phases of the project lifecycle, incorporating:

- mine water release to the environment from the North Arm management facility; or other discharge points from Lac du Sauvage;
 - release of effluent from the Ekati mine site;
 - dissolved oxygen levels from decomposition of newly submerged vegetation in aquatic environments flooded during construction and during re-watering at closure;
 - water quality during rewatering of Lac du Sauvage; and,
 - predict changes over time in the quality of mine water outflows.
3. Assess potential impacts of effluent discharge from the North Arm settling pond into Paul Lake in combination with other any other discharge sources
- the predicted long-term effect(s) with a description of any mitigation or treatment used in predicting those effects; and,
 - the management of rewatering any areas that were temporarily drained for mining operations including the management of vegetation.
4. Describe water quality management at Lac du Sauvage including:
- operational water diversions and water management activities including rewatering;
 - any changes to ice thickness or freeze-up timing;
 - contingency pumping or water diversion activities; and,
 - water storage facilities including estimated volume and quality of water remaining in undrained basins of Lac du Sauvage during mine operations;
5. Describe and predict the cumulative impacts to water quality and quantity as follows:
- estimated contaminants from Lac du Sauvage sources and contaminants from the Ekati mine site in combination with Diavik sources in Lac de Gras;
 - predict changes over time in water quality at Lac de Gras in combination with Project effluent, effluent from the Ekati mine site and effluent from the Diavik mine; and
 - cumulative effects to water quality including effects to Lac de Gras.
6. Saline connate groundwater has been encountered beneath kimberlite deposits in the Northwest Territories. Describe volumes and locations of known saline connate groundwater and discuss the potential for impacts from the saline connate groundwater including
- an analysis of expected inflow volumes;
 - the baseline groundwater quality; and,
 - the potential impacts related to saline groundwater management during all phases of the Project.

7. Describe and evaluate contingent water treatment alternatives that may be required prior to discharge of effluent into the environment during all project phases with an analysis of:
 - use of the North Arm settling pond;
 - use of undrained ponds within the de-watered area of Lac du Sauvage during operations;
 - mechanical water treatment options; and,
 - other water treatment options.

7.3.1.2 Impacts to water quantity from project components

For the locally impacted watershed, upstream and downstream water bodies (the extent of potential impacts and including Lac de Gras) DDEC will provide a comparison of predicted water quantities to baseline conditions and describe the impacts to surface water and groundwater both in isolation and collectively. DDEC will describe and evaluate:

- a conceptual dewatering plan for Lac du Sauvage;
- the diversion of water around the dewatered portion of Lac du Sauvage;
- raising of water levels and changes in flow rates in Duchess Lake and other water bodies and streams particularly with respect to impacts on archaeological and heritage resources, caribou movement and shoreline changes;
- the management of drawdown water from Lac du Sauvage;
- the management of mine water from the open pits;
- management of water and use of North Arm settling pond and other storage ponds in the control area of Lac du Sauvage;
- changing amount of flow through outlet channel of Lac du Sauvage during construction, operations, closure and post-closure phases;
- the water balance during all Project phases including baseline, construction, dewatering, operations, closure, rewatering and post-closure;
- closure hydrology issues associated with water sources used during rewatering of Lac du Sauvage;
- sequencing and timeline for rewatering of open pits and rewatering of Lac du Sauvage during closure and post-closure phases prior to re-connection of lake with surrounding watershed;
- the predicted long-term effect(s); and
- cumulative effects to water quantity during all project phases from the project in combination with the existing Ekati mine and the Diavik mine site including effects to Lac de Gras.

7.3.2 Impacts to fish and fish habitat from project components

For the following analysis, the developer will include at minimum Lac du Sauvage, Paul Lake, Duchess Lake, and all other reasonably relevant water bodies in the vicinity of the site (to the extent of predicted effects and a reasonable neighboring area of Lac de Gras). Effects/impacts to habitat are changes up to and including loss of habitat during all phases of the project. The developer will also consider the potential for fish to migrate into or out of these water bodies.

