



## ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

### Renard Diamond Project

#### SUMMARY

Reference/N : 061470.001-400

December 2011





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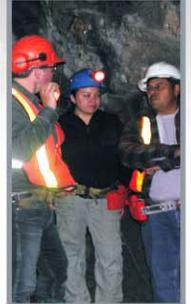
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## List of Acronyms

ALARP	As Low as Reasonably Practicable
CBHSSJB	Cree Board of Health and Social Services of James Bay
CEAA	Canadian Environmental Assessment Agency
CEAA	Canadian Environmental Assessment Act
CEPA	Canadian Environmental Protection Act
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
CO <sub>2</sub> eq	Carbon dioxide equivalent
COMEV	Evaluating Committee
CSMO	<i>Comité sectoriel de main-d'œuvre</i>
DFO	Department of Fisheries and Oceans Canada
EBS	Environmental Baseline Study
EHS	Environment, Health and Safety
EQA	Environment Quality Act
ESIA	Environmental and Social Impact Assessment
GHG	Greenhouse gas
ha	Hectare
IBA	Impacts and Benefit Agreement
JBNQA	James Bay and Northern Quebec Agreement
km	Kilometer
km <sup>2</sup>	Square kilometer
kW	Kilowatt
LEET	Trench landfill
m	Meter
m <sup>3</sup> /s	Cubic metre per second
MDDEP	<i>Ministère du Développement durable, de l'Environnement et des Parcs</i> (Department of Sustainable Development, Environment and Parks)
mg P/l	Milligram of phosphorus per liter
Mm <sup>3</sup>	Mega (x 10 <sup>6</sup> ) cubic meters
MRNF	<i>Ministère des Ressources naturelles et de la Faune</i> (Department of Natural Resources and Wildlife)
Mt	Mega (x 10 <sup>6</sup> ) tons
MTQ	<i>Ministère des Transports du Québec</i> (Quebec Department of Transport)
NRCan	Natural Resources Canada
OSHA	Occupational Safety and Health Administration
PDA	Pre-Development Agreement
PEM	<i>Permis d'exploitation minière</i> (claim)
REIMR	Regulation respecting the landfilling and incineration of residual materials
SOQUEM	<i>Société québécoise d'exploration minière</i> (Society for Mining Exploration)
VESCs	Valued environmental and social components





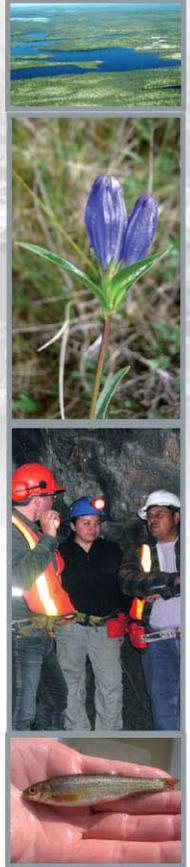
## 1 Introduction

This document consists of a summary of the Environmental and Social Impact Assessment (ESIA) of the Renard Diamond Project on the Foxtrot property in the municipality of James Bay in north-central Québec.

### 1.1 Overview and Project Location

Stornoway Diamonds (Canada) Inc. (hereinafter called Stornoway) plans to develop the deposit on the Foxtrot property, which represents a sizeable diamond resource. The Foxtrot property is located about 150 km southeast of Hydro-Québec's LG-4 complex and about 200 km northeast of Mistassini Lake (Map 1.1.1). The Renard mine site is located at 72°11' west longitude and 52°49' north latitude in Nord-du-Québec administrative region N° 10, approximately 70 km north of the Otish Mountains region. The mining industry plays a leading role in the development of the Nord-du-Québec region. Four mines are currently in operation in the James Bay territory, including three gold mines (Casa Bérardi, Géant Dormant and Bachelor Lake) and one zinc and copper mine (Persévérance). Some 66 exploration projects involving many mineral resources (diamonds, gold, copper, silver, zinc, nickel, platinum, palladium, chromium, etc.) are also currently underway in the region. In addition to the Renard Project, six other mines may be developed in the short to medium term (Map 1.1.1). The Nord-du-Québec region is also the most important electric power generation region in Québec, with 49% of total production. Hydro-Québec has no less than eight hydroelectric power stations in operation on the La Grande River (Map 1.1.1). The recreational-tourism industry also plays an important role in the regional economy with 37 non-exclusive outfitters operating in the area. According to the *Ministère des Ressources naturelles et de la Faune* (MRNF), the region attracts more than 37,000 anglers and 12,000 hunters annually.

According to the resources update released in February 2011, the Renard diamond mine would contain an indicated mineral resource of 24 million carats and an inferred mineral resource of 17 million carats, for an estimated value of US\$7 billion. Developing the project would involve putting in place mining infrastructure and ancillary facilities that would be used throughout the operation of



the mine. The mine's life is estimated to be about 20 years, with a potential for it being extended.

## 1.2 Project Proponent

The Renard Project is being developed by Stornoway, which holds all the exploration rights on the Foxtrot Property. Stornoway is a wholly-owned subsidiary of Stornoway Diamond Corporation.

Stornoway Diamond Corporation was founded in 1986, and is now one of the largest diamond exploration and development companies in Canada. Stornoway was involved in the discovery of more than 200 kimberlitic bodies in seven Canadian diamond districts. The company has direct or partnership interest in 18 properties in Canada.

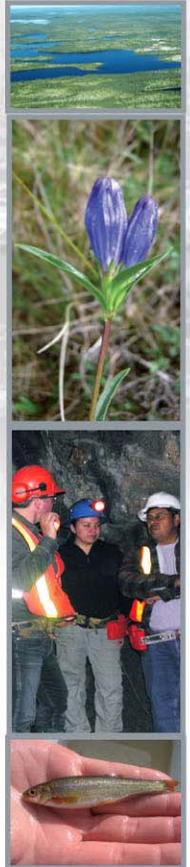
Stornoway Diamond Corporation is headquartered in Vancouver, British Columbia, and has three business offices in Québec. Its office for the Renard Project is in Longueuil while two satellite offices are located in Québec City and in the Cree community of Mistissini. A third office will eventually be set up in Chibougamau once the project gets underway.

## 1.3 Proponent's Environmental, Social Acceptability and Sustainable Development Policy

For the Renard diamond project as with all its projects, Stornoway Diamond Corporation and its non-public subsidiary companies are committed to maintaining sound environmental practices in the planning and operation of all their activities.

To achieve this, Stornoway, with its employees and contractors, will:

- ◆ Examine the potential impact on the environment of all proposed activities and take steps to minimize or where possible eliminate the impact;
- ◆ Ensure that all activities are in compliance with all environmental legislation and regulations;
- ◆ On a continuous basis, determine Stornoway's impact on the environment, and through continuous improvement, strive to attain higher levels of environmental performance;
- ◆ Maintain a high level of environmental protection by applying practices and technologies that minimize impacts and enhance environmental quality;





- Ville, municipalité / City, municipality
- Communauté crie / Cree community
- 🏠 Pourvoirie sans droit exclusif / outfilter without exclusive rights
- ✈ Aéroport / Airport
- 🚢 Hydrobase / Hydrobase
- ⚙ Aménagement d'Hydro-Québec / Hydro-Québec facility
- Ligne électrique d'Hydro-Québec / Hydro-Québec electricity transport lines
- Réseau routier principal / Main road network
- Réseau routier secondaire / Secondary road network
- Prolongement de la route 167 Nord vers les Monts Otish / Extension of Route 167 North to the Otish Mountains
- + Chemin de fer / Railroad
- ◆ Mine active / Operating mine
- ◇ Projets d'exploration de ressources minérales / Mineral resources exploration projects
- ◆ Mines qui pourraient être mises en exploitation à court ou moyen termes / Short and medium term potential mining projects
- ◆ Ancienne mine / Old mine
- Parc national projeté / National Park project
- ▨ Réserve de biodiversité projetée / Projected biodiversity reserve
- ▭ Réserve faunique / Wildlife reserve
- ▭ Limites de l'aire d'étude / Study area limits
- ▭ Propriété Foxtrot / Foxtrot property



**Projet diamantifère Renard / Renard diamond mine project**

Étude d'impact environnemental et social / Environmental and Social Impact Assessment

**Localisation générale du projet diamantifère Renard / General location of the Renard diamond mine project**

Carte de base / Base Map : BDGA 1M 2010  
 Fichier / File : 61470\_EIES\_LocGen\_111213.WOR  
 Source : - Projet d'exploration de ressources minérales / Mineral resources exploration projects, MRNF, 2010  
 Pourvoiries / Outfilter, MRNF, 2010



Décembre 2011 / December 2011

Carte / Map 1.1.1

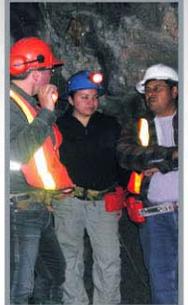


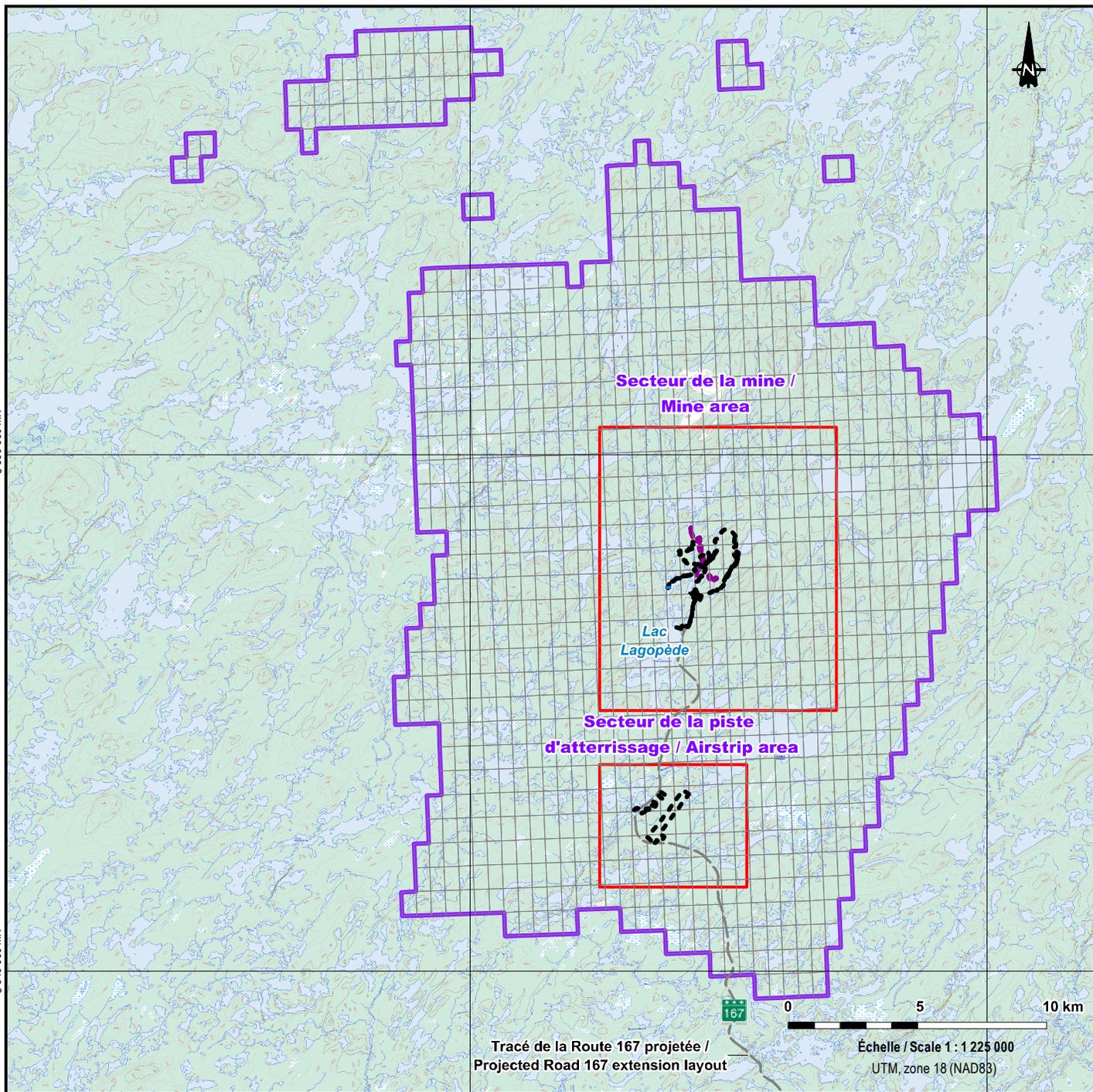
- ✦ Maintain dialogue with the communities and other stakeholders in the area of influence of the its exploration programs;
- ✦ Progressively rehabilitate disturbed areas, develop closure plans that can be continuously improved and incorporate new technologies where practical;
- ✦ Train all employees and contractors to understand their environmental responsibility related to its mineral exploration properties.

## 1.4 Land Ownership and Exploration Rights

The Québec government is the administrator of the lands where the Foxtrot Property is located. Québec public lands cover some 92% of the province's territory (1,700,000 km<sup>2</sup>). This vast area represents Québec's main basin of natural resources. To stimulate economic development, the government grants land and resource related rights, while taking steps to protect the environment. Exploration rights can therefore be granted to entities for mining purposes. The claim (including the mining exploration licence or PEM for « *permis d'exploration minière* ») is the only valid exploration right in Québec. A claim gives the holder an exclusive right to search for all mineral substances, except for sand, gravel, clay and other loose deposits, in a specified area.

The Foxtrot Property includes 1,047 individual practically contiguous claims over an area of about 54,550 ha (Map 1.4.1). The claims and PEMs are registered under the name of Stornoway. All the kimberlitic bodies, including the Renard kimberlite pipes and the Lynx and Hibou kimberlite dykes, along with the infrastructure associated with the Renard Project, are located on 49 claims covering an area of 2,548 ha.





Tracé de la Route 167 projetée / Projected Road 167 extension layout

Échelle / Scale 1 : 1 225 000  
UTM, zone 18 (NAD83)

Localisation générale / General location



-  Emprise du projet / Project footprint
-  Cheminées kimberlitiques / Kimberlite Pipe
-  Titres miniers actifs / Active claims
-  Propriété Foxtrot / Foxtrot Property
-  Aires d'étude / Study area



Projet diamantifère Renard / Renard diamond mine project

Étude d'impact environnemental et social  
Environmental and Social Impact Assessment

Titres miniers de la propriété Foxtrot /  
Foxtrot property mining claims



Carte de base : CCarte de base / Base Map :  
BDGA, 1M, 2010  
Fichier : 61470\_EIES\_Claims\_111213.WOR  
Décembre 2011 / December 2011

Carte / Map  
1.4.1

## 2 General Presentation of Renard Diamond Project

### 2.1 Background

The considerable natural resources in the Nord-du-Québec region have to date been underexplored and underdeveloped owing to the limited accessibility and remoteness of the area.

The project site is currently accessible only by air or snowmobile. Exploration activities are carried out from camp Lagopede located on the north shore of Kaakus Kaanipaahaapisk Lake (Lagopede Lake). The closest infrastructure is at Témiscamie, which is near Albanel Lake, or about 210 km south of camp Lagopede. Témiscamie is connected to the Cree community of Mistissini by Route 167. The municipality of Chibougamau, 360 km south of the site, is the main supply centre for regional natural resources exploration and development industries.

As of 1996, exploration rights in the sector of the Foxtrot Property were acquired in partnership by Ashton Mining Canada Inc. and SOQUEM Inc. On April 1<sup>st</sup>, 2011, Stornoway acquired 100% interest in the Renard Diamond Project, to then form the company Stornoway Diamonds (Canada) Inc.

### 2.2 Environmental Baseline Study (EBS)

In order to thoroughly characterize the environment associated with the project and identify related development and planning opportunities and constraints, an environmental baseline study (EBS) was carried out in the spring 2010 for a study area covering some 127 km<sup>2</sup>.

The purpose of the EBS was to consolidate information that was available on the study area and perform surveys and inventories required to characterize the project's environment. The EBS aimed to establish the baseline conditions of the environment before the project is carried out. It therefore constitutes a valuable reference document for the analysis and assessment of impacts of the Renard Project. Owing to the magnitude and level of technical details in the EBS, a summary document entitled 'State of Knowledge of the Environment' was prepared to highlight the main findings of the EBS.



The EBS covers the physical, biological and human environment. It identifies the most fragile and most valued environmental and social components, natural environmental constraints, planning opportunities, as well as the main issues associated with the project.

### 2.3 Study Area

The Renard Project is located in the hydrological watershed of the Misask River which is a tributary of the Eastmain River sub-watershed, more than 275 km upstream of the Eastmain-1 reservoir (Map 1.1.1).



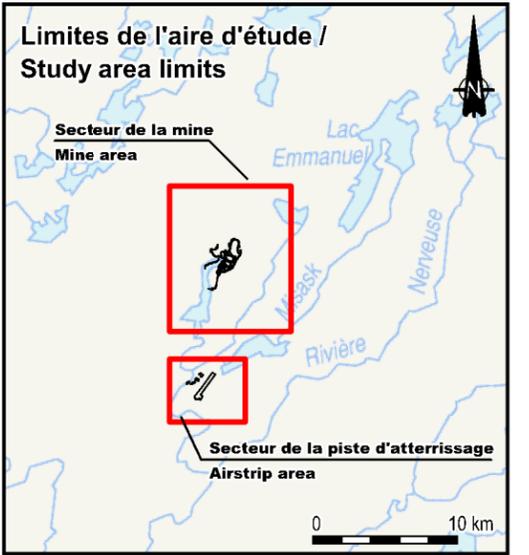
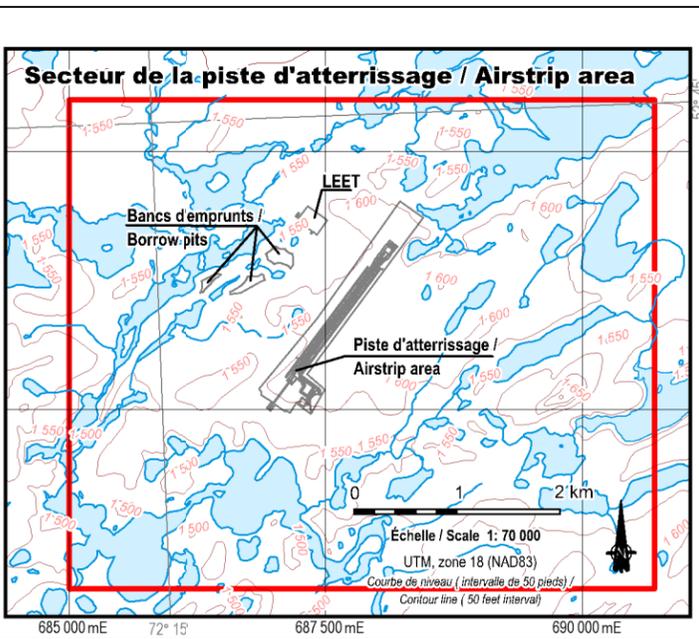
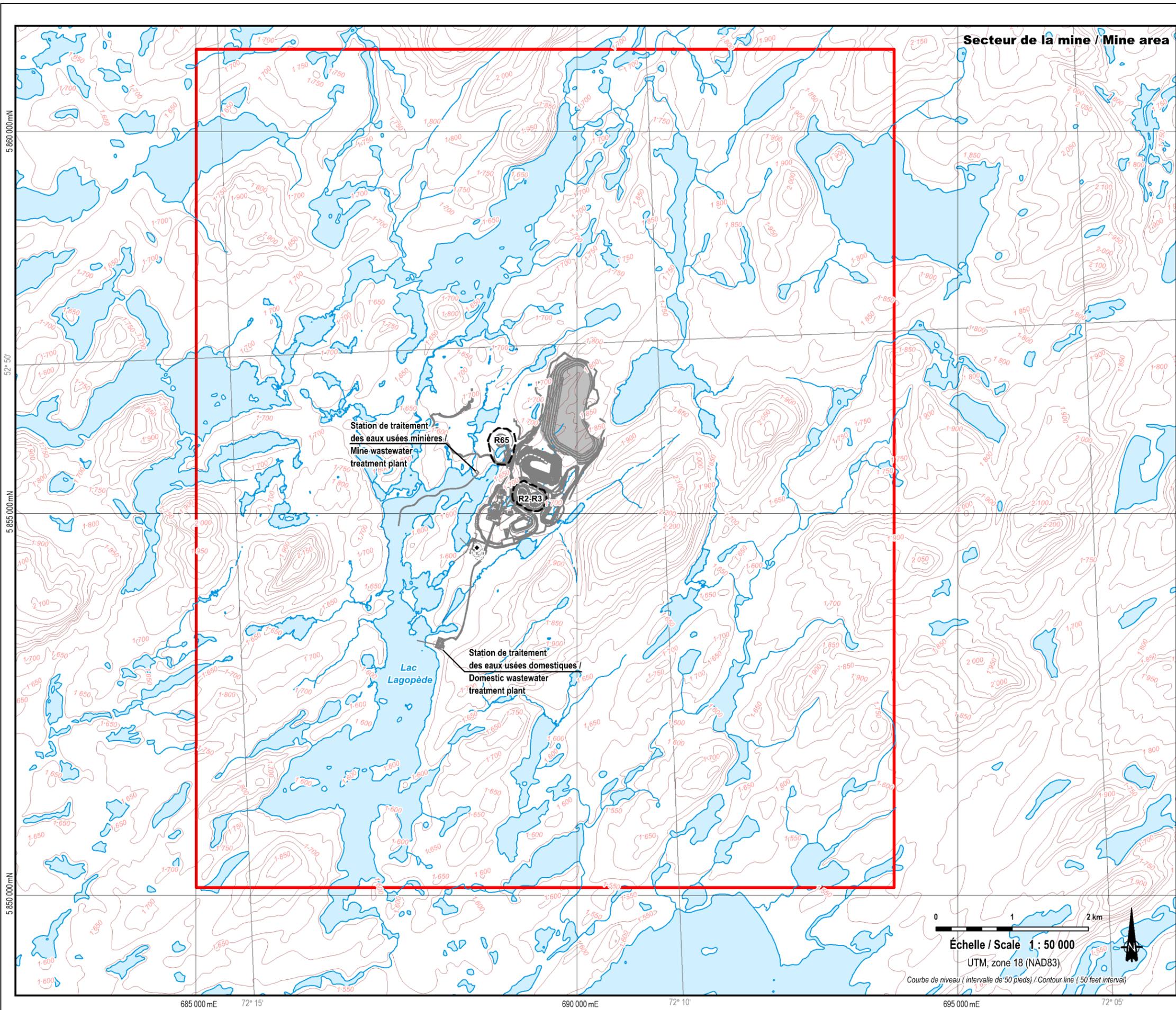
The main urban centres in the region are the municipalities of Chibougamau, Chapais and Matagami along with the

Cree community of Mistissini. Economic activity in the study area is dominated by forestry and mineral resource industries and businesses. Traditional hunting, fishing and trapping activities are also carried out in the study area. The study area also contains valued and protected natural areas, along with several sites of cultural heritage and archaeological significance.

### 2.4 Project

Operation of the Renard mine will require the installation of a number of facilities and the execution of various works, such as open-pits, a vertical shaft, adits, ore processing plant, a processed kimberlite confinement area, waste rock and overburden stockpiles, mining and domestic wastewater treatment systems, an accommodation and service complex, a network of secondary roads, a landing strip and other ancillary facilities. Map 2.4.1 illustrates the various facilities to be developed as part of the project.





**Projet diamantifère Renard / Renard diamond mine project**

Bilan des connaissances / State of knowledge

-  Emprise du projet / Project footprint (26/10/2011)
-  Fosse d'extraction à ciel ouvert / Open pit
-  Aire d'étude / Study area

**Localisation de l'aire d'étude et des différents aménagements du projet / Location of project study area and infrastructure**



## 2.5 Applicable Regulatory Framework

Given the nature and location of the Renard diamond mine project, it is mandatory that the project is subject to the provincial environmental and social impact assessment and review process. The property is located on Category III lands within the boundaries of the territory covered by Chapter 22 of the James Bay and Northern Quebec Agreement (JBNQA) and Chapter II of the *Environment Quality Act* (EQA). To authorize the implementation of the whole project, the latter will be subject to a provincial government decree under the EQA, as well as a federal authorization under the *Canadian Environmental Assessment Act* (CEAA). Project implementation will moreover require a number of provincial and federal authorizations and permits.

In light of applicable regulatory provisions for the project, Stornoway carried out an environmental and social impact assessment (ESIA) that meets the requirements of provincial and federal guidelines.

## 2.6 Environmental and Social Impact Assessment

### 2.6.1 Scope of the Project and the Environmental Assessment

The scope of the environmental assessment of the Renard Diamond Project specifies the project components that will be described and for which environmental impacts will be analysed, as well as the environmental elements that must be considered. The scope of the assessment is defined in the guideline issued by the Evaluating Committee (COMEV) in June 2010 (Appendix 2.2.1 of the ESIA), as well as the guideline issued by Fisheries and Oceans Canada (DFO) and Natural Resources Canada (NRCan) in July 2010 and its update issued by the Canadian Environmental Assessment Agency (CEAA) in June 2011 (Appendix 2.2.2 of the ESIA).

All of the project components and valued environmental components specified in these guidelines were taken into consideration in the ESIA and an exhaustive description of these elements is provided in the sectoral reports associated with the environmental baseline study. The list of valued environmental and social components (VESC) is provided in section 5.5 of the ESIA.



### 2.6.2 Temporal Boundaries

The construction phase for the Renard mine will last two to three years (2013 to 2015). The development of the deposit is expected to continue for about 20 years (2015 to 2033). Mine closure and site restoration activities are expected to take about two years (2033-2036). And finally, the post-closure period, which refers to the permanent condition of the site once closure is finalized, is set at more than 25 years, or the period during which it is feasible and reasonable to anticipate long-term impacts of the mine after mine closure and final site restoration work is complete.

### 2.6.3 Spatial Boundaries

The boundaries of the 127 km<sup>2</sup> study area are indicated on Map 2.4.1. The study area is large enough to encompass all direct and indirect impacts on physical and biological components that may be affected by the project. It consists of two main sectors: the mine area, which covers 100 km<sup>2</sup> and includes all the mining infrastructure, as well as the airstrip area, which itself covers about 27 km<sup>2</sup> (Map 2.4.1).

Given that the issues connected with the human environment go well beyond the study area defined for the physical and biological environments, a study area specific to the human environment was defined and covers all of the James Bay territory. Included in this area are the municipalities of Chibougamau and Chapais, as well as the Eeyou Istchee territory, which itself includes the Cree Nation of Mistissini and trapline M11 also affected by the project.

### 2.6.4 Impact Assessment Methodology

The assessment of the impacts of the Renard Project was carried out by a multidisciplinary team of environmental specialists with considerable expertise in assessing the environmental impacts of large-scale projects. The information below was used in the environmental assessment:

- ◆ Technical characteristics of the project;
- ◆ Baseline data with respect to the environment and socioeconomic setting;
- ◆ Experienced feedback from similar projects/activities;
- ◆ Available literature review (scientific, technical, etc.);
- ◆ Traditional knowledge of the Cree population;



- ◆ Advice and opinions obtained from public consultations (see Section 4 of this summary).

The major steps in the environmental assessment were as follows:

- ◆ Project definition, analysis and optimization;
- ◆ Project description;
- ◆ Identification of sources of impact;
- ◆ Identification of valued environmental and social components (VESC);
- ◆ Building of an interactions matrix;
- ◆ Identification, description, analysis and assessment of impacts;
- ◆ Development of mitigation and compensation measures for adverse impacts and improvement measures for positive impacts;
- ◆ Determination of the significance of residual impacts;
- ◆ Assessment of cumulative effects;
- ◆ Public consultations at various stages in the environmental assessment process.

➤ *PROJECT DEFINITION, ANALYSIS AND OPTIMIZATION*

The objective of this activity was to define site, alignment and management alternatives while taking environmental, technical, economic and human considerations into account in the analysis and selection of alternatives that will provide the best balance among these considerations and minimize the environmental impact.

➤ *PROJECT DESCRIPTION*

This activity was carried out in close cooperation with the technical feasibility and impact assessment teams. The objective was to describe the main project infrastructure and facilities as well as the various project activities in the construction, operation and closure phases.

➤ *IDENTIFICATION OF SOURCES OF IMPACT AND VALUED COMPONENTS*

On the basis of the project description, the sources of impact (also called project components) were identified. The detailed environmental characterization performed as part of the EBS was used to identify valued environmental and social components (VESC) that are likely to be influenced by the project, as required by COMEV and federal guidelines.



The sources of impact identified cover all phases of the project as well as all related activities, including temporary structures and activities and those that are indirectly linked to the project. The construction, operation and closure phases respectively include 10, 14 and 6 potential sources of impact.

A total of 22 VESCs were selected for identification of interactions and impact assessment.

➤ *BUILDING OF THE INTERACTIONS MATRIX*

The relationship between the sources of impacts and VESCs was examined in an interactions matrix to identify the probable impacts of the project. Each of the shaded areas in Figure 2.6.1 identifies a probable impact, the description and importance of which are provided in sections 6, 7, 8 and 9 of the ESIA.

➤ *DESCRIPTION, ANALYSIS AND ASSESSMENT OF IMPACTS*

Once the probable interactions and impacts were identified, a description and analysis of the impacts were prepared. The analysis took into consideration the direct effects of the project on an environmental component (e.g., impact of operation activities on air quality) and the indirect effects arising from a change to another environmental component (e.g., human health impact arising from a deterioration in air quality). This analysis was as quantitative as possible and took into consideration the nature and intensity of the activity along with its duration and spatial extent.

In some cases, special tools were used to better assess the magnitude of the impact. In the assessment of air quality impacts, for example, an atmospheric dispersion model of airborne contaminants was used. Recognized quality criteria were considered for some environmental components (e.g., air and water quality) in assessing project impacts on these components: the discrepancy observed between the anticipated concentrations and recognized quality criteria served as references for determining the intensity of the impact.



Figure 2.6.1 Matrix of potential interactions

		Valued Environmental Components																					
		Physical Environment							Biological Environment							Human Environment							
		Air quality	Ambient sound level	Soils	Groundwater	Hydrological regime	Surface water	Sediment	Benthos	Fish	Vegetation and wetlands	Reptiles and amphibians	Waterfowl and other aquatic birds	Raptors	Forest birds	Micromammals	Fur-bearing animals	Large game	Land and natural resources use	Economy and employment	Health and well-being	Archaeological and cultural heritage	Landscape
Construction	Site preparation and development: clearing, drilling, blasting, cut and fill, drainage, materials confinement and storage areas, borrow pits, secondary roads - All facilities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
	Quarry and borrow pit operations	X	X	X	X	X	X	X							X	X	X						
	Machinery and generator set use and maintenance and road traffic	X	X	X	X		X	X	X	X		X				X	X	X	X		X		
	Lake and stream dewatering and water and sediment management		X		X	X	X	X	X	X		X	X						X				X
	Water supply					X	X			X													
	On-site water management (runoff, drinking water, process water, wastewater, etc.)		X			X	X	X	X	X		X	X										
	Solid waste storage and management system and trench landfill (LEET)						X																
	Hazardous materials and fuel storage and management			X	X		X	X	X	X												X	
	Construction of mine facilities (ore processing plant, airstrip, generator sets, and related facilities)	X	X			X						X		X	X	X	X	X	X				X
	Manpower and procurement									X		X							X	X	X		
Operations	Pit development: clearing, drilling, blasting, cut and fill, drainage - All facilities	X	X	X	X	X	X	X		X	X	X			X	X	X	X				X	X
	Machinery and generator set use and maintenance and road traffic	X	X	X	X		X	X	X	X	X				X	X	X	X	X		X		
	Ore extraction, handling and storage	X	X				X			X		X			X	X	X	X	X				X
	Ore processing	X	X																				
	Management of materials produced by mining operations (overburden, waste rock and kimberlite)	X	X	X	X	X	X	X				X							X				X
	Water supply					X	X			X													
	Water management (runoff, mine drainage water, drinking water, process water, wastewater, etc.)		X		X	X	X	X	X	X			X										
	Solid waste storage and management system and trench landfill (LEET)				X		X											X					
	Hazardous materials and fuel storage and management			X	X		X	X	X													X	
	Generator sets	X	X																				
Airstrip operations	X	X				X					X		X	X	X	X	X	X				X	
Presence of facilities																	X	X				X	
Manpower and procurement									X		X								X	X	X		
Progressive rehabilitation of site	X		X							X	X				X	X	X	X				X	
Closure	Water management (runoff, pit flooding)				X	X	X	X	X	X	X	X						X					
	Machinery and generator set use and maintenance and road traffic	X	X	X	X		X	X	X						X	X	X	X		X			
	Dismantling and recycling of facilities	X	X		X				X					X	X				X				X
	Rehabilitation and final revegetation of site	X		X		X	X	X	X		X	X	X	X	X	X	X	X	X		X		X
	Manpower and procurement																			X	X		
Presence of site remains				X													X	X				X	

➤ *DEVELOPMENT OF MITIGATION AND COMPENSATION MEASURES FOR ADVERSE IMPACTS AND IMPROVEMENT MEASURES FOR POSITIVE IMPACTS*

The next step involved developing mitigation and compensation measures to reduce the anticipated impact or, in cases where mitigation would not be feasible, put in place a project or measures that would compensate for the impact in question. Improvement measures were also proposed where applicable to optimize positive impacts of the project.

➤ *ASSESSMENT OF RESIDUAL IMPACTS*

The next step in the assessment process is to evaluate residual impacts of the project, or those impacts that remain after the application of proposed mitigation, compensation and improvement measures. These impacts were assessed in terms of their characteristics and their significance. The significance of an impact refers to the changes to an environmental component caused by the project. Such predictions are based on objective knowledge and three main criteria, namely the intensity, scope and duration of the changes. The method used to determine the type and importance of impacts is described in detail in Chapter 5 of the ESIA.

➤ *ASSESSMENT OF CUMULATIVE EFFECTS*

To comply with the CEEA requirements as well as COMEV guidelines, an assessment of the cumulative effects of the project was undertaken. This exercise involved identifying and assessing the cumulative effects of the Renard Diamond Project combined with the effects of other past, current and future projects in the region. The methodological approach used to identify and assess the cumulative effects is presented in Chapter 10 of the ESIA.



## 3 Project Description

The objective of the Renard Project is to develop a large diamond deposit that has demonstrated economic viability and substantial potential for further resource expansion. The mine life could extend for about 20 years with good potential to further extend mine production.

The Renard diamond mine has an indicated mineral resource of 24 million carats as well as an inferred mineral resource of 17 million carats for an estimated value of US\$7 billion. The anticipated extraction rate is about 6,000 tonnes of ore per day, or about 2.2 million tonnes per year (mineral content varying between 0.75 and 0.87 carats/tonne) with increased production in the first few years to more than 7,000 tonnes of ore per day, or more than 2.5 million tonnes per year. The Renard diamond mine will produce high value gem-quality diamonds. There is also potential for very large diamonds (known as “specials”) to be recovered.

The Renard Project will result in significant spinoffs for local communities in terms of job creation and long-term contracts. The project may in fact create more than 500 jobs during the construction phase and 450 jobs during the operation phase. Wherever possible, Stornoway will favor the hiring of regional personnel and businesses with local procurement. Stornoway expects to invest C\$802 million in capital costs and about C\$125 million in annual operating costs.

### 3.1 Project Access

In light of the fact that the Renard Project is located in a remote area of northern Quebec, access to the site constitutes a crucial issue for the project. It is currently feasible to access the Foxtrot Property by air (helicopter, hydroplane and plane via an ice runway on Lagopedé Lake). There is currently no road access to the site. However, a winter road exists between Témiscamie near Albanel Lake, about 240 km south of the Renard Project and the former Eastmain mine site. Strateco maintains a section of this road to its Matoush camp some 110 km south of the Renard Project. The road is accessible only



a few months in the year. To the north, the closest access road is the Trans-Taiga Road (Map 1.1.1).

Building a road is therefore essential for the development of the Renard Project. An analysis of alternatives was therefore performed by the Quebec government on the basis of technical, environmental, socioeconomic and financial criteria. The alignment selected by the MTQ is a permanent road built as an extension to Route 167. The road is essential for the development of not only the Renard Project but also all the other potential mining projects in the area. Communities in the region will therefore benefit in terms of jobs and economic activities. The road will also help promote tourism, recreational activities, forestry operations, in addition to Cree trapping activities.

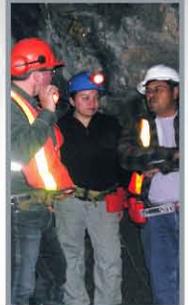


Plans and specifications contracts have been awarded for Route 167 North (km 0 to 82) and an accelerated construction schedule has been proposed by the MTQ which would provide Stornoway winter access to the site by winter 2013, and permanent access by summer 2013.

An airstrip also needs to be built to safely transport mine workers to the site. A site located 8 km south of the mine was selected from among 15 alternatives evaluated on the basis of environmental and safety requirements.

### 3.2 Positioning of Project Infrastructure

The location of the deposit necessitates the installation of mine facilities on the northeast side of Lagopede Lake. The site meets various environmental constraints, specifically the topography, hydrographic network, unstable areas, wetlands, presence of sensitive wildlife habitats, mining technical parameters, areas used by the Crees, health, safety and risk management considerations, and so forth. Taking all these constraints into consideration combined with the perspective to limit as much as possible the environmental footprint while optimizing operations considerably reduces the number of sites where the infrastructure could be installed.



The general layout plan selected for the facilities (Map 3.2.1) takes all these constraints into consideration. The plan will also improve safety while economizing by limiting the footprint of the infrastructure, earthwork requirements along with construction and operating costs.

The footprint was reduced by designing an accommodation complex with dormitories on two floors, thereby decreasing the number of buildings required, by repositioning the airstrip gatehouse and security control centre inside the reception building of the accommodation complex, and by grouping the garages, workshops and warehouses as well as the offices, dryhouse and laundry together. The explosives storage areas were also grouped together in the same sub-watershed which is already used for bulk sampling and will eventually be mined.

Reducing the footprint of the various buildings will also help to shorten the workers' itineraries, in addition to optimizing safety for workers walking on the site. Also note that platforms were made to blend in with the natural topography, thereby reducing excavation and fill requirements.

The processed kimberlite confinement area was determined as a result of an analysis of five potential site alternatives according to 18 environmental indicators, 6 social indicators and 9 technical environmental indicators (see section 3.2.4.5 of the ESIA for alternatives analysis). The selected site was also the site preferred by the tallymen of trapline M11 because it is at a greater distance from their moose hunting grounds and snowmobile trails.

The waste rock and overburden stockpiles were located near the mine open pits so as to minimize transportation of the materials and facilitate their reuse. The two stockpiles were optimized to minimize their footprint while maintaining acceptable heights.

A large sedimentation pond will be developed in the R-65 open pit, thereby limiting additional clearing required for water management purposes. All water in contact with the mine site will be collected by a network of perimeter ditches and directed toward the sedimentation pond. Pit R-65 will also be used as a quarry and source of aggregates for civil engineering work.