The developer will describe (incorporating seasonal variation and the sensitivities of specific life cycle stages) the impacts to fish, aquatic life, species-at-risk, and respective habitats from project-related changes to:

- water quantity (water discharge, water diversion, and winter withdrawal from surface water bodies) and water quality (including but not limited to, suspended solids, dissolved oxygen content, pH, and the concentrations of metals, ammonia, and nutrients);
- the introduction of contaminants to aquatic food chains from water released from the site;
- direct disturbance of riparian areas and other aquatic habitats including a map that shows water level changes and changes in riparian areas;
- changes to flow volumes, velocities, or patterns and subsequent indirect alterations to banks, shores, and riparian areas;
- changes to water levels that may impact access to preferred fish spawning areas and any resulting effects on reproductive success; and
- re-establishment of the aquatic ecosystem in Lac du Sauvage after mine operations are complete and water quality in the re-filled lake is acceptable for re-connection to upstream and downstream watersheds.

In addition, the developer will prepare the following:

- a conceptual fish off-setting plan in consultation with potentially affected communities and Fisheries and Oceans Canada;
- a conceptual fish-out plan in consultation with potentially affected communities and Fisheries and Oceans Canada; and
- a cumulative effects assessment on impacts to fish, fish habitat and aquatic life in the Lac du Sauvage watershed combined with impacts from the existing Ekati mine and the Diavik mine at Lac de Gras.

7.3.3 Impacts to caribou from project components

All required assessment information, should be provided in the context of baseline conditions and for all relevant life stages. Further, the predicted project-related long-term effect(s) to potentially impacted populations(s) should be discussed. DDEC will describe the impacts to caribou herds that interact with the Project from the following Project sources, both in isolation and collectively:

- for the locally impacted caribou population(s) DDEC will identify potential sources for increased caribou mortality, including any potential change to the predator-prey relationship of any potentially affected population.
- DDEC will describe the historic movement and migration patterns and the potential for disruption of caribou movements and migration patterns through the proposed Project area and determine possible effects on this species including how this might affect the energy and protein balance of caribou moving through the region, affect access to preferred habitats and affect caribou exposure to predators.
- DDEC will describe the direct physical loss of available habitat because of proposed project activities. Further, DDEC will conduct an additive assessment of the indirect disturbance effects to available habitat through lowered habitat suitability due to the following:
 - fugitive dust and air emissions;
 - site water release, water management, dewatering, flooding and diversion;
 - noise pollution;
 - light pollution;
 - viewscape;
 - vehicle traffic on the site access roads and Misery Road, and
 - the power line along the Misery Road.
- DDEC will provide an estimate of the existing habitat fragmentation at the regional and local scale, the expected increase, and its possible effects on this species.
- DDEC will conduct an analysis of the ways the Project may influence the energy and protein balance of caribou under different seasonal conditions, and to what extent this may affect population demographics. The analysis will include potential behavioural changes resulting from Project components or associated activities, including sensory disturbance, foraging impacts, rest and caribou movements in the development area and region.
- DDEC will describe impacts to caribou from continued operation of the Tibbit to Contwoyto Winter Road due to the Project and continued opportunities for harvesting of caribou.
- DDEC will describe and assess the success to date of all caribou effects mitigation methods used in relation to past and present Ekati mine operations.
- DDEC will describe the expected substrate of the dewatered lakebed and how it might change over time, analyze possible hazards or impacts to caribou crossing the dewatered lakebed and describe any mitigations for eliminating or reducing risk.

- DDEC will identify possible pathways for caribou exposure to contaminants, assess exposure risk, and provide discussion of any potential population health effects.
- DDEC will describe cumulative impacts to caribou including reasonably foreseeable projects and impacts from operation of the Tibbit to Contwoyto Winter Road to access reasonably foreseeable projects from the existing Ekati mine.
- The cumulative effects approach for caribou will include an energetics component, habitat component and population component consistent with the current state of cumulative effects assessment of barren-ground caribou.