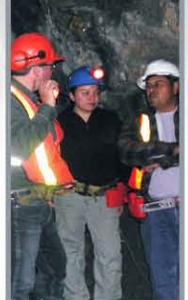


### 3.3 Project Alternatives

Once the project infrastructure has been positioned, various operations and management alternatives were examined in detail for the final project:

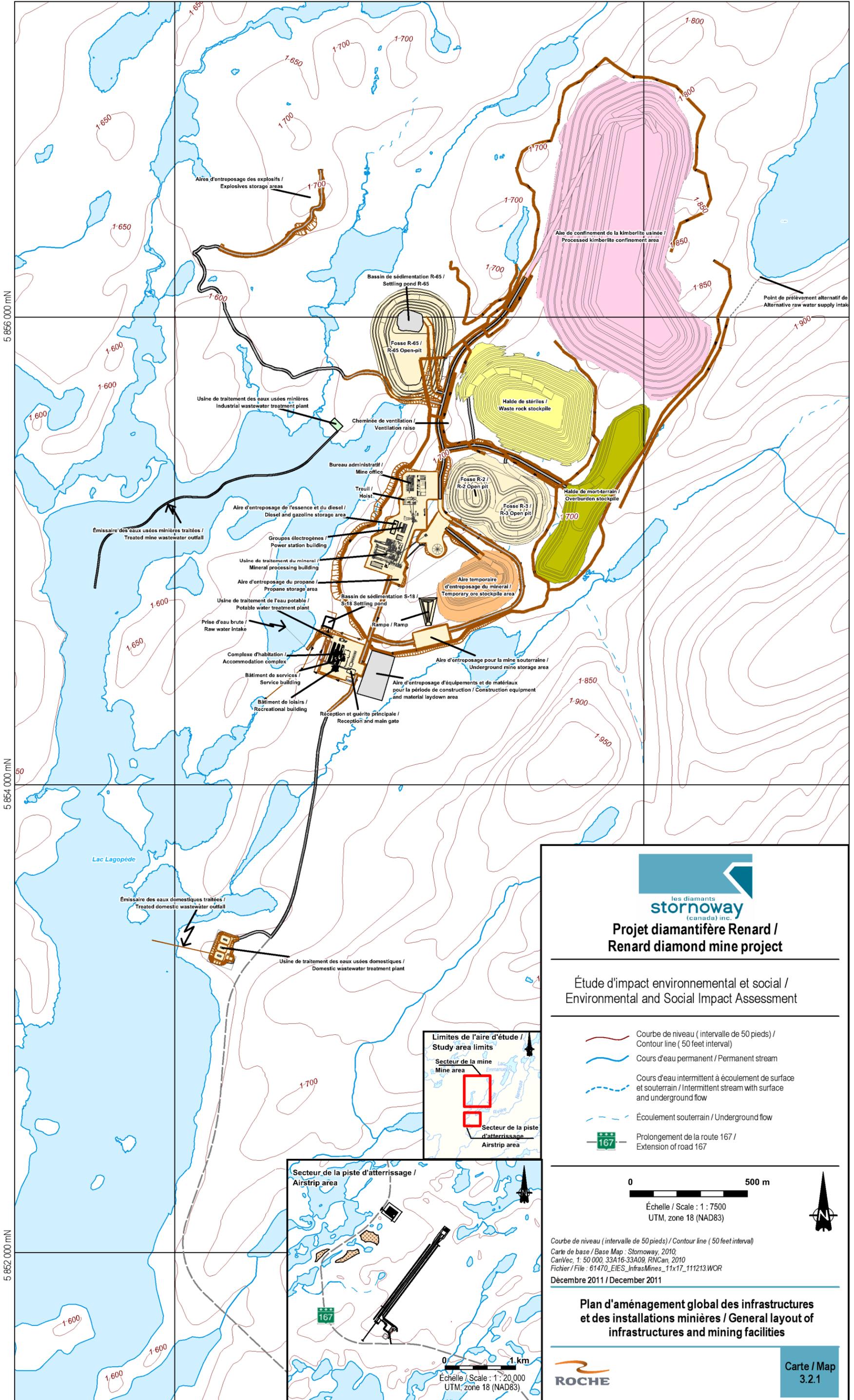
- ❖ Underground mining alternatives;
- ❖ Ore processing alternatives;
- ❖ Water management alternatives;
- ❖ Alternatives for the confinement of materials resulting from mining operations;
- ❖ Power supply alternatives;
- ❖ Accommodation and services complex;
- ❖ Solid waste material management alternatives.

These analyses of alternatives are discussed in detail in Chapter 3 of the ESIA.



688 000 mE

690 000 mE



5 856 000 mN

5 854 000 mN

5 852 000 mN



**Projet diamantifère Renard /  
Renard diamond mine project**

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Étude d'impact environnemental et social /  
Environmental and Social Impact Assessment

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	Courbe de niveau ( intervalle de 50 pieds ) / Contour line ( 50 feet interval)
	Cours d'eau permanent / Permanent stream
	Cours d'eau intermittent à écoulement de surface et souterrain / Intermittent stream with surface and underground flow
	Écoulement souterrain / Underground flow
	Prolongement de la route 167 / Extension of road 167

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Échelle / Scale : 1 : 7500  
UTM, zone 18 (NAD83)



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Courbe de niveau ( intervalle de 50 pieds ) / Contour line ( 50 feet interval)  
 Carte de base / Base Map : Stornoway, 2010,  
 CanVec, 1: 50 000, 33A16-33A09, RNCan, 2010  
 Fichier / File : 61470\_EIES\_InfrasMines\_11x17\_111213.WOR  
 Décembre 2011 / December 2011

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**Plan d'aménagement global des infrastructures  
et des installations minières / General layout of  
infrastructures and mining facilities**



Échelle / Scale : 1 : 20 000  
UTM, zone 18 (NAD83)



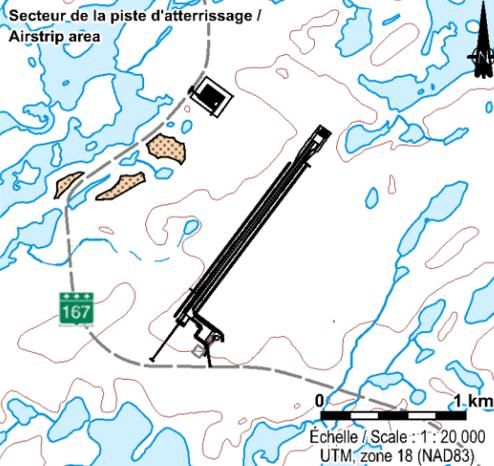
Carte / Map  
3.2.1

**Limites de l'aire d'étude /  
Study area limits**

Secteur de la mine  
Mine area

Secteur de la piste  
d'atterrissage  
Airstrip area

**Secteur de la piste d'atterrissage /  
Airstrip area**

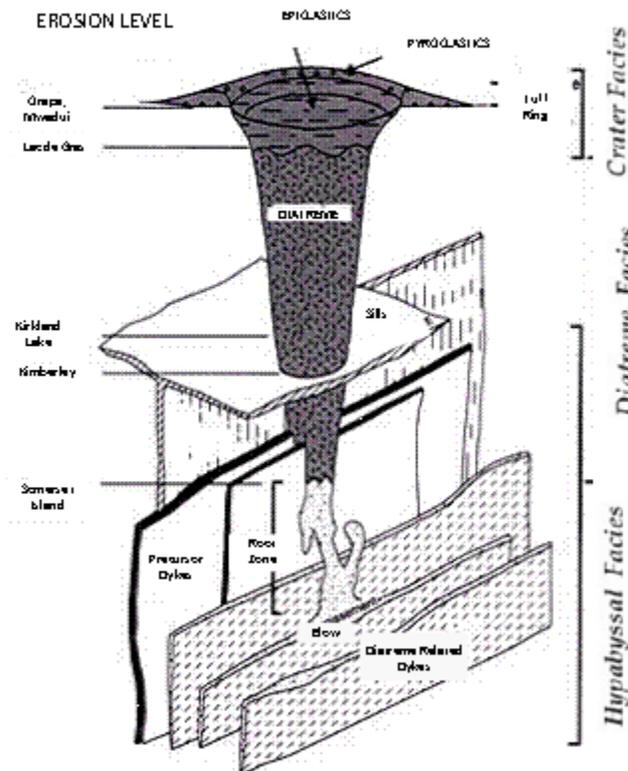




### 3.4 General Description of the Deposit and Mining Project

The geology of the project area is characterized by ancient rock from the Archean age (about 2.7 billion years old). The Archean bedrock is cross cut by old volcanic pipes (Figure 3.4.1) that carried a mixture of molten magma and rock and mineral fragments to the surface from great depths. Part of this mixture then hardened in the vertical pipe shafts, producing rock formations with highly varied properties.

The volcanic pipes that will be mined as part as of the project contain rock formations known as kimberlites (Figure 3.4.2). The presence of diamonds is typically associated with kimberlite formations that pushed them toward the surface.



Source: Taken from Kjarsgaard (1996) and modified according to Mitchell (1986); [http://www.futura-sciences.com/fr/doc/t/geologie/d/diamants-sur-canape\\_772/c3/221/p4/](http://www.futura-sciences.com/fr/doc/t/geologie/d/diamants-sur-canape_772/c3/221/p4/) (French only)

Figure 3.4.1 Example of kimberlite volcanic pipe

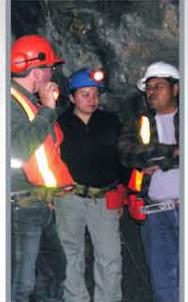


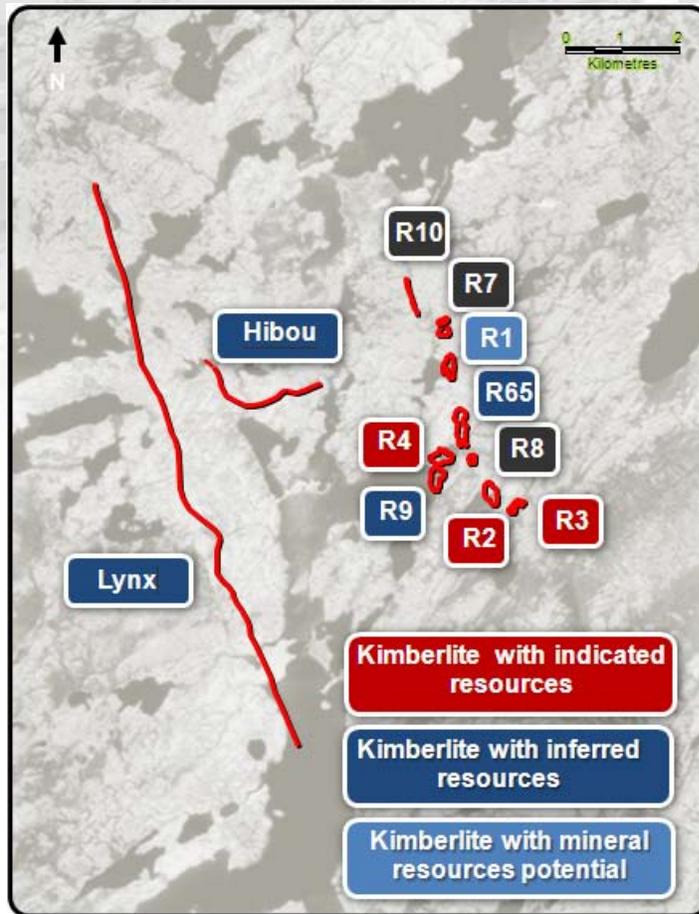


Source: [http://www.stornowaydiamonds.com/mining\\_fundamentals/genesis\\_of\\_diamonds/types/](http://www.stornowaydiamonds.com/mining_fundamentals/genesis_of_diamonds/types/)

**Figure 3.4.2 Renard Project kimberlite with a diamond from a sample collected during drilling**

Nine kimberlite pipes (Renard 1 to 4, 7 to 10 and 65) were identified over 2 km<sup>2</sup> in the Renard Project study area. At the surface, kimberlite pipes are irregular, elliptical bodies, covering 0.1 to 2.0 ha and generally spaced 50 to 500 m apart. Linear dyke systems (Hibou and Lynx) associated with the kimberlites are also of interest in terms of resource development. Figure 3.4.3 shows the locations of the main kimberlites and related dykes. Figure 3.4.4 shows a cross-section of a kimberlite pipe.





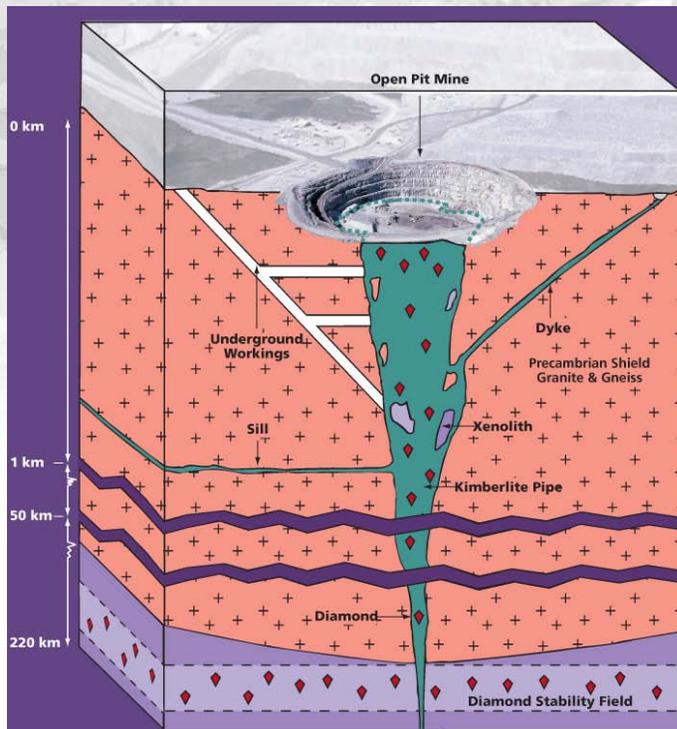
LEGEND

-  Kimberlites of Renard
-  Kimberlite Dyke

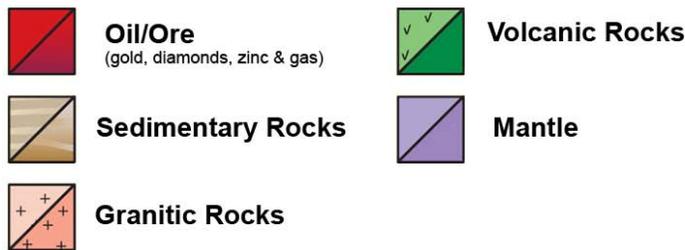
Figure 3.4.3 Principales kimberlites et dykes associés au projet Renard

The R-2, R-3, R-4, R-9 and R-65 kimberlite pipes, as well as the Hibou and Lynx dyke systems were the object of more intense exploration activities. They contain diamond concentrations with economic potential.





**Legend**



Source: [http://geoscape.nrcan.gc.ca/nwt/diamonds\\_f.php](http://geoscape.nrcan.gc.ca/nwt/diamonds_f.php)

Figure 3.4.4 Main components of kimberlite pipe mining operation

**3.5 Mine Plan**

The mine plan includes mining several deposits. The location of the overburden, waste and ore stockpiles is illustrated on Map 3.2.1.



The construction phase will take place from 2013 to 2015 (before the start of ore processing), and will include the following activities among others:

- ❖ Clearing and levelling work;
- ❖ Construction of access roads;
- ❖ Construction of various buildings and infrastructure;
- ❖ Installation of water management system components (ditches, culverts, treatment facilities, etc.);
- ❖ Extraction of overburden, waste rock and ore from pits R-65 and R-2/R-3.

The operation phase will run from 2015 to 2033 at a rate of 6,000 to 7,000 tons per day.

In 2013 and 2014, overburden, waste rock and ore will be extracted from pit R-65. The waste rock will be used for construction purposes, whereas the ore and overburden will be transported to their respective stockpiles. Extraction activities at R-65 will be suspended in 2015 and 2016 then resumed in 2017 to the end of project activities in 2033.

Extraction activities will begin at pits R-2/R-3 in 2014. Materials management will be the same as for R-65 during the construction phase. However, at pits R-2/R-3, extraction activities will end in 2016.

The construction of the access ramp to the R-2/R-3 underground sites will begin in 2013. There will obviously be no overburden to remove and the waste rock will be stockpiled in the specified area. Mining activities at the R-2/R-3 underground sites will continue until 2028.

Site preparation for R4 and R9 underground sites will begin in 2021 and extraction operations will get under way in 2024 continuing to the end of project activities in 2033.

Note that all the waste rock will be used for construction purposes, backfilling underground or returned to the pits. Part of the overburden will be used in site restoration.



### 3.6 Mine and Ancillary Facilities

The general layout plan for the main project facilities is shown on Map 3.2.1. Project infrastructure and facilities are described in detail in Chapter 3 of the ESIA. Figure 3.6.1 shows a 3D model of the site in the operation phase.

The main infrastructure required for mine operations include the following components:

- ❖ Open pits for the development of three kimberlite pipes (R-2, R-3 and R-65);
- ❖ A 740-m pit and access drifts for underground extraction of kimberlite pipes (R2, R3, R4 and R9);
- ❖ Access ramp to underground mine;
- ❖ Kimberlite processing plant;
- ❖ Processed kimberlite confinement area;
- ❖ Waste rock stockpile and a temporary ore stockpile;
- ❖ Overburden stockpile;
- ❖ Water management system with sedimentation ponds;
- ❖ Industrial wastewater treatment system;
- ❖ Accommodation complex and services;
- ❖ Drinking water treatment and supply system;
- ❖ Domestic wastewater treatment system;
- ❖ Airstrip for transportation of personnel, and related infrastructure;
- ❖ A quarry and borrow pits;
- ❖ Solid waste and hazardous materials storage, management and recycling area;
- ❖ Trench landfill for solid waste management;
- ❖ Explosive storage area;
- ❖ Secondary roads on site;
- ❖ Generator sets and heat recovery system for industrial heating;
- ❖ Fuel storage and fuel stations.

For the purposes of the environmental assessment, these facilities along with their construction and operation were grouped in different project components that are listed and described in Table 3.6.1.





Figure 3.6.1 3D model simulation of Renard Project site in operation



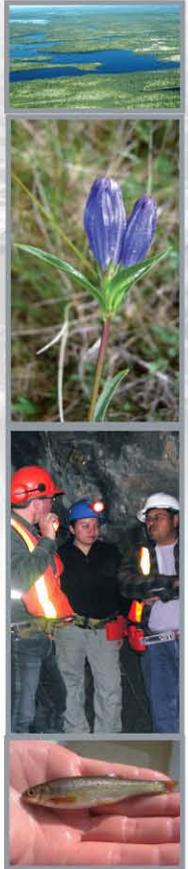
Tableau 3.6.1 Project components by project phase

Project Components		
Construction phase	Operation phase	Closure phase
Site clearing and preparation	Open pit development	Water management
Operation of quarry and borrow pits	Maintenance and operation of machinery and power generating sets; road traffic	Maintenance and operation of machinery and power generating sets; road traffic
Maintenance and operation of machinery and power generating sets; road traffic	Ore mining, handling and storage	Dismantling and recovering facilities
Dewatering of lakes and watercourses and sediment and water management	Ore processing	Final site rehabilitation and revegetation
Water supply	Management of material resulting from mining	Work force and procurement
Water management of on the construction site	Water supply	Remains of the site
Solid waste storage and management system and trench landfill	Water management	
Fuel and hazardous materials storage and management	Solid waste storage and management system and trench landfill	
Construction of mining facilities	Fuel and hazardous materials storage and management	
Work force and procurement	Power generating sets	
	Airstrip operation	
	Presence of facilities	
	Work force and procurement	
	Progressive site rehabilitation	

### 3.7 Work Force and Procurement

The Renard Project will be developed in a region with long established mining and forestry industries. A highly skilled and experienced regional workforce will therefore be available for the project. In recent years, however, economic activity in Northern Quebec has declined considerably: several mines in the area have ceased production; the forestry industry has been seriously affected by a downturn in demand, and the development of large hydroelectric projects has slowed. The economic contraction has had the effect of decreasing demand for workers in the region, which has prompted workers to seek employment elsewhere, even to retrain and migrate to other industries or to Cree or Jamesian public institutions.

Today, the situation is quite different. The Quebec mining industry is booming. According to the 2010-2020 report by the *Comité sectoriel de main-d'œuvre de l'Industrie des mines* (CSMO Mines), an increase of 31% in the number of operating mines is expected by 2015, and 41% by 2020. This increased growth in the mining industry combined with an aging workforce points to a pending labour shortage, an issue many mining companies in Nord-du-Québec will have to face. According to CSMO Mines, by 2020, 12,800 job openings will need to be filled in the Abitibi-Témiscamingue, the Côte-Nord and primarily Nord-du-Québec regions. We know for example that mining projects in the advanced exploration stage in the



Renard Project area of influence are likely to induce significant pressure on the pool of qualified regional workers. Manpower requirements for six known projects are estimated to be close to 2,000 workers.

The workforce required for the Renard diamond project is indicated in Table 3.7.1. Stornoway is committed to promoting and encouraging employment on Eeyou Istche Baie-James territory. The company will also promote and facilitate the registration of potential candidates in appropriate training programs offered by recognized educational institutions. In addition, Stornoway will actively participate in regional and national career fairs and other employment events focussing on employment.

Table 3.7.1 Manpower requirements for Renard Project

Phases	Number of Jobs	Main Types of Jobs
Construction phase (2013 to 2015)	343 <sup>1</sup>	Jobs connected with civil engineering, concrete, steel, architecture, mechanical, piping, electrical, instrumentation, mine development, shaft, headframe and ramp construction, and management and supervision
Operation phase (2014 to 2033)	450	Miners, truck and heavy machinery operators, mechanics and electromechanics, engineers, nurses, and administrative and human resources personnel, etc.
Closure phase (last two years following end of operations)	50	Workers for dismantling facilities, planters.

Source: Stornoway, 2011

<sup>1</sup> A maximum of 550 jobs will be created during the construction phase.

Procurement for the Renard Project includes the acquisition of goods and services for the construction, operation and closure of the mine site. A responsible procurement policy will be adopted by Stornoway to maximize the application of the 3RVE principles (reduce, reuse, recycle, convert and eliminate) (see section 3.2.7 of the ESIA).

Purchases of the materials and equipment at the start of the project will serve, first, to build the mine, and, secondly, for its operation. Once the mine site is permanently accessible via Route 167, one of the priorities will be to build a warehouse. Goods will be delivered to the mine site primarily by truck with a regular flow of deliveries. It is anticipated that 40,000 truck trips will be required during the three-year construction phase. Transportation costs will amount to \$2 million



including any necessary maritime transportation. Some regional and provincial companies have been identified as potential sub-contractors for the transportation of materials and equipment.

### 3.8 Construction Plan

The strategy for building the facilities will promote the optimal use or reuse of facilities in the operation phase, while minimizing risks for workers and the environment. The project development and implementation schedule is shown in Figure 3.8.1.

### 3.9 Implementation Schedule and Manpower Requirements

#### 3.9.1 Implementation Schedule

The construction phase for the Renard Project is scheduled to start in May 2013 (Figure 3.8.1) with the preliminary work (site clearing and preparation, roads, temporary camp, water management, water treatment system, etc.). The first permanent access road to the Renard Project will be built by July 2013, on the basis of the construction schedule for the extension of Route 167. The road works will be carried out entirely by the *Ministère du Transport du Québec* (MTQ).

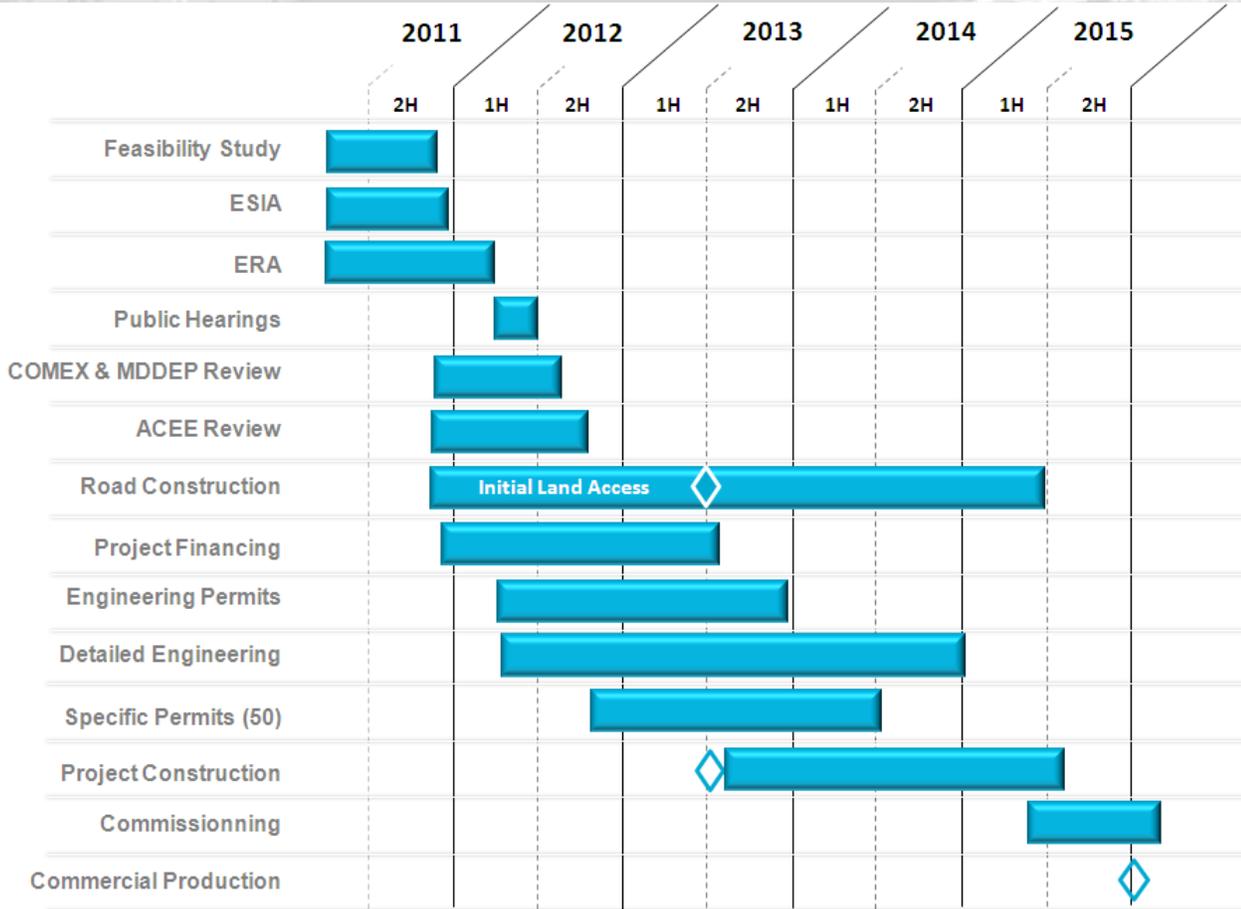
Construction work at the site will begin with the construction of infrastructure (permanent camp, service building, generator sets, airstrip, etc.), kimberlite processing plant (structural, mechanical, electrical and instrumentation work), pits and headframe for underground operations as well as mine site development work (pit preparation, ramps, underground construction). The construction phase will continue until 2015.

Use of the airstrip could start by late August 2013, and it is expected to be fully operational by December 2013.

Mining will extend over about 20 years. Open pit mining operations will begin in 2014 and end in 2016. In the meantime, operations at the kimberlite processing plant will start up in late September 2015. Underground mining activities will begin in 2016 and end around 2033. During the operation phase, progressive rehabilitation and revegetation work will be carried out.



The site restoration work (dismantling of infrastructure and reforestation work) will start in 2033 and is expected to take about two years (will end in 2035).



**Figure 3.8.1** Schedule of activities planned for the project development and implementation

**3.9.2 Manpower Requirements**

**3.9.2.1 Construction Phase**

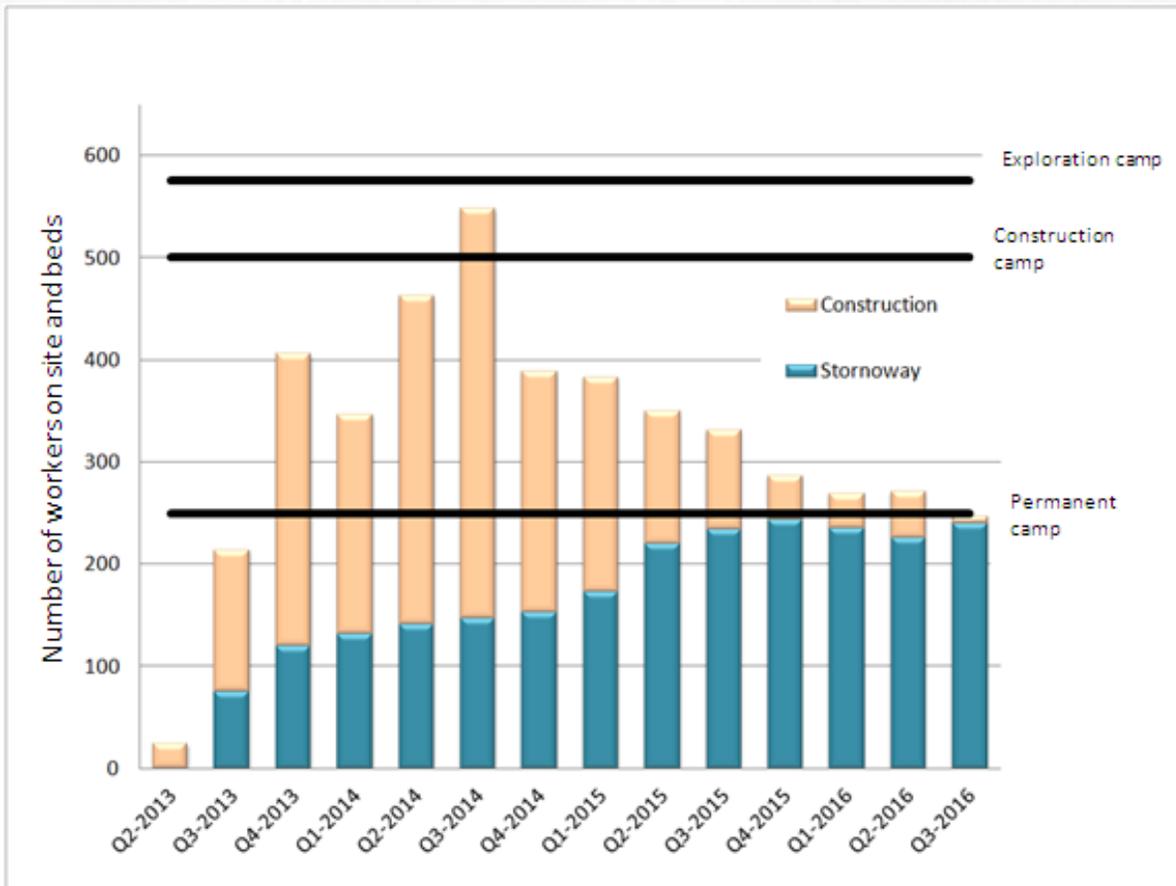
The first major hiring period will take place in late 2013. Work will begin with infrastructure construction (e.g., camp construction), airstrip construction, and site clearing and preparation. A second hiring phase will occur in mid 2014 for the intensive work to build the kimberlite processing plant.

At the peak of construction, in the third quarter of 2014, some 550 individuals will be working at the site, including close to 350 construction workers, about 50 workers



for the construction of the shaft and headframe (work to be performed by specialized contractor) and some 150 workers for mine development. The camp will accommodate 575 at that time (Figure 3.9.1). During the construction phase (2013-2016), the staffing level will reach an average of 343 employees on site.

The types of jobs created will be related to engineering (civil and structural engineering), architectural, electrical and mechanical work, plant construction (e.g., instrumentation), mining development, as well as management and supervision of work and personnel.



Source: Stornoway, décembre 2011

Figure 3.9.1 Main-d'oeuvre au site et capacité cumulative des camps



➤ *WORK SCHEDULE*

Depending on the type of work performed, the typical workweek during the construction phase will range from 70 to 84 hours (10 or 12 hours per day, seven days a week), with 2 to 4 week rotations on site followed by 1 to 2 weeks leave off site.

### 3.9.2.2 Operation Phase

During the 20 years of mining (2014 to 2033), the average staffing level will be 450 employees, including 85 subcontractor employees. The largest number of employees during the operation phase will be working in the underground mine. Stornoway anticipates operating with 230 employees on a two-shift rotation.

Manpower requirements during the operation of the mine will involve the following activities: ore processing plant (e.g., process engineer), technical services (e.g., geology), mining activities (e.g., machinery operators), diamond recovery facilities (e.g., diamond sorters), maintenance (e.g., electricians), security (security officers), environment (e.g., environmental technicians), human resources (e.g., trainers), procurement (e.g., warehouse clerks) and camp logistics (e.g., housekeeping).

Many management and administration jobs will be located offsite, in Longueuil, Toronto, Vancouver, Chibougamau ou Quebec (e.g., vice-president, business development).

➤ *WORK SCHEDULE*

To provide employees with longer periods of rest, offset the remoteness of the work site and promote a positive work-life balance, Stornoway will implement a work rotation of two (2) weeks on site following by two (2) weeks leave off site. The schedule is based on a 84-hour workweek (12 hours per day, 7 days a week).

➤ *WORKER TRANSPORTATION*

Workers will be flown in by plane from the Chibougamau airport, which will be the principal staging area for travel to the mine site. Another aircraft will be based in Montreal, the secondary staging area. If required, alternative staging points will be established as dictated by the geographical distribution of the workforce.



**3.9.2.3 Closure Phase**

Jobs will decline significantly for the closure phase, which should begin in 2033. About 50 workers will be involved in dismantling the site, along with a few planters for the reforestation work.

**3.10 Closure and Progressive Rehabilitation Plan**

A rehabilitation plan (also called a closure and progressive rehabilitation plan) that will be subject to prior approval by the Ministry of Natural Resources and Wildlife (MRNF) has been prepared and is presented in full in Appendix 3.18.1 of the ESIA.

The rehabilitation plan will incorporate the following principles:

- ❖ No building shall be left in place. Buildings will be sold along with the equipment they contain in full or in part. All mobile equipment and vehicles will be transported off site for sale or recycling;
- ❖ Secondary roads and trails will be scarified and revegetated;
- ❖ Flat surfaces of the processed kimberlite confinement area and the overburden stockpile will be revegetated;
- ❖ The waste rock pile and temporary ore stockpile will be revegetated;
- ❖ The domestic wastewater treatment plant and mine wastewater treatment plant will be dismantled;
- ❖ R-2/R-3 and R-65 open pits will no longer be dewatered and will gradually become “lakes”. Where feasible surface drainage will be restored to pre-project conditions;
- ❖ Embankments will be constructed around the pits and a concrete slab installed to secure underground access points (shaft, access ramp, vent raise and backfill raises);
- ❖ The airstrip will be offered to local authorities given that it represents a component of regional development for the community. If for any reason, local authorities do not wish to assume responsibility for the airstrip, it will be scarified and revegetated, and the airstrip buildings will be dismantled;
- ❖ A period of post-closure monitoring.







Figure 3.10.1 3D model of site following closure and revegetation

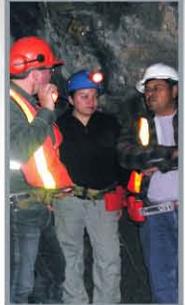


## 4 Communication and Public Consultation

### 4.1 Objectives and Methods

To make the Renard Diamond Project more socially acceptable, Stornoway Diamonds (Canada) Inc. implemented a proactive stakeholder communication and consultation process.

The process began when the land was first explored in the early 2000s. It became more intensive during bulk sampling in 2006-2007 and again when feasibility studies and environmental and social impact assessment of the project began in 2010.



## 4.2 Communication and Consultation during the Study

In June 2000, the partners involved in the project informed the authorities in the Cree community of Mistissini of their intentions since the Renard Project is located in traditional Mistissini territory. These discussions quickly led to a first official meeting with Mistissini representatives early in 2002.

Over the years, there have been various communication and consultation initiatives. The main ones are summarized below:

- ❖ Meetings with the Mistissini Band Council and elected representatives of Chibougamau and Chapais to inform them of the Renard Project's progress;
- ❖ The *Renard-Mistissini Working Group* was set up to keep Swallow family members and the Cree community of Mistissini informed regarding jobs that would be available on the Renard Project. It was dissolved in summer 2010 after the Pre-Development Agreement (PDA) was signed;
- ❖ Negotiation of agreements with the Cree Nation of Mistissini and the Grand Council of the Crees (Eeyou Istchee) led to the signature of a Pre-Development Agreement (PDA) in July 2010. Further discussions began in the fall of 2010 to develop an Impacts and Benefits Agreement (IBA);
- ❖ The *Environment Exchange Group* was created to contribute to project development and preparation of the ESIA. Six meetings were held at regular intervals during the ESIA. The group consisted of 17 to 29 members representing Stornoway and its environmental consultant, the Cree Nation of Mistissini (administrators, members of the family that operates trapline M11, etc.) and various local organizations;
- ❖ Regular feedback and discussion meetings were held with the tallymen and their families;
- ❖ Two open houses gave Stornoway opportunities for contact with the citizens of Chibougamau and Mistissini to answer people's questions and deal with their concerns and expectations regarding the Renard Project;
- ❖ Stornoway opened an office in Mistissini in January 2011 to maintain a presence in the community and a place where Renard Project information can be exchanged with the Crees on a variety of social, environmental and economic topics, especially upcoming training, employment and business opportunities;
- ❖ Eight official site tours were organized to explain and describe the nature of the current activities to the Crees and their representatives;
- ❖ The *Otish Mountain Access Road Committee*, set up in 2006 by the Mayor of Chibougamau and the Chief of Mistissini, is composed of mining companies and various regional and provincial socioeconomic stakeholders. Stornoway joined the group to cultivate a partnership with local and regional stakeholders. The committee's objective is to make government authorities aware that this multiservice road has structural value for regional development. The committee is also a dynamic vehicle for information and communication about progress of



the Renard Project, which was perceived to be a driving force for this regional road;

- ◆ Participation in local public events has enabled Stornoway to inform local populations about project developments and possible spinoffs for the region. For example, Stornoway discussed its project during conferences organized by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), Développement Chibougamau and the Chamber of Commerce. Stornoway also took part in the Symposium Mines Baie-James in Chibougamau and Mistissini;
- ◆ Preconsultation meetings held in October 2010 in Chibougamau and Mistissini established contacts with various local organizations and garnered additional information needed to complete the ESIA.

The comments, concerns and questions from the participants (trapline M11 users, socioeconomic stakeholders, etc.) during the various communication and consultation initiatives were collected and compiled to be taken into account in project optimization and completion of the ESIA. The comments and concerns dealt mainly with the following aspects: technical clarifications, economic, social and cultural considerations, relations between the proponent and stakeholders, environmental assessment and impacts, and the environment.

### 4.3 Consideration of Local Knowledge

Local knowledge considered for this environmental and social impact assessment covers the various facets of knowledge, including the local population's knowledge about use of the environment, environment-related knowledge, the value of environmental components and the basis for the knowledge system. The environment concerned here is almost exclusively used by the Crees so the local knowledge considered is therefore mainly native and commonly known as Cree traditional knowledge.

Local knowledge information was mostly obtained during an in-depth, semi-guided interview of trapline M11 users on September 1, 2010, and during various validation and feedback meetings with the same users.



#### 4.4 Public Consultation and Communication during the Project

To maintain transparency and harmonious community relations, Stornoway will continue the consultation and communication initiatives begun during the project feasibility study throughout the project. Stornoway is therefore making public the results of its Environmental and Social Impact Assessment (ESIA) before it is published by the government authorities. When the latter is published, Cree and public authorities will be able to file depositions with the Evaluating Committee (COMEV) that may hold public hearings or other forms of consultation. Stornoway will make all the necessary audiovisual materials available to the participants for the public consultations.

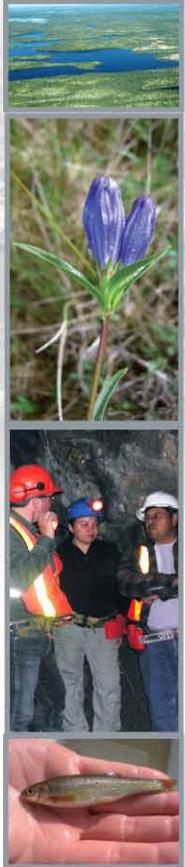


Following project authorization, Stornoway will encourage consultation of the Crees by setting up various discussion and coordination committees in accordance with the Impact and Benefit Agreement (IBA), specifically the Renard Committee, the Education and Training Committee and the Environment Committee. The Environment Exchange Groups will also continue to operate.

#### 4.5 Social and Economic Impacts and Benefits Agreement (IBA)

The Pre-Development Agreement (PDA) signed in July 2010 by Stornoway, the Cree Nation of Mistissini and the Grand Council of the Crees (Eeyou Istchee) provides for business opportunities and jobs for Crees during the pre-development phase, evaluation of business capabilities and jobs during the operation phase, development of a common communication strategy, and Cree collaboration in conducting the ESIA and any other relevant studies. During 2011, these commitments led to completion of a study of business capabilities and jobs for Crees during operation of the Renard mine. Six Environment Exchange Group meetings were also held in Mistissini.

With a view to confirming social acceptability, the stakeholders then began discussions to develop an Impacts and Benefits Agreement (IBA), which is intended



# CHAPTER 4

## ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT Renard Diamond Project SUMMARY

to establish and support long-term harmonious, productive work relations based on mutual trust and respect, in a context of sustainable development. It is the main measure for mitigating impacts and maximizing benefits of the Renard Project for the Crees. The IBA includes rules for awarding contracts and hiring Cree workers, as well as various workers training and coaching measures. It identifies action that Stornoway will take to enhance and protect Cree society and culture and support continuation of traditional hunting, fishing and trapping activities.