7.3.4 Analysis of alternative means

The *MVRMA* requires the Review Board to consider the potential impacts from alternatives to a proposed development. Accordingly, the developer will present the most probable alternatives to the proposed development description and potential impacts stemming from their potential adoption, and suggested mitigation.

The DAR will include an analysis of alternative means of carrying out the Project which takes into account the multiple accounts analysis⁴ method as described by Robertson and Shaw (2004) and will also consider alternative analysis reports which have been recently conducted to support project applications for the Gahcho Kué Project (De Beers 2012) and the Meliadine Gold Project (AEM 2013). The consideration of alternatives (ie. the multiple accounts analysis) should include technical feasibility, economic viability (e.g. capital and operating costs and scheduling), social economic considerations (e.g. anticipated employment and other socio-economic benefits), and the environmental considerations of each alternative.

The alternatives analysis will be consistent, transparent and robust. The DAR should provide a rationale and justification for the developer's preferred alternative that considers trade-offs and analysis required above.

The developer will describe the alternative methods for carrying out the components of the development including:

- a description of the alternative methods considered, how or why they are not technically and/or economically feasible, and the rationale for rejecting any alternatives that are excluded from further assessment.
- the criteria and rationale for selecting the preferred alternative methods.
- maps depicting the various alternatives with their comparative changes to the landscape.

The multiple accounts analysis will be conducted for the mining method, for example:

- Diavik-style ring dyke construction to access the open pits with an access causeway to shoreline without drawdown of Lac du Sauvage.

⁴ For guidance see, http://technology.infomine.com/enviromine/issues//cls_maa.html

- alternative drawdown, diversion and pumping scenarios.
- underground mining methods.

Once the overall mining method is identified, the alternative means for the following mine components will be considered:

- alternative waste rock storage areas and pit backfilling options.
- alternative energy sources and conservation methods.
- alternative road alignments to minimize caribou disturbance and barriers to movements.

The developer will indicate how community engagement and traditional knowledge have influenced the determination of the selected alternative described in its DAR.

7.4 Subjects of note

Subjects of note require a thorough analysis including a cumulative effects assessment, but do not require the same level of detail. The following subjects of note are based on concerns expressed by the various interest parties and the general public during the issues scoping meetings.

Four subjects of note were identified for the Jay-Cardinal Project.

7.4.1 Impacts to air quality from project components

The developer is encouraged to pursue dialogue with Environment Canada and the Government of the Northwest Territories about appropriate methods for modeling air quality and analysis to ensure compatibility between these programs and the assessment. For the locally impacted airshed DDEC will provide a comparison of predicted contaminant levels to baseline conditions and relevant air quality guidelines and describe the impact to air quality from the following sources (defining both dispersion and deposition areas), both in isolation and collectively:

- the exposed lakebed fugitive dust emissions;
- the waste rock management area fugitive dust emissions;
- the aggregate management area fugitive dust emissions;
- the emissions from construction and operations activities, including blasting;
- equipment and traffic air emissions and fugitive dust emissions;
- accidents and malfunctions;
- the predicted long-term effect(s) to air quality; and,

- cumulative effects assessment of air emissions and accumulation of those emissions in the environment from the project in combination with impacts from existing Ekati mine and the Diavik mine.

The developer will quantify emissions (incinerator, heavy equipment etc.) and the accumulation of those emissions in the environment (dioxins, furans, metals etc.), and demonstrate the manner in which the developer will show compliance with national standards and minimize these emissions and their impacts to the environment.

7.4.2 Impacts to vegetation from project components

For the locally impacted landscape, DDEC will describe physical disturbance from project activities to vegetation and terrestrial habitat broken down into habitat types to a reasonable and relevant level.

The developer will:

- describe vegetation and terrestrial habitat disturbance, including total amount of land to be disturbed, losses of vegetation, and description of the soil to be removed, conserved, or stored;
- describe impacts on any rare plants and plants of cultural or economic importance;
- describe potential impacts of air emissions on vegetation around the project site; and,
- cumulative effects assessment to vegetation from the Project in combination with disturbances from, but not limited to, the existing Ekati mine and the Diavik mine.