With regard to environmental protection, the IBA sets out the management measures that will be used during mining and provides for Cree participation in environmental monitoring. Optimization of the Crees' local knowledge is the particular focus here.

The IBA also highlights the parties' agreement on participation, collaboration, discussion and communication. This will be achieved by creating a Renard Committee to monitor compliance with the IBA. This committee will include representatives of Stornoway, the Cree Nation of Mistissini and the Grand Council of the Crees (Eeyou Istchee). It will meet at least four times a year. The committee may call upon the services of any other technical committee, as deemed appropriate. Effective immediately, the IBA provides for creation of a Training Committee and an Environment Committee. The Crees and Stornoway will have equal representation on these two committees.

The IBA includes financial commitments towards the Cree community. The benefits granted will be paid into various dedicated funds that may be used, for example, for training, social and economic development, environmental monitoring, etc.



4





## 5 Environmental Description

The environmental baseline study (EBS) for the Renard Project was carried out using documentary sources as well as surveys and inventories conducted from 2003 to 2011 in collaboration with tallymen. The new environmental data on the physical, biological and human environments that are summarized in the EBS are now public information. This new data will be used to gradually build a natural environment reference database and enable public institutions and the Cree and Jamesian community to set their own baselines and anticipate and manage the potential impacts of future projects that are likely to be developed in the region under the auspices of the Quebec government's Plan Nord.

### 5.1 Physical Environment

#### 5.1.1 Climate

The weather in the area of the Renard Project is characterized by very long, cold winters when the mercury may drop to  $-50^{\circ}\text{C}$ . Overall, the region receives about 500 mm of rain and 300 cm of snow annually. Lakes in the area are partially or completely ice-covered from October to May. The air quality shows pollutant concentrations significantly below current air-quality standards. However, forest fires can temporarily degrade air quality by increasing concentrations of air-borne fine particulates.

#### 5.1.2 Topography, Geology and Surficial Deposits

The land around the Renard Project study area is 450 m to 550 m in altitude. The topography is gently undulating and scattered with many lakes, streams and rounded hills rarely exceeding 100 m in elevation. The rock substratum consists of geological formations mostly belonging to the Superior Province ( $\leq 2.90$  to 2.65 billion years ago) and includes diamondiferous kimberlite. The various minerals found in the area's rock formations support a mining industry that has driven regional development in James Bay. Northern Quebec has excellent potential for diamond discoveries because the Quebec part of the Superior craton shares many characteristics with cratons elsewhere in Canada that contain diamondiferous kimberlites.



The vast majority of surface deposits covering the study area consist of glacial material deposited directly by the glacier. Unconsolidated deposits are mostly sand and gravel characterized by till 0 to 24 metres thick. Eskers and small proglacial outwash plains cut across the area and provide a good source of borrow materials. Few areas sensitive to natural erosion were observed. The results of soil characterization further show that some metals, such as chromium and nickel, naturally exceed criterion A of the MDDEP *Soil Protection Policy*.

### 5.1.3 Groundwater

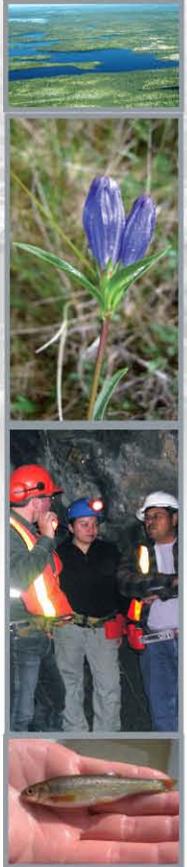
The aquifer in the bedrock is confined or semi-confined, which suggests that the predominantly till layer on top of the bedrock is naturally not very permeable. According to DRASTIC indices, groundwater vulnerability is considered low to medium for till overlying bedrock and basal till and bedrock, and high to very high for sand and gravel deposits and wetlands. Groundwater flows mainly into the various surface waterbodies, suggesting the presence of groundwater resurgence into the various lakes and aquifer recharge areas on high topography. In unconsolidated deposits, the water table is 0 to 8 m below the surface and its quality could make it a potential source for drinking water, despite the water's lower pretreatment quality (presence of iron and zinc).

### 5.1.4 Hydrology

The Renard Project lies within the Misask River watershed (1,515 km<sup>2</sup>). This river flows into the Eastmain River. Ninety percent of the water in the Eastmain watershed (32,893 km<sup>2</sup>) is diverted into the Grande Rivière watershed (97,400 km<sup>2</sup>). The presence of a string of lakes in the Misask River watershed causes the routing of streamflow, reducing the peak flow by spreading the flood volume over time.

All the streams draining the Renard Project site flow into Lagopede Lake. At the head of the Misask River watershed, these streams are generally shallow with very limited flow. Some are intermittent and flow through boulder fields or wetlands where the flow is diffuse.

The estimated annual average inflow into Lagopede Lake is 4.6 m<sup>3</sup>/s, for an annual volume of 146,556,852 m<sup>3</sup>. For information, 13 of the 25 subwatersheds that feed Lagopede Lake flow into the main tributary north of the lake, accounting for 50.7%



of the discharge from the different subwatersheds. The volume of Lagopede Lake is 21 Mm<sup>3</sup> and the water renewal time for the lake is about fifty days.

### 5.1.5 Surface Water and Sediment

The results of water quality and sediment characterization show that, overall, the water and sediment in the Renard Project study area are of good quality and their properties are similar to those at other sites in the region. The water is generally clear and the pH ranges from acidic to neutral. Ion and nutrient concentrations are low or below detection limits. Because of the low alkalinity, surface water in the study area is highly sensitive to acidification.

The highest concentrations of metals in the water are iron, manganese and copper, which are characteristic of the bedrock in the study area.

## 5.2 Biological Environment

### 5.2.1 Plants

The Renard Project study area is in the black spruce-lichen domain that covers the taiga subzone. In this region, the growing season is short and varies from 100 to 140 days. The cold, harsh climate partially dictates the northern distribution range of some plant and animal species. For example, in the study area, balsam fir and jack pine are at the northern limit of their range.

The land in the study area is 94% low-density coniferous forest and 1.7% barrens of boulder fields, rock outcrops and clearings. These forests grow on a bed of lichens, moss and sphagnum. Black spruce, whose reproduction is supported by the harsh climate and low precipitation, are scattered across the carpet of lichens. Wetlands, mainly bogs, are generally small and cover 2% of the land in the study area.

At least 24 species of traditionally used plants were reported during the surveys. No threatened or vulnerable plants or plants likely to be so designated were reported or observed in the study area.

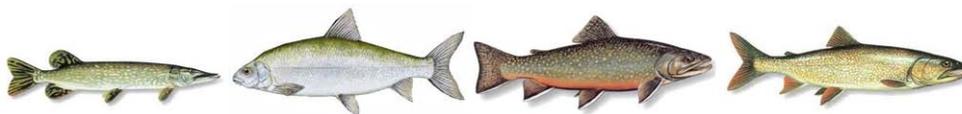


### 5.2.2 Benthos and Fish

The hydrographic network is characterized by the presence of many small, low-flow or intermittent streams that generally have a channel-type facies. The average depth of the streams is usually less than 1 metre and there is little aquatic vegetation. Most of the lakes are small (<10 ha) and relatively shallow (<5 m), except for Lagopede Lake (471 ha) which is the largest lake in the study area. It contains many pools that can be nearly 25 m deep. The substrate in lakes is generally silt, organic matter, sand and boulders. The lakeshores are mainly sand and sometimes gravel.

The lake and river bottoms are colonized by benthic organisms that serve as food for fish and some bird and amphibian species.

Most of the lakes and rivers likely contain fish. Although 14 species of fish were recorded in the study area, 91% of the 1,314 fish caught during the fish survey belong to four species (pearl dace, white sucker, brook trout and lake chub). No special-status species or fish likely to be so designated were recorded. All the species caught are frequently observed in the area according to previous studies. In general, the species richness of fish in the study area is higher than in watersheds farther south. Northern pike, lake whitefish, brook trout, lake trout and burbot are the five fish species preferred by Cree fishermen in the study area. Given the limited access to the Renard Project site, fishing pressure is fairly limited.



### 5.2.3 Amphibians and Reptiles

In this region, amphibian and reptile richness tends to decrease latitudinally, from south to north. Only five species were sighted during surveys in the Renard Project study area: four Anura species (mink frog, northern spring peeper, wood frog and American toad) and one lungless salamander species (northern two-lined salamander). None of the species observed are on the federal list of endangered species or on the Quebec list of animal species designated threatened or vulnerable or likely to be so designated.



### 5.2.4 Birds

The surveys in the Renard Project study area confirmed the presence of 45 species of forest birds, evaluated the relative abundance and density of nesting birds, and corroborated the presence of special-status species. All of these species nest in the study area with a varying degree of certitude (possible, probable or confirmed). The olive-sided flycatcher and rusty blackbird, two species at risk, were confirmed as nesting in the study area. Two other species warrant special interest: the Bohemian waxwing (first record of nesting in Quebec) and the orange-crowned warbler (rarely nests in Quebec). The presence of two forest birds (spruce grouse and willow ptarmigan) that are hunted by the Crees was confirmed in the study area (in winter).



Only three raptor species were recorded during the breeding period in the study area: osprey, red-tailed hawk and bald eagles (a species classified as vulnerable by the province). Only the red-tailed hawk was confirmed as actively nesting on the cliffs in the study area. One juvenile bald eagle was observed in flight in 2010; it was most likely a nomadic bird just passing through the area.

Nine Anatidae species (ducks and geese) were observed in the study area, including three species that accounted for 60% of the nesting birds.

### 5.2.3 Mammals



Surveys confirmed the presence of 23 species of mammals in the study area, including seven micromammal species. The southern bog lemming is the only species caught that is likely to be designated threatened or vulnerable.

In the area surveyed in March 2011 for large mammals, only 29 migratory caribou were observed in three groups between 34 and 43 km from camp Lagopede. The Renard Project study area therefore falls within their wintering ground. The reduction of the Riviere aux Feuilles migratory caribou herds and their more limited movements compared to the past may partly explain the low occupation of the study area by migratory caribou. This information was corroborated by the tallymen.

No woodland caribou were observed in the vast territory surveyed. It appears that since the great caribou migrations in the 1990s, the woodland ecotype has left the



region. The woodland caribou herd nearest to camp Lagopede is the Temiscamie herd. The winter feeding potential in the study area is average for woodland caribou and the obvious presence of wolves would considerably interfere with woodland caribou survival in the study area.

With the gradual northward expansion of their range, moose have become a species valued by the Cree hunters. Moose inhabit mixed forests of conifers and deciduous trees, especially forests of white or yellow birch. Since the land in the Renard Project study area is 94% coniferous forests, it is normal that moose abundance in the area would be very low. In March 2011, no moose were observed during the big game survey. However, in September 2010, moose tracks were

sighted twice within a 3-km radius of camp Lagopede. The survey

of a 100-km<sup>2</sup> control area near the project study area

recorded four moose (two males, one female and one calf) for a density of 0.04 moose/km<sup>2</sup>. Given that

moose in the study area are in the northern part of their range, that very small deciduous forests are

present and that moose densities recorded during the

survey are low compared to moose densities in Quebec,

we can consider that the number of moose in the Renard Project

study area is low. Furthermore, the high density of wolves and bears observed in the study area would definitely account for predation of moose.

The habitat potential for fur-bearing mammals in the study area was based on the results of a track survey in March 2011, scientific literature and available trapping data. Some species have a relatively high abundance in the area, specifically grey wolf, red squirrel and American martin. The abundance for others, like the red fox, snowshoe hare, river otter and American mink, is medium. Some species, i.e., beavers, Canada lynx, porcupines and short-tailed weasel, are low in abundance.

### 5.3 Human Environment

The Renard Project is located in a region that was inhabited some four thousand years ago. To date, the area has been occupied mainly by Amerindians, with infrequent visits over time by European and Canadian explorers. Furthermore, it is



an enclave not currently accessible by road. This will change soon, however, with the extension of Route 167 to the mine site.

Land use around the mine is typical of traditional resource harvesting by the James Bay Crees; the immediate responsibility for it lies with the users of trapline M11

from the Cree community of Mistissini. This vast trapline, covering some 3,800 km<sup>2</sup>, includes two main Cree camps and is traversed by a number of snowmobile trails, this being the preferred travel method for hunting, fishing and trapping. These activities are concentrated in certain favourite parts of the trapline, specifically around lakes Lagopede, Emmanuel and Bray. The tallymen spend most of the year

on trapline M11 and are accompanied by about 25 other users who frequent trapline M11 on a regular basis. Natural resource harvesting mentioned by the family members occupying the trapline include, among other things, waterfowl hunting, big game hunting, trapping fur-bearing animals, collecting berries and wood, and fishing. Users also mentioned the presence of a number of valued sites on their trapline, specifically birthplaces and burial sites.

From an administrative point of view, the Renard Project is in an area that has seen many changes since Phase 1 of the James Bay hydropower development. At that time, in the mid 1970s, the *James Bay and Northern Québec Agreement* was signed. It was followed, in the early 2000s, by the *Agreement Concerning a New Relationship between Le gouvernement du Québec and the Crees of Québec*, commonly called the *Paix des Braves*. More recent is the *Framework Agreement between the Crees of Eeyou Istchee and the gouvernement du Québec on Governance in the Eeyou Istchee James Bay Territory*, which provides for negotiation of a merger between the Jamesian and Cree authorities in a new, shared regional governance entity that will be known as the Eeyou Istchee James Bay Regional Government. The Renard Project is also a beachhead for the Plan Nord, providing financial input from Stornoway for extension of Route 167 and making a significant contribution to the development of mining in Quebec.



On a more local scale, the project concerns the Cree community of Mistissini, which is about 250 km south of the Renard Project, and the towns of Chibougamau and Chapais, about 100 km farther south. In 2006, these localities had 3,500, 7,565 and 1,630 inhabitants respectively. They have various services that can be used during construction and operation of the Renard mine. Some of the labour required can also come from the region, generating a real opportunity for economic and social development.

Such development is even more desirable in the Cree community where socioeconomic conditions lag somewhat behind those of Quebec as a whole. The median personal income for the Mistissini Crees is about \$22,000, compared to nearly \$24,500 for Quebec. Unemployment exceeds 20%, while in Quebec it wavers around 7.5%. In recent years, the number of students who obtain a high school diploma has remained between 20% and 40% in Mistissini, while it is around 75% for Quebec.

The employment and education challenge among the Crees is all the more blatant and urgent because it is a young, growing society. Half of the population of Mistissini is under age 24 whereas in Quebec this age group accounts for about 30%.



## 6 Impact Assessment

The Renard Project was prepared with a view to preventing and limiting potential adverse impacts on the environment. However, given the size of the project and despite precautionary measures, it will still generate certain impacts that will require monitoring and the application of specific mitigation and management measures. Figure 6.1.1 provides a summary of the residual impacts of the Renard Project that may persist after the application of planned mitigation measures. Chapters 6, 7 and 8 of the ESIA present a detailed description of anticipated impacts on the physical, biological and human environments, along with planned mitigation, compensation and improvement measures. Chapter 9 summarizes these measures by project component. Chapter 10 outlines the cumulative effects of the project, while Chapter 11 presents the environmental and social management plan that specifies the environmental management measures established to manage residual impacts including a monitoring and surveillance program.



Figure 6.1.1 Summary of residual impacts on valued environmental components by project phase

Project phase	Valued Environmental Components																						
	Physical environment							Biological environment									Human environment						
	Air quality	Ambient noise level	Soil	Groundwater	Hydrological regime	Surface waters	Sediment	Benthos	Fish	Vegetation and wetlands	Amphibians	Waterfowl and other waterbirds	Raptors	Forest birds	Micromammals	Fur-bearing animals	Large game	Land use	Socio-economic context	Economic environment	Health and well-being	Archaeological heritage	Landscape
Construction	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	●	⚠
Operation	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	●	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	⚠	●	⚠
Closure	⚠	⚠	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	●	⬆

**Legend (symbols) - Significance of impacts**

⚠	Negative, low	⬆	Positive, low	●	Negligible or zero
⚠	Negative, moderate	⬆	Positive, moderate		
⚠	Negative, high	⬆	Positive, high		

## 6.1 Construction Phase

The project components that will generate the greatest environmental impact during the construction phase are site preparation and development work, along with water management activities specifically the dewatering of small lakes F3302 and F3303 and the diversion of the F3298V stream north of pit R-65. The main anticipated impacts are the loss of terrestrial and aquatic habitats, and water quality degradation. Note that 90% of terrestrial and wetland habitat losses and 100% of aquatic habitat losses will occur during this phase of the project.

### 6.1.1 Milieu physique

Impacts on the physical environment will occur primarily during the site preparation and development work. Anticipated residual impacts are primarily related to:

#### ◆ SOIL EROSION

- These changes should not have a significant impact on water and sediment quality other than site-specific punctual changes;
- Erosion control measures and the water management plan will include a system of perimeter collection ditches, a large sedimentation pond in pit R-65 and a mine water treatment system.

#### ◆ SITE-SPECIFIC CHANGES TO THE HYDROLOGICAL AND HYDROGEOLOGICAL REGIME IN SOME SMALL SUB- WATERSHEDS

- These are associated with changes in topography and the type of surface materials and the dewatering of two small lakes. These changes will lead to an increase in runoff;
- The footprint of the Renard Project (226 ha, for all phases combined) represents only 1.4% of the Lagopede Lake watershed (15,681 ha).

#### ◆ RISKS OF CONTAMINANT LEAKS AND ACCIDENTAL SPILLS

- These risks are associated with the use of machinery and power generating sets along with road traffic, which may affect locally soil, as well as surface and groundwater quality;
- The risks of leaks and accidental spills primarily involve gas and diesel fuel from vehicles, machinery and power generator sets, refuelling areas and hazardous materials (paints, solvents, oils, etc.) storage areas. However, the hazardous materials and fuel management plans, as well as the emergency response plan will serve to prevent leaks and spills and allow fast and efficient response to confining contamination in the event of an accident.

#### ◆ NUISANCES, SUCH AS NOISE AND DUST, WHICH WILL ESSENTIALLY BE CONFINED TO THE WORK AREAS

- Where necessary, such nuisances will be controlled with dust control agents and noise mitigation measures so as to comply with health and safety standards and ensure the well-being of mine workers.



The machinery used will release combustion gases and suspended particulates. Owing to the low levels of exhaust from the machinery, the maximum concentration of combustion gases released will be within 100 m of the machinery. The concentrations of nitrogen oxides and particulates emitted by the machinery will be below the limits set out in the *Regulation respecting occupational health and safety*.

The seepage of precipitation through the solid waste at the trench landfill (LEET) may result in the transport of contaminants (nutrients, metals, organic matter) to the water table. To minimize such impacts, the LEET was designed to meet the specifications set out in the *Regulation respecting the landfilling and incineration of residual materials* (REIMR, RSQ c. Q-2, r. 19). In addition, the soil at the LEET site will be raised so that the waste is buried above the water table. To ensure the leachate is properly treated, a system of observation wells will be installed on the periphery of the LEET to monitor groundwater quality.

According to the activities typically associated with adverse residual impacts, the residual impacts on valued environmental components of the physical environment are considered to be limited in the construction phase, given that they will be limited over time and will affect small extents (Figure 6.1.1).

### 6.1.2 Biological Environment

During the construction phase, the most obvious residual impacts are connected with terrestrial and aquatic habitat losses caused by the site preparation and development work (clearing, stripping, cut and fill, etc.), the dewatering of small lakes F3302 and F3303 along with a few streams, and the diversion of stream F3298V to Lake F3295.

Clearing will lead to the loss of forest stands (254 ha or 2.5% of initial area), dry barren land (18 ha or 16% of initial area) and wetlands (4.8 ha or 1.8% of the initial area). Young black spruce-lichen stands, the most extensive stand in the study area, will account for about 68% of the forest ecosystem losses. Old black spruce-sphagnum-moss stands and old jack pine-lichen stands will absorb respectively 15% and 14% of such losses. The wetlands that will be lost (1.5% of their initial area) are small in size and consist of open ombrotrophic peatland and riparian minerotrophic peatland.



None of the affected forest ecosystems and wetlands is rare or unique from a regional perspective and the affected areas are limited. The impact of the project on vegetation and wetlands in the construction phase is therefore considered to be low. These environments are however wildlife habitats. Two bird species will lose nesting and feeding habitat as a result of the site preparation and development work. These two bird species are the olive-sided flycatcher (species that is considered threatened federally and likely to be designated as threatened or vulnerable provincially) and the rusty blackbird (species of special concern federally and likely to be designated as threatened or vulnerable provincially). The site preparation and development work will also result in barren areas (secondary roads, storage areas, etc.) representing physical barriers for the movement of amphibians between habitats. Although most animal species will be disturbed by the construction activities, some may actually be attracted by the mining facilities (wolf, fox, black bear and common raven) and could represent a nuisance. Making employees aware that they should neither feed wild animals nor leave any food out would help keep wild animals away from the mine site.

The two small lakes to be dewatered amount to 3.75 ha of lacustrine ecosystems, or 0.17% of the total initial lake area in the study area. Despite the small area covered by these lakes, they represent wildlife habitats. A total of about 2.3 km in streams will be lost (equivalent of 4,625 m<sup>2</sup> of fish habitat), or 3% of the total length of streams in the study area. Since a large part of the affected streams flow under the surface, only a small proportion consists of favourable fish habitats. Note that the stream bed of the new stream created from the diversion of Stream F3298V will be developed over 930 m so as to create a fish habitat. The total fish habitat losses associated with the Renard Project amount to 41,617 m<sup>2</sup> (11% stream and 89% lake habitats). These losses will be compensated by fish habitat gains associated with the proposed developments and the flooding of the pits at the end of mining (223,600 m<sup>2</sup> including 99% for the pits).

The water management system put in place on the site will limit residual impacts on water quality and aquatic wildlife. All the water that comes in contact with the mine site will be collected by means of a system of perimeter ditches, directed toward a sedimentation pond, then treated and tested before being discharged into Lagopede Lake. The impacts on water quality will in fact essentially be felt in the vicinity of the plumes of treated domestic wastewater and mine water effluents



discharged into Lagopede Lake. The plume modelling results for the treated domestic effluent indicated that at the edge of the mixing zone (52 to 130 m from the discharge point), the contaminant concentrations will be of the same order of magnitude as the concentrations currently measured in the receiving environment. Within the plumes, additional loads of nutrients and organic matter could increase local productivity in the vicinity of the discharge points.

The results of the plume modelling for treated mine effluent indicated that in severe low flow conditions, the initial concentration of the treated effluent will reach a dilution of 1:10 at a distance of 750 m from the discharge point and at 300 m under fall mixing conditions. In the north basin, at the edge of the plume, the concentration of the various contaminants will fall within the range of concentrations measured as part of the baseline conditions, except for total phosphorus, whose concentration at the edge of the plume could also slightly exceed (0.01 mg P/l) the concentration in the lake (95th percentile = 0.007 mg P/l). The mine water and domestic wastewater plumes will not overlap. The phosphorus input from mine effluent could result in a temporary (in August) and local increase of the total phosphorus concentration in the north basin of Lagopede Lake corresponding to the concentration found in a oligomesotrophic lake (typically between 0.007 and 0.013 mg/l of total phosphorus). Depending on the proportion of bioavailable phosphorus, these inputs could feasibly contribute to a site-specific and temporary increase in the productivity and fish potential in this sector of Lagopede Lake. Given the hydraulic residence time of water in Lagopede Lake (about 50 days) and the generally low water temperature in September, this effect would be short term, possibly limited to August. To validate the impact assessment, a water quality monitoring program is planned for Lagopede Lake and effluent discharges (see Chapter 11 of the ESIA).

Traffic speed limits on site will considerably reduce the likelihood of vehicle-wildlife collisions.

Possible sources of contamination from hydrocarbons and hazardous materials are the use and maintenance of machinery and generator sets, as well as the hazardous materials and fuel storage areas. Setting up a hazardous materials and fuels management plan will minimize the risk of leaks and spills involving hydrocarbons or other hazardous materials. The monitoring and surveillance programs will ensure rapid detection of leaks or spills and the emergency response



plan will decrease the magnitude and impact of any such accidents should they occur.

Finally, most construction activities result in nuisances such as noise and localized dust emissions. Anticipated noise levels have the potential to be higher than the residual noise levels in the natural environment within a 6-km radius of the facilities and could affect the daily activities of wildlife (amphibians, forest birds, waterfowl, micromammals, fur-bearing animals, and big game).

Generally, the residual impact of the construction phase on the biological environment will be negative and will vary from low to moderate according to the valued environmental component (Figure 6.1.1).

### 6.1.3 Human Environment

The project components that represent the main sources of impact during the construction phase are divided into three groups. The first group involves the actual footprint of the project and is associated with site preparation and development activities as well as the dewatering of the lakes and streams. The second group involves construction activities, whereas the third entails manpower and supply.

Site preparation and development activities essentially impact land use and the landscape. The first impact will entail the removal of 300 ha of territory from the natural resources harvesting area used by M11 trapline users. Clearing sites for the mining facilities and stripping soil in place will result in deterioration of the visual quality of the landscape. To minimize this impact, no infrastructure will be built within 30 m of Lagopede Lake or streams, and the height of the processed kimberlite confinement area will be lower than the surrounding hills.

In the case of construction activities, the use and maintenance of machinery and generator sets, road traffic, air transport and the construction of mining facilities will result in various nuisances that will make a certain number of animals distance themselves from the construction site, while inconveniencing local users of the territory.

Some species that are more sensitive to disruptions will avoid the mine area. Since a 1-km security perimeter will be set up around the facilities, Cree users of the area will need to change their hunting, fishing and trapping habits by avoiding the mine area.



Aircraft taking off and landing will undoubtedly inconvenience one of the trapline users who has a camp 2.1 km east of the airstrip. To minimize these impacts, Stornoway will maintain contact with trapline users to avoid interfering with their activities and will set up agreements with them to compensate for anticipated or observed disruptions.

There are in addition a few direct health and safety risks for personnel and visitors on the project site as well as in the mine during operation. This impact is taken into consideration as part of the general management of occupational health and safety at the construction site and at the mine, in compliance with applicable legislation specifically the *Act respecting occupational health and safety*.

Overall, the impacts during construction on land use and the landscape are of moderate significance (Figure 6.1.1). Mitigation measures to be applied will primarily focus on reducing adverse effects on the activities of trapline M11 users. Since mine employees and contractors will not be permitted to hunt or fish on the site, additional pressure on wildlife resources from hunting and fishing in the sector is not anticipated. The 1-km security perimeter around the facilities will also help mitigate pressure on hunting and trapping in the vicinity of the facilities and pressure on fishing in Lagopede Lake. It is possible that archaeological remains will be unearthed by the excavation work on site. In such cases the work will be stopped where the discovery is made to allow for a complete evaluation of the area by archaeologists.

Manpower requirements for construction work will have a positive impact on the socioeconomic context. The Nord-du-Québec and Abitibi-Témiscamingue regions are expected to provide almost a quarter of the manpower required during the construction phase, with about 450 jobs. In all, taking indirect and induced jobs into account, this phase of the project should sustain 6,642 jobs in person-year equivalents. Close to 70% of these jobs will be in Quebec. During the three-year construction phase, the initial investment of \$801.8 million should in addition generate economic spinoffs in the order of \$733 million in Canada, 14% of which will be in the region and 55% in the rest of the province of Quebec. Canada-wide induced effects will be just as important as direct effects, which means that worker incomes represent a major component of overall spinoffs and that the retail sector will benefit considerably from the construction phase.



Stornoway plans on developing a recruiting policy that promotes regional hiring to optimize its impact on the regional socioeconomic context.

## 6.2 Operation Phase

The operation phase will extend for about 20 years. The project components that will have the greatest impact during mining are likely those that generate jobs, stimulate the economy and provide business opportunities in the region. This applies in particular to the manpower and procurement components, which will support all other mine development activities during the operation phase.

In relation to impacts on the natural environment, the project components that are the most likely to impact the natural environment are mine extraction and materials management activities, water management, the presence of facilities, pit, quarry and borrow pit development, machinery use and maintenance, and road traffic. The other project components will have less of an impact on valued environmental components.

### 6.2.1 Physical Environment

Although the general footprint of the Renard Project will be relatively compact, the mining infrastructure to be developed will have various impacts on the physical environment. During the operation phase, the significance of anticipated adverse residual impacts on the physical environment varies from low to moderate depending on the valued environmental components.

In the case of soil, groundwater, surface water quality and the hydrological regime, the significance of residual adverse impacts of the project are considered to be moderate, given the size of the areas developed and the extent of water management on site. The areas where the pits and borrow pits will be developed are relatively small, i.e., about 28.6 ha.

Developing these areas will change the local topography and the water infiltration rate in the soil. The pit dewatering activities will induce a local drawdown of groundwater level, primarily near the pits. These changes will lead to site-specific impacts on the hydrological regime in certain small sub-watersheds, and could lead to a drop in the local water table. Water management on site will have a major influence on local hydrological and hydrogeological regimes at the site, which



cannot be fully mitigated. Dewatering the mine pits will have a significant impact on groundwater in the area. Simulations have shown that groundwater levels could drop about 10 m over a maximum distance of about 500 m of pit walls.

Some contaminants resulting from mining activities could infiltrate the soil or be transported in runoff and groundwater. Although moderate in significance, the residual impacts on water quality will be largely mitigated by the application of an integrated water management plan that includes erosion and sediment transport control measures, runoff collection, as well as water treatment and quality control prior to discharge to Lagopede Lake.

The results of static and kinetic laboratory testing on the materials that will be excavated confirmed that no acid drainage is anticipated and the materials are not likely to leach metals in concentrations that could pose a risk for aquatic wildlife, water consumption or aquatic organisms. The water treatment issue primarily entails controlling particulate and nutrient levels, and the mine and domestic wastewater treatment plants have been designed with that in mind.

Operating generator sets over the 20-year life of the mine risks producing significant amounts of greenhouse gases (GHGs). Overall GHG production is estimated to amount to 75,000 tonnes of CO<sub>2</sub> eq per year, of which 35,000 tonnes alone will be produced by the generator sets. However, if the economic context prior to project startup is such that the cost of fuel increases and the development of a Nikamo-Renard line becomes economically viable, the project could opt to contribute to the construction of the power line.

Nuisances such as noise and dust are anticipated, but they will be generated at declining rates with the development of the R-65 quarry, the R-2 and R-3 open pits and the processed kimberlite stockpile. Typically, these residual impacts will be site-specific and limited in extent. They will therefore be managed in a similar way as in the construction phase with appropriate mitigation measures.

The expertise acquired at other Canadian diamond mines and air emissions modelling show that wind erosion and airborne particulate transportation problems are unlikely to occur given the size of the particulates, the position of the buildings and the presence of the surrounding hills.



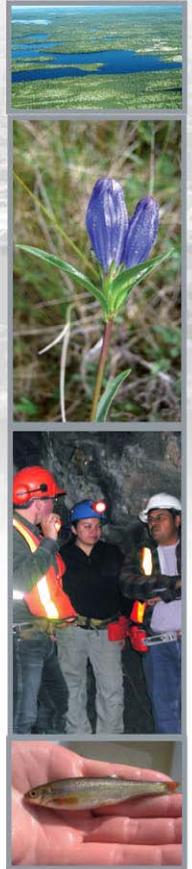
### 6.2.2 Biological Environment

During the operation phase, additional losses in forest and wetland ecosystems from the development of the pits, which will be small in relation to such losses in the construction phase, will amount to 27 ha of forest stands and 1.2 ha of wetlands. The progressive rehabilitation of the sites (processed kimberlite confinement area berms) that will be undertaken during the operation phase will partially compensate for these habitat losses by hydroseeding grass and planting spruce on disturbed sites that will no longer be used.

As in the construction phase, the water management plan put in place will limit the impacts of the project on water quality. Treated effluent volumes from mine water and domestic wastewater treatment plants will be tested so as to minimize their impact on the quality of the water in Lagopede Lake, and hence the quality of fish and benthos habitats. During the operation phase, the volume of domestic effluent will be lower than that anticipated in the construction phase and the plume will be smaller (38 to 83 m downstream from the discharge point). The plume will not rise to the surface, and will remain at a depth of about 4 to 6 m.

Plume modelling results for treated mine effluent indicated that in severe low flow conditions the phosphorus concentration at the outer limit of the plume (300 to 750 m from the discharge point) could be slightly higher (0.02 mg P/l) than the phosphorus level in the lake (95<sup>th</sup> percentile = 0.007 mg P/l). These phosphorus inputs could lead to a site-specific and temporary increase in productivity in the north basin of Lagopede Lake. Given the hydraulic residence time of water in Lagopede Lake (about 50 days) and the generally low water temperature in September, this effect would be short term, possibly limited to August. To validate the impact assessment, a water quality monitoring program is planned for Lagopede Lake and effluent discharges (see Chapter 11 of the ESIA).

Traffic speed limits on site will minimize the risk of vehicle-wildlife collisions. Road traffic along with most of the other activities associated with the operation of the mine and airstrip will be sources of noise and dust that have the potential to affect the daily activities of wildlife in the immediate vicinity of the mine site. Anticipated noise levels will potentially exceed residual noise levels in the natural environment within a 6-km radius of the facilities and could affect the daily activities of wildlife.



Airstrip operation and road traffic will significantly open up the region, facilitating supply and exchanges. Aircraft (Dash 8) taking off and landing will represent point and infrequent sources of noise given that the number of flights will be low (3 per week). The disturbance caused by the noise will have a temporary effect on wildlife in the area. The noise level could rise from 50 dB to 60 dB for 1 to 10 minutes during take-offs and landings. A noise level of 60 dB, for example, corresponds to a conversation between two people 1 metre apart from one another. Given the low frequency of the flights, these disturbances will be short in duration and possibly comparable with, even lower than, current disturbances caused by float planes and helicopters whose noise levels exceed those of a Dash 8.

The hazardous materials and fuels management plan will minimize the probability of leaks or spills of hydrocarbons or other hazardous materials. Should any such accident occur, the environmental management plan (monitoring and surveillance) and the emergency response plan will ensure rapid detection and decrease the extent and consequences of any accident.

The progressive rehabilitation of the site will help restore a small proportion of the habitats lost during site preparation and development work. During the operation phase, the temporary construction materials storage area, temporary camp site, and part of the processed kimberlite confinement area will be covered with a layer of overburden and soil and then hydroseeded and planted with black spruce. These initial revegetation trials will serve as test sites for the final revegetation work and lessons could be learned from them. The restored habitats would eventually be recolonized by wildlife.

In short, the residual impact of the operation phase on the biological environment will be negative and will be negligible for birds of prey; low for benthos, vegetation and wetlands, waterfowl and other aquatic birds, forest birds and micromammals; and moderate for fish, amphibians, fur-bearing animals and large game (Figure 6.1.1).

### 6.2.3 Human Environment

Certain land use disturbances identified in the construction phase will continue into the operation phase as well. The sources of impact will be road traffic and machinery maintenance, the extraction, handling and stockpiling of ore,



mining-related materials management, airstrip operation, the presence of facilities and manpower, and the progressive site rehabilitation work. These project components will generally result in disruption of hunting, fishing and trapping activities in the vicinity of the project footprint area. On the basis of the area occupied by mining facilities and the roughly 1-km security perimeter around the mining site, the project will impact land use over some 1,500 ha. In addition, the noise and traffic associated with mining could result in wildlife avoiding the surroundings of the mine site (within a <6 km radius of the mine site), which could hinder the peaceful use of the area for traditional hunting and trapping activities. Trapline M11 users may have to relocate some of their activities. New hunting and trapping grounds are being considered near the southeast boundary of the trapline and in the central section northeast of the Renard Project.

Note that the presence of facilities and stockpiles on the mine site will have a negative impact on the landscape. This is partially due to the size, colour and shape of the facilities and stockpiles which will contrast sharply with the natural surroundings. This impact is considered of moderate significance. About 44.3 Mt of processed kimberlite will need to be stockpiled. The total area of the processed kimberlite confinement (PKC) area and the waste rock and overburden piles will be about 114.9 ha. These confinement and stockpile areas will obviously have an impact on the landscape, with the strongest impact associated with the PKC area (maximum height of 90 m), the waste rock pile (52 m high) and the overburden pile (20 m high). Progressive revegetation of the horizontal surfaces of the PKC area and the overburden stockpile will have a positive impact on the landscape.

On the other hand, it should be noted that the Renard Project will presumably generate employment or business income for interested and available trapline M11 users, thereby promoting their use of the territory along with the practice of traditional activities. In light of this, the impact of mining on land use is considered to be negative but of moderate significance, given that only a small part of trapline M11 will be affected.

With regard to the health of workers and visitors, a new element to be considered in relation to the construction phase involves dust emissions that may be discharged from the various materials stockpiles. According to air quality, groundwater and



surface water analyses, no air pollution or environmental pollution that could have a health impact on users of the territory is anticipated.

Regarding public safety on the mine site, it should be noted that traffic on Route 167 will be limited given that workers will be flown in and out. The same applies to the finished products (diamonds). Road traffic will therefore be limited to transporting supplies and should amount to about three vehicles daily. No impact on traffic flow is therefore anticipated in relation to existing conditions and the safety of users on Route 167 and the regional road system, because the traffic generated by the mine will be limited in terms of volume and trip frequency.

The movement of various hazardous materials such as hydrocarbons and explosives could in theory pose certain health risks for residents. The risks are however minimal because the transportation of hazardous materials to the Renard mine is governed by the Quebec Ministry of Transportation's *Transportation of Dangerous Goods Regulations*. Stornoway will in addition have an emergency response plan in place.

With regard to public health and safety, the sources of impact will essentially be related to manpower and procurement as well as the mere presence of the project. During the operation phase, even more so than the construction phase, manpower and procurement components will overall have a positive impact on general social conditions among the Cree and Jamesian residents, owing to the economic spinoffs generated by the project.

The operation of the Renard mine should result in 244 direct jobs in the Nord-du-Québec and Abitibi-Témiscamingue region in equivalent person-years, or 52% of the total workforce. A total of 432 direct mining and facilities-related jobs will be maintained every year in Quebec. In addition to these direct jobs, the project will sustain 275 jobs among suppliers (primarily Quebec suppliers) and 465 jobs among businesses that will see their operations grow as a result of the sustained or additional incomes earned by direct and indirect workers.

The annual economic spinoffs arising out of the Renard mining expenses are for their part estimated to amount to \$110.8 million, including 34% in the Nord-du-



Québec and Abitibi-Témiscamingue regions, 47% for the rest of the province, and 19% for the rest of Canada. In addition to these spinoffs are government and public revenues from personal income taxes, goods and services taxes, corporate taxes, payments to the Crees under the Paix des Braves agreement, mining company taxes paid to the governments of Quebec and Canada, and mining royalties. The economic spinoffs of the project during the operation phase represent a positive impact of high significance.

In addition to the benefits of the project's economic spinoffs are the financial benefits of the Impacts and Benefits Agreement (IBA) negotiated between Stornoway and the Crees. Under this agreement, Stornoway plans to ensure the Crees benefit from a certain number of jobs, proportional to their demographic representation (currently about 50%) in the Eeyou Istchhe Baie-James region. In addition, the IBA provides for various Cree training opportunities as well as the optimization of spinoffs for Cree businesses.

A certain number of potentially negative impacts on the well-being of the Crees are however anticipated, specifically with regard to job conditions. Past experience with other projects on James Bay territory has highlighted the challenges involved with integrating Native workers on work teams. With the facilitation and awareness-raising measures Stornoway plans to implement, the integration should nonetheless run smoothly.

The study on the Eastmain-1-A-Sarcelle-Rupert site highlighted the adverse effects of the Native workers' extended absences on their family life. Some observers, specifically the CBHSSJB (2010) in a recent analysis of a mining project on the territory pointed out that the higher incomes earned by individuals or households in the communities could lead some Crees to spend more on alcohol, thereby compelling Cree health and political authorities to invest more resources in providing assistance and programs that promote healthy lifestyles.

Other follow-up studies suggest that the arrival of mining companies in remote areas does not have marked negative impacts on the well-being of local communities. Overall, during the operation phase, the belief is that the Renard Project will not result in any detectable transformation in the lifestyles of the Cree and Jamesian communities concerned by the project.



## 6.3 Closure Phase

Mine closure and final site rehabilitation activities are expected to extend over about two years. Initially in the closure phase, machinery use and road traffic will generate minor site-specific nuisances (local dust emissions, machinery noise, sediment transport). However, the project components that will lead to the largest environmental changes are the dismantling of the mine facilities, rehabilitation work and final revegetation of the site and water management activities involved in flooding the pits.