7.4.3 Impacts to wildlife and wildlife habitat from project components

In addition to the standalone assessment to be provided for potential impacts to caribou from project components (7.3.3), an assessment encompassing all other wildlife-valued components is required.

For the following analysis, the developer will include at minimum the footprint of the project and a reasonable neighboring area to capture the extent of the predicted effects. Effects/impacts to habitat are changes up to and including loss of habitat during all phases of the project. The developer will also consider the potential for wildlife migration through the area.

The developer will describe (incorporating seasonal variation and the sensitivities of specific life cycle stages) the impacts to all wildlife value components, species-at-risk, and respective habitats from project-related changes to:

- habitat degradation and fragmentation;
- direct and indirect sources of mortality (e.g., vehicle-wildlife collisions, human interactions);
- increased attraction to the project;

- potential for sensory disturbance (e.g. noise, light, viewscape) to reduce habitat suitability;
- potential for disruption of animal movements and migration patterns, population cycles, home ranges, distribution and abundance;
- potential for disruption to predator-prey relationships;
- potential for bioaccumulation of contaminants from all sources within the food chain (including, vegetation quality, water quality, sediment quality, waterfowl quality, etc., as relevant); and,
- the dewatered lakebed including potential hazards or implications from wildlife crossing the dewatered lakebed and any mitigations for eliminating or reducing such risk.

DDEC will conduct a cumulative effects assessment on wolverine, grizzly bears and species at risk in combination with impacts from past, present and reasonably foreseeable projects.

7.4.4 Impacts to terrain from project components

When assessing the impacts and risk related to terrain, the developer will:

- describe the existing geotechnical stability of the area proposed for the mine rock management areas including:
 - soil and hydrological conditions;
 - permafrost, ground thermal conditions, and ground ice conditions;
 - description of the physical and chemical characteristics of mine rock and tailings; and,
 - topography and slope stability.

Describe how the geotechnical stability of all engineered structures, including site access roads will be ensured against a range of climate, seismic, and precipitation scenarios.

Identify any plans to mitigate and monitor against impacts on terrain, including

- erosion control measures;
- prevention of permafrost degradation or growth encouragement; and,
- how the geotechnical stability of the mine rock management area, and the system of dikes and dams will be monitored, and for what extent of time.

7.5 Biophysical environmental monitoring programs and management plans

Monitoring is an action that the developer can take in order to recognize a potentially significant adverse impact as it develops. From there, monitoring information can direct preventive measure to ensure that adverse impacts do not develop any further. In line with its duties to prevent significant adverse impacts on the environment, as well as in the spirit of integrated resource management in the Mackenzie Valley, the Review Board will analyze

the adequacy of monitoring programs towards the end of detecting and preventing potential significant adverse impacts from developing.

As part of the environmental assessment, DDEC will demonstrate that the monitoring and management plans have representative near-field and far-field baseline information, consider the natural range of variability, and will detect and mitigate any relevant changes – expected or unexpected – before they become significant adverse impacts.

Extensive monitoring programs are established for the Ekati Mine that should be used as the basis for monitoring of new project components. A response framework is required under the Ekati Mine Water Licence and should be used as the basis for new project components. Further, the developer will describe the framework for proposed monitoring programs and management plans or amendments to existing plans that will guide their evaluation of and adaptive management for impacts to water quality. Specifying:

- which phase of the development the plan is for;
- the framework for surface water and ground water monitoring;
- which parameters the plan monitors for changes in, and how this related to detection of a significant adverse impact to water quality;
- how monitoring data will be used to determine if action is required such as definition of any methodologies used, critical values, and threshold conditions;
- how the proposed mitigation fits into adaptive management plans, including how project management will be adapted if necessary to prevent significant adverse impacts, including but not limited to:
 - unexpected deviations from environmental assessment predictions for any substance of concern,
 - contingency plans in case metals leaching or acid rock drainage occurs, and,
 - contingency plans for unacceptable treated-water quality.