### 6.3.1 Physical Environment

Overall, the residual impacts of the site closure phase are considered to be positive and of moderate to low significance.

Infrastructure dismantling along with site restoration and revegetation work will restore and stabilize the soils, and re-build the topography, plant cover and water system in a way that will resemble the natural environment. These measures will also help re-establish water soil infiltration and runoff conditions, which will promote the return to hydrological and hydrogeological conditions that are close to the initial natural conditions.

The water management facilities will remain in operation until the closure activities are complete and follow-up monitoring demonstrates that the quality of the water in contact with the mine site complies with environmental discharge objectives and no longer requires treatment. At that point, the stream and lake drainage patterns on the periphery of the mine site will be restored where feasible to conditions similar to those observed prior to the start of operation. For these reasons, few changes are anticipated as regards water and sediment quality. The shutdown of mining activities and the restoration of soil and plant cover will also help improve surface and ground water quality.

During the closure phase, two new lakes north of Lagopede Lake will be formed with the flooding of pits R-65 and R-2/R-3. It is anticipated that R-2/R-3 will fill as a result of net precipitation, surface runoff and seepage from groundwater.

In light of the small fleet of vehicles and low traffic volume in relation to the other phases, the risk of contaminant leaks and spills will be limited and managed in the same way as in the preceding phases. As for noise and dust generated by the



infrastructure dismantling and revegetation work, the impact will be of low intensity, short duration and limited to the mine site. Finally, some construction debris will be disposed of either in the trench landfill or transported off site for final disposal in a MDDEP-authorized site.

Post-closure follow-up will be put in place for monitoring surface and ground water and vegetation quality. These follow-up activities will ensure that the remains of mining (processed kimberlite confinement area, overburden piles and LEET landfill) have no significant environmental impact or that necessary corrective measures are applied if ever sources of contamination are identified.

### 6.3.2 Biological Environment

The impacts of the project during the closure phase are associated primarily with the final rehabilitation and revegetation of the site as well as water management activities. Although activities associated with final rehabilitation and revegetation work could feasibly cause certain nuisances (noise, dust, disruption to wildlife, etc.), the magnitude of these nuisances will be less than during the operation phase and the residual impact of this phase is positive varying from low to high depending on the environmental component under consideration (Figure 6.1.1).

The final rehabilitation and revegetation of the site will stabilize and restore the topography, soil and plant cover and re-create appropriate wildlife habitats.

By the end of mining activities, rehabilitation of 75% of the affected areas will have been initiated with a view to gradually re-establishing a forest cover. The slopes on the processed kimberlite confinement area and the overburden stockpile along with the flooded pits, covering an area of 76.8 ha or 25% of affected areas, will not be revegetated after mine closure.

The industrial buildings will give way to grass prairies produced by hydroseeding and spruce trees planted at a density of 2,000 plants per hectare. This new habitat on the shores of Lagopede Lake could initially attract geese, some forest birds and raptors, micromammals, small mammals, and possibly amphibians in wetland depressions. Forest habitats could gradually regenerate on 230 ha of the 307 ha of the terrestrial environments affected in the construction and operation phases of the project. The processed kimberlite confinement area and the overburden stockpile will gradually take on the appearance of bare hills, which will turn green with time.



Initially, the plant community structure will be composed primarily of an herbaceous and shrub layer with a sparse cover of spruce. Over the years, nearby vegetation will help recolonize the site and the wildlife and trees will gradually grow in number. The new terrestrial habitats will as a result be gradually colonized by wildlife.

In addition to the terrestrial habitats, aquatic habitats will also be created following the closure of mining with the flooding of pits R-2/R-3 and R-65. These pits will become deep lakes covering a total area of 28.6 ha and will be ideal habitats for species valued by the Cree such as lake trout, lake whitefish, and burbot. These lakes will be connected to the natural hydrographical system, which will enable fish to colonize the lakes. The two new lakes created by flooding the pits will account for more than 222,000 m<sup>2</sup> of fish habitat. Amphibians and waterfowl could also become established there, essentially on the more shallow flood plains. These changes could possibly contribute to increasing productivity in the Lagopede Lake region along with its fish and game potential. Once treated domestic wastewater and mine effluent are no longer discharged into Lagopede Lake, the quality of the lake water will gradually improve and return to the same properties as those found prior to the Renard Project.

### 6.3.3 Human Environment

During the closure phase, the project components that constitute the main sources of impacts are essentially the same as those in the operation phase although lesser in magnitude and much shorter in duration. These negative impacts will be largely compensated by the final rehabilitation and revegetation of the site, which in addition to improving the visual aspect of the site, will allow vegetation and wildlife to gradually recolonize the environment.

The industrial mine site will be transformed and returned to natural conditions that will differ in part from conditions prior to project implementation. The buildings and industrial facilities that were established on the site for some 20 years will be dismantled and removed. The objective of the final rehabilitation work will be to restore the topography ensuring it blends in with the natural landscape, stabilize the soils, re-establish a plant cover to control erosion, and re-establish a forest cover.

With the final closure of the mine, the sound environment will return to what it was prior to the project.



Once the mine site facilities have been removed, the footprint of the project has been rehabilitated and the pits flooded, the space occupied by the Renard Project should overall return to its original features and recapture its original tranquility and former productivity. It will therefore become available again as a heritage resource for the Mistissini community and M11 trapline tallymen.

From a long-term standpoint, the Renard Project will have contributed to the construction of a road that opened up the Eeyou Istchee Baie-James region (Route 167 North). Stornoway is also prepared to transfer ownership of the airstrip to regional authorities should they be interested. These two regional infrastructure components (road and airstrip) can eventually play a role in diversifying the regional economy (e.g., hunting and fishing outfitters, ecotourism activities, future Albanel-Témiscamie-Otish national park).

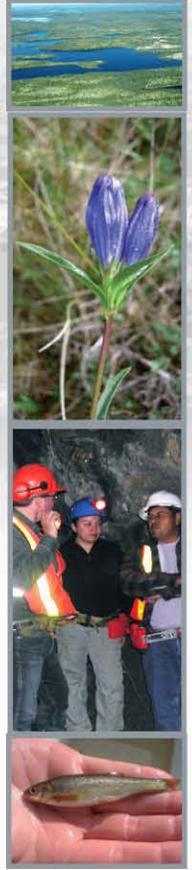
Psychosocially, this would have a positive effect in that it would mitigate the negative effect associated with the feeling of loss triggered by mining in a once undisturbed environment.

Overall the impacts during this phase of the project will essentially be positive, of long duration and will allow the Cree and Jamesian people to regain the use of the territory and its resources with improved access.

In terms of jobs, the direct impact of the closure phase is an estimated 34 person-years from the region. Closure activities will provide in total some 135 jobs Canada-wide. Like other mining facilities, the Renard mine will terminate its operation once the resource has been depleted, or on the basis of the current state of knowledge, about 20 years after startup. This will mean several jobs at the mine will be lost. Stornoway will provide a range of separation bonuses based on job category and will participate in the measures set out in the *Act respecting Labour Standards* with respect to the formation of a downside committee. Equipment and materials from the mine site could be recovered or recycled in the region, thereby mitigating business opportunity losses connected with the end of the project. During operation, Stornoway will invest in improving the skills and competencies of its employees, specifically Cree personnel. The goal in doing so, on the basis of what is known and has been confirmed in the immediate region of the Renard Project, namely at the Troilus mine and the Eastmain-1 and Eastmain-1-A-Sarcelle-Rupert hydropower projects, is to ensure that Cree employees improve their employability



and will be readily re-employed. To ensure this situation receives the required attention from the outset, Stornoway will set aside appropriate funding for post-closure monitoring of job conditions and its former employees. The funding required for such a monitoring will be determined in cooperation with the Renard Committee and will be included in a fund related to the financial guarantees deposited for post-closure site restoration. Ideally, this monitoring should be carried out by an organization in the Eeyou Istchee Baie-James region involved in job development and training and overall economic development.



## 7 Cumulative Effects Assessment

In conjunction with the impact assessment, an assessment of the cumulative environmental effects of the project was performed. The principles of cumulative effects assessment recognizes that the environmental effects of various human activities can combine and trigger a series of interactions that generate cumulative effects, the nature and scope of which can differ from the individual effects of each of the activities.

It should however be noted that not all VESCs require a cumulative effects assessment. For some VESCs there are no or practically no cumulative effects simply because there is very little or no overlapping in time and space with other projects (e.g., effects on the aquatic environment of projects in different watersheds). In the case of other VESCs that are distributed across extensive areas (for example, woodland caribou or employment), these could be influenced and a cumulative effects assessment would then be necessary and important.

The method used to assess cumulative effects considers the current state of environmental knowledge and the availability of project-related information. Many projects that might be carried out in the region are currently in the early development stage and involve confidential information that was not available for consultation for this assessment. The method used for the assessment of cumulative effects is consistent with the procedures established by the Canadian Environmental Assessment Agency and the World Bank. Biophysical and human factors were taken into consideration and a number of environmental and socioeconomic issues were identified in relation to those factors. Only those issues that were likely to produce combined effects with other projects were selected for evaluation of anticipated cumulative effects. Four (4) spatial boundaries were selected for the assessment of the cumulative effects of the project so as to account for the various VESCs.

- ❖ The “immediate study area” consists of the study area defined in the ESIA for the Renard Project (127 km<sup>2</sup>) to which is added a 1-km strip on either side of Route 167 and a 250-m strip (right-of-way) along the preliminary transmission line alignment connecting camp Lagopede to the Nikamo power station near LG4. These strips cover an additional area of about 521 km<sup>2</sup> and will be used to consider some impacts (visual and noise impacts) that could occur elsewhere than in the actual footprint of the infrastructure. The immediate study area incorporates all direct and indirect impacts of the Renard Project on biophysical components and land use. It includes the various development projects and



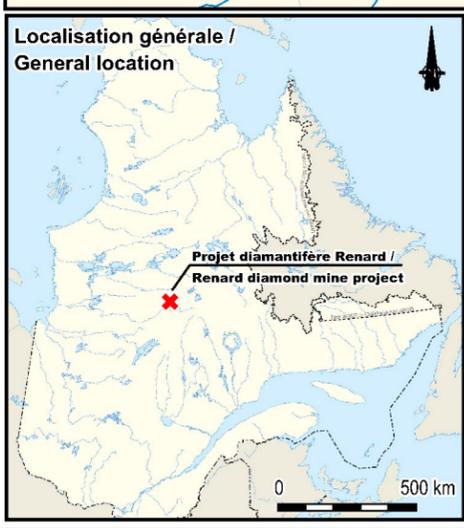
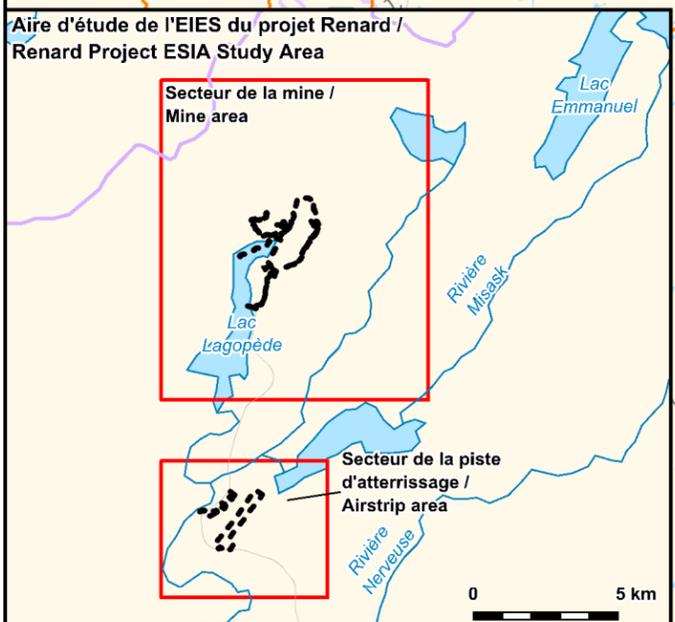
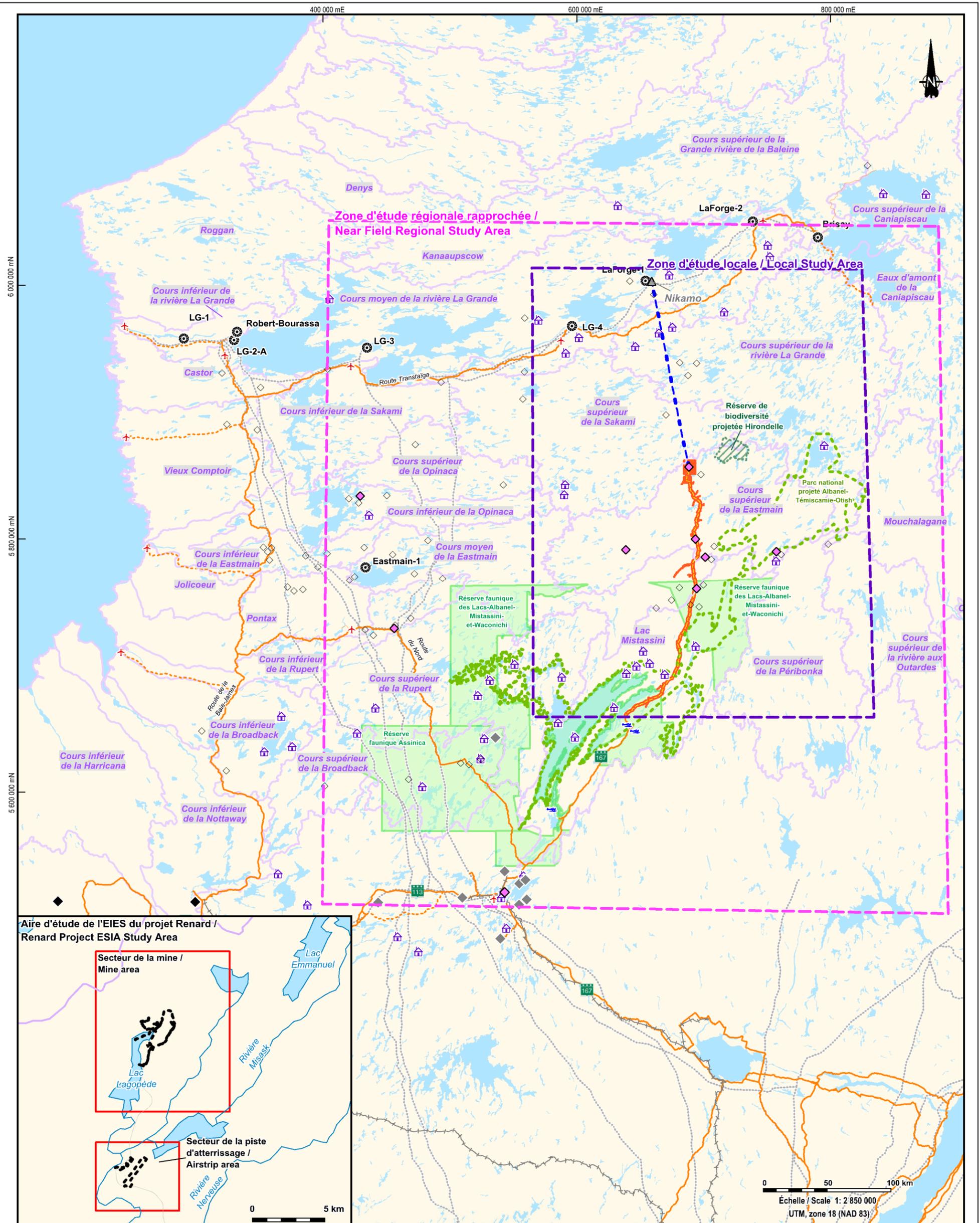
activities within and near the mine's right-of-way, i.e., within a 100 km<sup>2</sup> area and in the 27 km<sup>2</sup>-airstrip area. Few cumulative effects are anticipated in the immediate study area;

- ❖ The “local study area” represents the spatial boundary of potential impacts of the project and those of other industrial and commercial activities (mining, forestry, outfitting, etc.) and recreational-tourism operations (future parks and wildlife reserves) that exist or are likely to be developed in the vicinity of the site, especially as a result of easier access to the territory. In addition to including the immediate study area boundary, this area includes activities that may be carried out in the watershed area where the project is located (upper Eastmain River); those within the 100 km-strip on either side of the planned infrastructure alignments (Route 167 and power transmission line to LG4 that will provide easier and more economical access to the territory); as well as potential home ranges of large game, such as caribou and moose, on the territory. The local study area primarily involves cumulative biophysical effects. This rectangular area covers about 94,695 km<sup>2</sup> (9,469,500 ha);
- ❖ The spatial boundary of the “regional study area” is the territory where potential cumulative effects of the project and other activities may occur primarily on socioeconomic components. Unlike the study area for biophysical components, the assessment of impacts on socioeconomic components extends well beyond those previous boundaries. It includes the James Bay territory, considered in this assessment as the “expanded regional area”, as well as the “immediate regional area” corresponding to urban communities of Mistissini, Chibougamau and Chapais. Some other issues related to the economy, employment and training could entail cumulative effects on an even larger area, thus the regional study area intentionally has no definite boundaries.

The boundaries of respective cumulative effects study areas and the location of development projects and activities are shown in Map 7.1.1.

The temporal boundaries of the cumulative effects assessment would include the main development projects and activities from 1920 to 2050 within the spatial boundaries of the various study areas established, on the basis of a start-up date of 2013 for the Renard Project.