For each monitoring plan or program, the developer is required to describe a method of differentiating the Ekati vs. Diavik contributions to water quality and quantity changes or changes in aquatic life in Lac de Gras.

For all other physical and biological valued components⁵, describe the framework for proposed monitoring programs and management plans or amendments to existing programs and plans that will guide DDEC’s evaluation of and adaptive management for impacts to valued components. Specify:

- which phase of the development the plan is for;
- what parameters (measurement endpoints) the plan monitors for changes and how this is related to detection of a significant adverse impact to a valued component;
- how monitoring data will be used to determine if action is required such as definition of any methodologies used, critical valued, and threshold conditions;

⁵ Due to complexity of cultural and socio-economic impact assessment, the line items for human environment monitoring and management will appear in the human environment section.

- how DDEC's proposed mitigation fits into adaptive management plans, including how project management will be adapted if necessary to prevent significant adverse impacts, including but not limited to:
 - unexpected deviation from environmental assessment predictions for any substance of concern that may impact the valued component, and,
 - provide a summary table listing all biophysical environmental monitoring and management systems, where they are described in the *Developer's Assessment Report*, the length of time the monitoring is proposed for, and rationale for each timeline; and,
- the framework for any new plans or amendments to existing plans related to overall incineration and waste management Plan(s), including commitments for management of solid, liquid, hazardous, and airborne wastes, and associated monitoring programs; and,
- a framework for new plans, or for amendments to existing wildlife related plans, which specifically details the proposed changes to current plans and any revisions that might be required to make such plans consistent with draft guidelines.

See Appendix B for additional information on monitoring and management plans.

8 Impacts on the human environment

The *MVRMA* lists social impacts, cultural impacts, impacts on heritage resources, and impacts on wildlife harvesting in the definition of impacts on the environment. In addition, the Guiding Principles of Part 5 of the *MVRMA* requires the consideration of the social, economic, and cultural well-being of residents and communities of the Mackenzie Valley during every environmental assessment. The Review Board's *Socio-economic Assessment Guidelines* provide a context for assessing impacts on the human environment.

The developer is encouraged to work with potentially affected communities and responsible government authorities to identify valued components of the human environment, appropriate indicators and sources of information to measure change, pathways by which change may likely occur, and mitigation and monitoring strategies that may be required to maximize benefits and minimize adverse impacts. Mitigation may not be entirely the responsibility of the developer, as governments and communities have social, economic, and cultural protection mandates. However, it is primarily the responsibility of the proponent of the project to initially document these issues in its *Developer's Assessment Report* and where the Project would contribute to an existing impact or create a new one, to identify appropriate mitigation and monitoring mechanisms.

8.1 Key lines of inquiry

Based on information from the technical scoping meeting and community scoping meetings, one key line of inquiry was identified pertaining to the human environment. Operating staff at the Ekati Mine will have the opportunity for long-term extended employment; direct business spending will be extended through the Jay-Cardinal Project; and established funding, training, preferential hiring, business opportunities, and communication requirements will continue. However, it is likely that no additional personnel will be needed and no new business or contract opportunities will be created.

8.1.1 Maximizing benefits and minimizing impacts to communities

In its analysis of maximizing benefits to communities during the various phases of the planned mine life the developer will:

- list and provide non-confidential details on all current or proposed socio-economic initiatives or agreements;

- describe barriers to direct or contractor employment, advancement and retention of aboriginal and Mackenzie Valley residents and transportation of employees from communities and identify methods to address these barriers;
- describe the developer’s existing, including any anticipated modification of, plans, strategies, and commitments for maximizing direct or contractor employment, advancement and retention of residents from potentially-affected communities, and other Aboriginal and Northwest Territories residents;
- describe the developer’s future commitments for any training, apprenticeships education, or other improvements necessary to maximize local and regional employment and business capacity to benefit from the project; and
- describe the effectiveness of past or present socio-economic benefit initiatives including levels of success in improving recruitment, retention and advancement of workers from potentially affected communities.