- Ville, municipalité / City, municipality
- Communauté crie / Cree community
- ▲ Poste de transformation Nikamo / Nikamo substation
- 🏠 Pouvrières sans droit exclusif / outfilter without exclusive rights
- ✈ Aéroport / Airport
- 🚢 Hydrobase / Hydrobase
- ⚙ Aménagement d'Hydro-Québec / Hydro-Québec facility
- Ligne électrique potentielle d'Hydro-Québec / Hydro-Québec potential electric power lines
- Ligne électrique d'Hydro-Québec / Hydro-Québec electric power lines
- Réseau routier principal / Main road network
- Réseau routier secondaire / Secondary road network
- Prolongement de la route 167 Nord vers les monts Otish / Extension of Route 167 North to the Otish Mountains
- +— Chemin de fer / Railroad
- ◆ Mine active / Mine in operation
- ◇ Projets d'exploration de ressources minérales / Mineral resources exploration projects
- ◇ Projet minier en phase de développement avancé / Mining project in advanced stage of development
- ◆ Ancienne mine / Old mine
- ⬭ Parc national projeté / National Park project
- ⬭ Réserve de biodiversité projetée / Projected biodiversity reserve
- ⬭ Réserve faunique / Wildlife reserve
- ⬭ Bassin versant / Watershed
- ⬭ Aire d'étude du projet Renard / Renard Project Study Area
- ⬭ Zone d'étude de l'étude d'impact du prolongement de la route 167 / Road 167 extension project study area



**Projet diamantifère Renard / Renard diamond mine project**

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Étude d'impact environnemental et social  
Environmental and Social Impact Assessment

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**Zones d'étude pour l'évaluation des effets cumulatifs / Cumulative effects assessment study areas**

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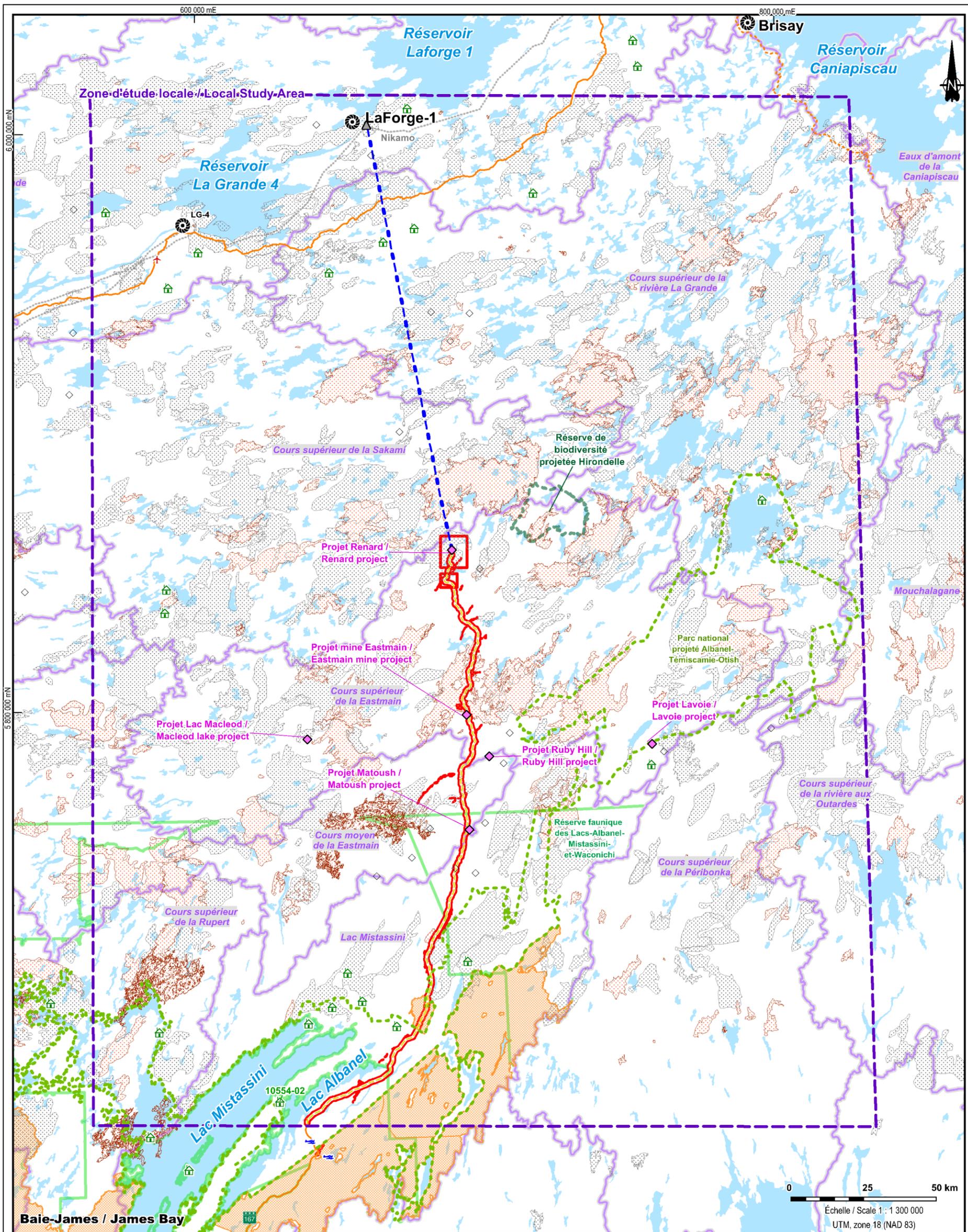


Carte de base / Base Map : BDGA, 1M, 2010  
 Fichier / File : 61470\_EIES\_EC\_ZE\_111216.WOR  
 Source : "Projet d'exploration de ressources minérales / Mineral resources exploration projects, MRNF, 2010  
 Pouvrières / Outfilter, MRNF, 2010  
 \* Bassin versant: Ressources naturelles Canada, Données-cadres nationales de l'Atlas du Canada, Hydrologie - Aire de drainage, 2008

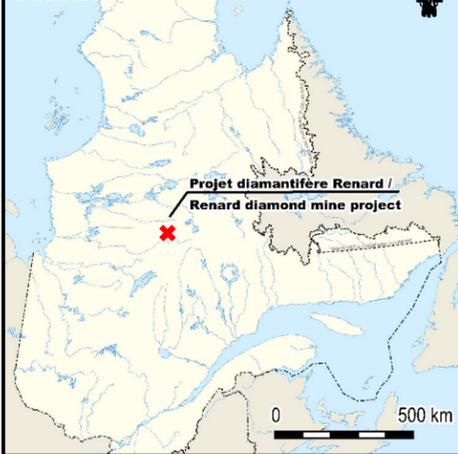
**Carte / Map 7.1.1**

Décembre 2011 / December 2011





**Localisation générale / General location**



- Ville, municipalité / City, municipality
- Communauté crie / Cree community
- ◆ Mine active / Operating mine
- ◇ Projets d'exploration de ressources minérales / Mineral resources exploration projects
- ◇ Mines qui pourraient être mises en exploitation à court ou moyen termes / Short and medium term potential mining projects
- ◆ Ancienne mine / Old mine
- ▲ Poste de transformation Nikamo / Nikamo substation
- 🏠 Pourvoires sans droit exclusif / outfitter without exclusive rights
- ✈️ Aéroport / Airport
- 🚰 Hydrobase / Hydrobase
- ⚙️ Aménagement d'Hydro-Québec / Hydro-Québec facility
- Ligne électrique d'Hydro-Québec / Hydro-Québec electric power line
- - - Ligne électrique potentielle d'Hydro-Québec / Hydro-Québec potential electric power line

- Réseau routier principal / Main road network
- Routes projetées d'accès aux bancs d'emprunt / Projected access roads for the exploitation of borrow pits
- Réseau routier secondaire / Secondary road network
- Prolongement de la route 167 Nord vers les Monts Otish / Extension of Route 167 North to the Otish Mountains
- Chemin de fer / Railroad
- Zone d'exploitation forestière 2661-2662 / 2661-2662 Logging area
- ▭ Parc national projeté / National Park project
- ▭ Réserve de biodiversité projetée / Projected biodiversity reserve
- ▭ Réserve faunique / Wildlife reserve
- ▭ Limite des feux de forêts (Avant 1990) / Forest fires prior to 1990
- ▭ Limite des feux de forêts (1990 à 2010) / Forest fires between 1990 and 2010
- ▭ Bassin versant / Watershed
- ▭ Zone d'étude de projet Renard / Renard Project Study Area



**Projet diamantifère Renard / Renard diamond mine project**

**Étude d'impact environnemental et social / Environmental and Social Impact Assessment**

**Sources potentielles d'effets cumulatifs sur le milieu biophysique / Potential sources of cumulative effects over the biophysical environment**

Carte de base / Base Map : BDGA, 1M, 2010  
 Fichier / File : 61470\_EIES\_EC\_SPMB\_111216.WOR  
 Source : "Projet d'exploration de ressources minérales / Mineral resources exploration projects, MRNF, 2010  
 Pourvoires / Outfitter, MRNF, 2010  
 Décembre 2011 / December 2011



**Carte / Map 7.1.2**



The great diversity of past, current and future projects and activities within the perimeter considered for the assessment will lead to different types of cumulative effects on the environment. On James Bay territory, the impact of mining, road, outfitting and power transmission line projects primarily involves a decrease in or fragmentation of various types of habitats. Terrestrial, wetland and aquatic environments, woodland caribou habitat, moose habitat, fish habitat and territory used by the Crees are the main types of habitats that will be affected by the various projects.

The potential cumulative effects of the Renard Project on the biophysical environment will be felt primarily in the project's local study area. Few cumulative effects are anticipated in the immediate study area, owing to the fact that the projects are all quite distant from one another, and the potential sources of contaminants on the Renard Project site have different potential receiving environments (ditches, drainage systems, etc.). Few effects are also anticipated in the immediate regional study area. Among all the projects and activities discussed in the previous sections, those that could potentially generate cumulative biophysical effects with the Renard Project are shown on Map 7.1.2

The main valued environmental components selected for the cumulative biophysical effects assessment are:

- ◆ Air quality;
- ◆ Soil quality and integrity;
- ◆ Surface and groundwater quality and quantity;
- ◆ Aquatic fauna (freshwater fish and benthos) and their habitats;
- ◆ Terrestrial fauna (birds, herpetofauna, mammals) and their habitats (in particular caribou, moose, fur-bearing animal and waterfowl habitats);
- ◆ Vegetation and wetlands.

In developing the project, significant effort was put into minimizing the negative environmental and socioeconomic impacts and maximizing positive effects of project-related activities. These measures are described in detail in Chapters 6 to 9 of the ESIA. However, positive and negative cumulative effects are still anticipated. Greater access to the territory (roads and power transmission lines) will promote exchanges among the regions, but will also facilitate the development of new projects and activities (mining, forestry, outfitting, recreational-tourism parks, traditional Aboriginal activities) leading to a general increase in occupation of the



territory and pressures on the environment, resources and regional services. The anticipated cumulative effects consist primarily of:

- ❖ Direct increase in land use and pressures on the natural environment associated with the development of a larger number of mining projects and other activities owing to better access to the territory;
- ❖ Degradation primarily limited to the sites of the biophysical components (soil erosion, noise, air quality, water quality, GHG, etc.) owing essentially to the distance between the projects and activities;
- ❖ Increase in pressures on local and regional resources (natural resources, drinking water supply, power supply, purchase of goods and services, manpower, accommodation, etc.);
- ❖ Significant contribution to regional economic development for local towns and communities.

The footprint left by the projects and activities will remain relatively small given the vast size of the territory. The projects are relatively compact, distant from one another, and governed by a well-established regulatory framework (James Bay and Northern Quebec Agreement). That is not to say that these effects need not be addressed and monitored. Mechanisms and measures to identify and manage potential cumulative effects need to be put in place. Figure 7.1.1 provides an overview of the positive and negative effects on various biophysical and socioeconomic components that are likely to be affected by cumulative effects.

The management of potential cumulative effects of the Renard Project in relation to other proposed projects or activities will require a joint concerted effort by various levels of government, industry and local communities. This process will entail a precise definition of the functions and responsibilities of each party. In this regard, Stornoway will assume all environmental and social responsibilities directly associated with the Renard Project. Regionally, Stornoway is in addition prepared to actively participate in all concerted monitoring, planning and research initiatives, specifically by supplying inputs pertaining to the mining project.





		Combined Effect
<b>Cumulative biophysical effects</b>		
	Terrestrial, aquatic, wetland environments: mining sites and infrastructures (transportation) in relation to natural conservation areas	High negative (red inverted triangle)
	Energy supply: transportation infrastructures (power lines) in relation to quality of regional supply (access)	Low negative (orange inverted triangle)
	Caribou and moose habitats: total populations in relation to changes in migration patterns	Low negative (orange inverted triangle)
	GHG production: global budget (hydroelectric power in relation to the use of power generating sets)	Low negative (orange inverted triangle)
<b>Cumulative socioeconomic effects</b>		
	Economic spin-offs: collective wealth (employment, health, education, etc.) in relation to manpower needs and procurement	Low positive (green triangle)
	Cree land use: local nuisances and gradual changes to practice of traditional hunting, fishing and trapping activities	Low negative (orange inverted triangle)

Legend – Impact Significance Symbols			
	Low negative		Low positive
	Moderate negative		Moderate positive
	High negative		High positive

Figure 7.1.1 Overview of anticipated cumulative environmental effects of the Renard Project

Although specific cumulative effects management measures must be addressed and managed on regional and local levels, the following management proposals based on initiatives implemented within the context of the project could be applied:

- ◆ Control of mine discharges (air and water, solid waste): discharge limits have been defined and are part of regulatory requirements. Control of mine discharges should be the same for all sectors;
- ◆ Regional monitoring: regional monitoring of the main environmental and socioeconomic indicators could be carried out by regulatory authorities in order to continue developing a database of baseline conditions. This monitoring will also serve as a tool for assessing changes and the impact of growth;
- ◆ Common land use planning and zoning: effective land use planning and zoning are essential to managing cumulative effects and reducing land use conflicts;
- ◆ Implementation of a collaborative research program with other local and regional stakeholders to assess the impact of the project on fishery resources. Similar initiatives could be undertaken in other sectors;



# CHAPTER 7

## ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

### Renard Diamond Project

#### SUMMARY

- ❖ Consultations with and commitment from stakeholders: engagement of local communities in the change management process is important to managing growth-related expectations;
- ❖ Conservation of archaeological resources: a regional approach to the management of archaeological and cultural resources could be taken and tied in with local and regional planning efforts;
- ❖ Conservation of regional biodiversity: development needs to be balanced with conservation priorities. Any level of government could develop a regional approach to protected areas management, by considering lands targeted for development as an integral part of land use plans.



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## 8 Environmental and Technological Risks Management

### 8.1 Environmental and Social Management Plan

The environmental and social management plan for the Renard Project will be based on ISO 14 001 standard. This management framework will allow to monitor and control environmental impacts of the project and thereby reconcile the imperatives of mine operations with the applicable regulatory framework and industry best practices. The environmental policy of Stornoway Diamonds (Canada) Inc. will guide the long-term vision of the management plan and take into consideration the inseparable nature of the environmental, social and economic dimensions of the Renard Diamond Project.

The management plan will allow to monitor and validate environmental and social impacts assessed within the context of the impact assessment, to ensure the application of mitigation measures, regulatory requirements and best practices within a context of continuous improvement. Specific management plans will be developed to prevent and minimize residual impacts identified in the impact assessment during the construction, operation, closure and post-closure phases of the project.

Each plan will include the following elements:

- ◆ Requirements of the environmental policy and regulations, including a summary of required authorizations during the various project phases, elements relevant to operating decrees and objectives outlined in project specifications;
- ◆ General impact prevention and management measures, including general environmental controls allowing to prevent and manage environmental impacts and general mitigation measures identified in the impact assessment;
- ◆ Functions and responsibilities of the management team, employees and subcontractors in the implementation and maintenance of a plan;
- ◆ Auditing, control and follow-up of reports;
- ◆ Development, implementation, and evaluation processes of corrective actions.



Specific plans will be developed for the following management activities:

- ❖ Air emission management;
- ❖ Noise and vibration management;
- ❖ Water, sediment and sludge management;
- ❖ Pollution prevention;
- ❖ Solid waste and hazardous material management;
- ❖ Social concern management.

These programs specify means and mechanisms for ensuring compliance with legal and environmental provisions and the achievement of the project's environmental objectives. The surveillance program (see section 11.3 of the ESIA) thereby will serve to verify smooth performance of the work and operation of the equipment and facilities in place, as well as to detect any environmental disturbance caused by project construction or operations. It will also ensure compliance with the laws, regulations and other environmental considerations developed in the plans and specifications.

The environmental monitoring plan is used to measure, observe and document changes (natural or project-related) in the environment in relation to baseline conditions, to verify the accuracy of the environmental assessment and to evaluate the effectiveness of mitigation measures (see Section 11.4 of the ESIA). The Renard Project's surveillance program includes monitoring of climate, air quality and air emissions, noise levels, liquid effluents, hydrology and sediment transport, surface water and sediment quality, groundwater quality and levels, as well as benthos, fish and large game. Monitoring of the human environment is also planned, more specifically of land use, training, employment and the economy, health and well-being, as well as archaeological, historical and cultural resources.

Lastly, follow-up of the Impacts and Benefit Agreement (IBA) will be carried out during the various project development phases. The mechanisms for this follow-up process have yet to be defined, but the themes that could be explored include employment, training, worker integration, communications and the environment. This process could be run by various committees including Renard, Employment/Training and Environment committees with Cree participation.



## 8.2 Technological Risk Management and Emergency Response Plan

### 8.2.1 Technological Risk Management

Chapter 12 of the ESIA discusses technological risks and occupational health and safety management. The project aims at continuous improvement to achieve the highest environment, health and safety (EHS) standards. The EHS management plan will comply with to all applicable laws and regulations and standards including OSHA and ISO 14 001 standards, which will be used as guidelines for the continuous improvement of the environment, health and safety.

Implementing the environment, health and safety management plan falls under the jurisdiction of the environment, health and safety manager, who reports to the VP and Chief of operations.

An industrial hygiene program will be put in place to ensure workers are not exposed to contaminants and chemicals that could impact their health or physical integrity. Under the program, these contaminants and physical agents will be identified and monitored in order to develop recommendations for controlling them at source and/or providing workers with appropriate personal protective equipment. The program was developed in compliance with requirements set out in the *Regulation respecting the quality of the work environment* (c. S-2.1, r.15).

The industrial hygiene program also covers the verification and documentation of the underground mine ventilation system.

Specific programs will be put in place to control drinking water quality, food contamination and potential epidemics at the camp.

A Health and Safety at work prevention program has been developed for the construction site based on the strict and rigorous application of regulations and Stornoway procedures. All workers at the site will be required to perform their tasks in such a way that they do not expose themselves or others to danger. All activities must be performed in compliance with rules established by site management as well as with health and safety standards. As a basis for the development of a prevention program, a risk register was developed. It includes the following:



- ❖ Identification and description of dangers contributing to risk;
- ❖ Evaluation of risk level and main risk factors including consequences and probability of occurrence;
- ❖ Summary of control, safety and recovery measures required to maintain risk at the As Low as Reasonably Practicable (ALARP) level;
- ❖ Reduction and control actions, and people responsible to implement them;
- ❖ Assessment of anticipated risk level after control and mitigation actions have been performed.

The risk register will be regularly updated. The most recent version of the risk register portion is provided in Appendix 12.1 of the ESIA. Performance indicators will be established to detect deviations from EHS programs and apply necessary corrective actions.

The health and safety policy for the operation phase is a continuation of the policy applied during the construction phase. It complies with requirements set out in the Mine Health and Safety Regulations (RSQ. c. S-2.2 r.19.1).

Complete, up-to-date documentation on facilities-related risks will be developed, kept current and made available to employees. This documentation will include material safety data sheets for chemicals products, HAZOP reports, and specific instructions from equipment suppliers. A HAZOP study performed by SNC-Lavalin in 2011 for the project will be updated and amended whenever changes to the facilities are introduced.

Safety reviews will be performed for all the facilities as part of the design phase and before the facilities are commissioned. Inspections and controls will be undertaken to ensure the equipment installed conform complies with plans and specifications. A formal list of observed deficiencies will be developed and these deficiencies will be managed in accordance with their risk level. Pre-operational verification and critical testing will be performed.

A mechanical integrity control program will be put in place for the equipment to prevent failures that would endanger worker health and safety. Certain safe work practices and procedures will be put in place to ensure safe operation and maintenance of the facilities.

The fire safety system is designed to protect surface facilities as well as underground mine facilities. The equipments are designed according to applicable





codes. A first aid station operated by qualified medical personnel and equipped with the appropriate material for mining operations will be set up. An injured worker who requires emergency treatment at a hospital will be evacuated by air (aircraft or helicopter) from the airstrip.

All employees will take part in a health and safety training program consisting of classroom (theory) and on-the-job (practical) instruction. Workers will be tested and will need to demonstrate their knowledge before being assigned to a job. All individuals will be informed when they arrive on site of safety rules and the emergency response plan including the alert systems, evacuation procedures and other actions to take, cold weather working dangers (for outside work) or dangers associated with work in hot conditions, and dangers associated with wild animals including bears.

Various types of inspections and audits are planned to ensure elements of the health and safety program are in place and operational in order to develop any necessary corrective measures.

An assessment of technological risks was conducted as part of the ESIA. The risk assessment method is compliant with the MDDEP guideline issued in 2010. This assessment focussed on identifying major risks, their consequences, probability of occurrence, prevention or mitigation measures in place and safety management.

The Renard Project is located at a considerable distance from any permanent dwellings, and as such, does not represent a risk for local populations in the event of an accident. However, it is conceivable that an accident could affect workers on site and the environment. The site is also quite far from resources that could be deployed in the event of a major accident. It will therefore need to rely on its own emergency response measures. It is therefore vital to identify potential site risks to ensure the necessary resources are available to respond with diligence and confidence in the event of a major accident.

Technological risks that have been identified are summarized in Chapter 12 of the ESIA. Consequence levels, probability of occurrence, uncertainty and risks levels



were evaluated using a risk matrix, consequence severity levels, classes of probability of occurrence, levels of uncertainty and risk acceptability criteria.

### 8.2.2 Emergency Response Plan

Despite all the preventive and mitigation measures established as part of the Renard Project, the risk of an accident occurring is still present. Stornoway Diamonds (Canada) Inc. is not immune from a failure or error that would result in a significant adverse impact on mining operations, users of the site and/or the environment.

Although the focus should be first and foremost on prevention rather than emergency response measures, the very nature of human activity is such that disasters can occur and in fact do occur. Through appropriate preparation and emergency response planning, however, efforts can be made to minimize the risks, losses and damages associated with accidents.

Appendix 12.3 of the ESIA presents the emergency response plan for the project and identifies potential disasters so as to ensure the development of systems with which to respond appropriately to such circumstances. The plan also specifies the roles, responsibilities and stakeholder organizations along with resources that should be available. It defines the alert process, response and coordination mechanisms as well as training needs. This emergency plan meets the requirements of the *Environmental Emergency Regulations under the Canadian Environmental Protection Act* (CEPA, 1999) and the Emergency Preparedness and Response standard (CAN/CSA Z731-2005), and may be used in support of the CSST's Mine Rescue Manual, fifth edition (*Manuel de sauvetage minier, cinquième version*).





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