The Jay-Cardinal Project is anticipated to provide an additional 10 to 20 years of mine life to the Ekati mining operation. DDEC will describe the following:

- workforce resource requirements;
- contracting and business resource requirements; and,
- anticipated revenue generation, specific to the Northwest Territories.

The developer will assess the potential impacts of the Jay–Cardinal Project on the economy of the Mackenzie Valley during the various phases of the planned mine life including trends over time.

In assessing access to employment and business opportunities, the developer will provide the following:

- a description of employment and associated training opportunities by phase and category. The developer should present this information in the context of existing conditions;
- an assessment of the likely percentage of direct employment for Northwest Territories Aboriginal residents and other NWT residents at the project for the extent of the mine life and for each phase;
- discussion of the potential for longer term community capacity building, if any have been planned and are to be implemented throughout the Project’s lifetime, regarding how mine training plans can enhance the transferability of skills after the mine closure (i.e., management and human resource skills, computers skills, heavy equipment skills).
- an estimate of contractor and subcontractor goods and services that the project will require, by project phase, as well and an estimate of what percentage of required goods and services can feasibly be sourced by local and regional businesses as well as Aboriginal-owned business ventures ; and,
- the developer’s existing policies, plans, and commitments associated with maximizing contracting to Aboriginal and Northwest Territories owned and operated businesses, with emphasis on assisting business development initiatives and joint ventures.

In assessing potential social impacts that may be associated with the Project the developer will:

- describe potential social impacts of the Project;
- describe ways in which the developer will collaborate with communities in identifying and addressing social and community wellness issues related to the Project;
- discuss current and proposed initiatives to address potential social impacts; and,
- provide a plan for ongoing collaboration with communities throughout the life of the Project to develop and implement monitoring and mitigation to minimize social impacts.

8.2 Subject of note

One subject of note pertaining to the human environment was identified for the Jay-Cardinal Project. The developer will describe and evaluate impacts to cultural aspects from project components in this subject of note.

8.2.1 Impacts to cultural aspects from project components

The analysis of heritage resources is inclusive and cultural impacts include both tangible and intangible aspects of culture including traditional land use and occupancy by members of potentially affected communities. When assessing the impacts and risk related to cultural aspects, the developer will:

- describe engagement with traditional knowledge holders, archaeologists, anthropologists, and the Prince of Wales Northern Heritage Centre and how such interactions influenced:
 - heritage resource surveys locations;
 - heritage resource management plans; and
 - programs related to community capacity and sustainability.
- identify all known archaeological and heritage resources, sites or areas of cultural significance;
- describe all recommended mitigation measures for the protection of local known and high potential areas of physical heritage resources and associated developer's commitments;
- describe any potential impacts from the Jay-Cardinal Project on physical heritage within the geographical scope of the development from dewatering, flooding, road and diversion construction and other construction and operations activities.
- describe any potential impacts of the project on traditional harvesting activities for Aboriginal residents of potentially-affected communities, including changes from

impacts to wildlife, changes in all-season access, and any changes in access by non-resident hunters;

- provide a prediction of the total impact of the project on traditional activities, and on the potential for increased or reduced harvesting success including post-mining perceptions of the area for traditional activities and harvesting;
- describe any change in the environment which may in turn impact navigation on navigable waterways; and,
- describe any potential sensory impacts (e.g. noise, light, viewscape), any measures taken to minimize disturbance, and how any remaining sensory changes will affect the traditional users' experience within the potentially affected land use areas.

8.3 Human environment monitoring and management plans

The developer will describe any commitments, plans, and strategies to engage with responsible authorities and potentially affected communities in continuing and improving monitoring impacts on the human environment. These monitoring and management plans include:

- local and regional residents and Aboriginal people in gaining employment at the Jay-Cardinal Project;
- training initiatives;
- employee recruitment;
- employee retention;
- worker and family wellness
- minimizing social impacts; and,
- impacts on wildlife harvesting and practice of traditional culture on the land.

9 Assessing the impacts of the environment on the development

The developer will consider the effects of the environment on the Project. The developer will describe potential impacts of the physical environment on the development including the use of the Tibbit to Contwoyto Winter Road such as:

- changes in the permafrost regime;
- climate change impacts;
- seasonal flooding and melt patterns;
- seismic events; and,
- extreme precipitation.

Any changes to the design or management of the Jay-Cardinal Project as a result of considering potential impacts to the environment should be noted in the relevant sections.

10 Cumulative effects summary

Cumulative effects are considered in the key lines of inquiry and subjects of note as described above in Sections 7 and 8. In this section, DDEC will provide a combined summary of its discussion on its assessment of cumulative effects from the relevant sections.

This summary will include a discussion identifying the committed means for DDEC, either on its own or cooperatively with others, to reduce or avoid any predicted cumulative effects.

11 Accidents and malfunctions

For this section, the developer will first discuss impacts in relation to all Key Lines of Inquiry from an accident or malfunctions as though it has happened, then discuss the associated probability of the event. The assessment would then be carried forward to describe the potential impacts to all relevant valued components. The developer will:

- conduct a risk assessment using best practices for the Project including components, systems, hazards and failure modes;
- assess likelihood and severity of each risk identified;
- provide rationale for criteria used for decisions on the various risks related to malfunctions/accidents during all project phases from construction through post-closure;
- describe contingency plans for accidents, malfunctions or unforeseen impacts of the environment on the development;

- describe water containment features, dykes, pumping systems and detections systems used for early warning of spills;
- describe all accident and emergency response plans that will be in place during the construction phase and operations phase, including materials transport, along with emergency communications plans; and,
- describe the likelihood that invasive species will be introduced, by what means, the potential impacts, and any mitigation practices to be implemented to reduce the likelihood.

12 Closure and reclamation

DDEC will present its framework for the conceptual closure and reclamation plan for any aspects of the Jay-Cardinal Project that are not currently provided for in the Interim Reclamation and Closure Plan in the *Developer's Assessment Report*. The developer will be guided by existing guidance, such as Mackenzie Valley Land and Water Board – Aboriginal Affairs and Northern Development Canada's Guidelines for the Reclamation of Advanced Mineral Exploration and Mine Sites in the NWT when developing its reclamation plan for the Jay-Cardinal Project (http://mvlwb.com/sites/default/files/documents/wg/WLWB_5363_Guidelines_Closure_Reclamation_WR.pdf).

In the *Developer's Assessment Report*, the developer will:

- discuss the existing Interim Reclamation and Closure Plan as it related to any existing facilities that will be used as a part of the Jay-Cardinal Project;
- illustrate how project components will be encompassed within the Interim Reclamation and Closure Plan;
- provide a framework for DDEC's Closure and Reclamation Plan, in respect to any "new" facilities or activities to the Ekati mine operation, which will include:
 - identification of the overall reclamation objectives, standards, and criteria the Closure and Reclamation Plan is designed to achieve and over what time period, and,
 - a conceptual program and schedule for any progressive reclamation envisioned;
- identify and describe any unique, novel or experimental aspects of the development that are distinct from the rest of the Ekati project components or conventional industry experience with respect to reclamation, and discuss any uncertainties posed and how these will be resolved in the closure planning process;
- in the Conceptual Closure and Reclamation Plan, discuss management and monitoring programs for any materials/locations that may cause acid rock drainage or metal leaching;
- discuss the long-term physical integrity of any permanent features;
- discuss monitoring coverage required to track for any reasonably foreseeable post-closure contamination pathways;

- describe how closure and reclamation activities and monitoring will ensure long-term suitability of all fish-bearing waters potentially affected by the Project in terms of fish and fish habitat;
- describe the predicted timing of the return of Lac du Sauvage to a healthy and self-sustaining aquatic ecosystem and the expected processes that will occur related to the re-establishment of the aquatic ecosystem;
- describe how reclamation will provide for safe wildlife use of and movement through the reclaimed area;
- provide conceptual images showing what the area will look like after active mining and after the various stages of reclamation 10, 25 and 50 years later; and,
- identify how potentially-affected communities were engaged in determining end land use and water objectives for reclamation.

13 Conclusion

The Review Board anticipates that the requirements described in this document will result in a *Developer's Assessment Report* that clearly describes DDEC's predictions of impacts from the Jay-Cardinal Project and the likely effectiveness of proposed mitigation and management plans that are demonstrably viable both economically and technically while providing sufficient detailed information and analysis for the Review Board and parties to analyze and evaluate the environmental acceptability of the proposed development.

Appendix A: Scope of development

Construction	Construction of dikes and a water diversions structures to divert water from main body of Lac du Sauvage
	Construction of site access roads (spur roads from Misery Haul Road to project components at Lac du Sauvage)
	Production of borrow sources/ aggregate quarries to obtain construction material for the roads, dikes, and water diversion
	Power line to supply site with electricity
	Construction of water management facilities to accommodate drawdown volumes and mine water
	Diversion and drawdown of water from the isolated portion of Lac du Sauvage and fish-out of this area of the lake
	Construction of two open pits and associated support infrastructure
	Construction of underground mining and associated infrastructure
Mining Operations	Establishment of two waste rock storage areas
	Removal of waste rock, kimberlite, and mine water from the open pits, including the use of explosives
	Underground mine operations
	Storage and handling of waste rock
	Management of mine water,
	Surface water management
	Use of Tibbitt-Contwoyto winter road
Closure and Reclamation	Removal (decommissioning) of all temporary structures and equipment
	Reclamation of open pits and the main body of Lac de Sauvage
	Reclamation of all permanent structures (e.g., waste rock piles, road)
	Long-term monitoring and water management

Appendix B: Guidelines for monitoring and management programs

In the interest of fair, efficient, and effective environmental assessment that successfully meshes with integrated resource management in the Mackenzie Valley, the Review Board encourages the developer to review the following non-comprehensive list of documents while assessing potential impacts from the development, as well as in creating and presenting monitoring and mitigation programs for the project. The documents include but are not limited to:

Mackenzie Valley Environmental Impact Review Board

Environmental Impact Assessment Guidelines (2004);
Socio-Economic Impact Assessment Guidelines (2007); and,
Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment (2005).

Mackenzie Valley Land and Water Board

Any relevant guidelines published by the Mackenzie Valley Land and Water Board:

- The Mackenzie Valley Land and Water Board Document Submission Standards (2012);
- Standards for Geographical Information Systems Submissions (2012);
- Guide to Completing Land Use Permit Applications (2013);
- Guide to Completing Water Licence Applications (2003);
- Engagement and Consultation Policy (2013);
- Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits (2013);
- Water and Effluent Quality Management Policy (2011);
- Guidelines for Developing a Waste Management Plan (2011);
- Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories (2013 MVLWB/AANDC); and
- Draft Guidelines for Adaptive Management (2010).

Natural Resource Canada

- Dam Safety guidelines (Canadian Dam Association 2007)

Fisheries and Oceans Canada

- Freshwater Intake End-of-Pipe Fish Screen Guideline (1995);
- Protocols for Winter Water Withdrawal in the Northwest Territories (2005); and,
- Fish Screen Design Criteria for Flood and Water Truck Pumps (2011).

Aboriginal Affairs and Northern Development Canada

- Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the Northwest Territories (2009);
- Mine Site Reclamation Guidelines (2007);
- Mine Site Reclamation Policy for the Northwest Territories (2002);
- Northwest Territories Cumulative Impact Monitoring Program; and,

- Guidelines for Spill Contingency Planning (2007).

Canadian Council of Ministers for the Environment

- Canadian Environmental Quality Guidelines for the Protection of Aquatic Life

Government of the Northwest Territories

- Guideline for Ambient Air Quality Standards in the Northwest Territories` Government of the Northwest Territories Guideline for Dust Suppression (2004)
- Draft Wildlife and Wildlife Habitat Protection Plan and Wildlife Effects Monitoring Program Guideline (2013)