



Canadian Environmental
Assessment Agency

Agence canadienne
d'évaluation environnementale

Star-Orion South Diamond Project

Comprehensive Study Report



June 2014

Canada 

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Executive Summary

Shore Gold Inc. and Fort à la Corne Joint Venture (the proponent) is proposing the construction and operation of the Star-Orion South Diamond Mine (the Project) approximately 60 kilometers east of the City of Prince Albert, Saskatchewan. The Project consists of two open pit mines (Star and Orion-South open pits) and associated infrastructure. The Project would excavate approximately 45 000 tonnes of kimberlite rock per day over a projected 20-year period. The Project includes the following components:

- Star open pit
- Orion-South open pit
- Overburden and rock storage pile
- Coarse processed kimberlite pile
- Processed kimberlite containment facility
- Processing plant with live stockpile
- Associated infrastructure

Natural Resources Canada and Fisheries and Oceans Canada have regulatory responsibilities in relation to the Project and may issue authorizations and approvals under the *Fisheries Act* and *Explosives Act*, respectively. Transport Canada may have a regulatory responsibility in relation to the Project should the proponent choose to seek an authorization under the *Navigation Protection Act*. These authorizations trigger the requirement for a federal environmental assessment under the former *Canadian Environmental Assessment Act* S.C. 1992, c. 37, 1992 (the former Act). A comprehensive study of the Project is required under the *Comprehensive Study List Regulations* of the former Act before the above-referenced authorizations can be issued.

The Project is considered a major resource project and is therefore subject to the provisions of the Cabinet Directive on Improving the Performance of the Regulatory System for Major Resource Projects. Environment Canada, Aboriginal Affairs and Northern Development Canada, and Health Canada participated in the environmental assessment as expert federal authorities.

Environmental and socio-economic valued components are notable features of the natural and human environments that are likely to be affected by a project. The Agency identified and assessed the potential environmental effects of the Project on the following valued components: atmospheric environment, ground and surface water resources, vegetation and plant communities, fish and fish habitat, terrestrial wildlife habitat and species, current use of lands for traditional purposes, and human health.

Potential environmental effects and concerns identified in this comprehensive study report include:

- Project discharge water quality and its effect on the Saskatchewan River and aquatic health;
- Lowering of groundwater levels from operational pit dewatering and inflow of groundwater into the pits at closure, and its effect on potable groundwater wells, local hydrology, fish and fish habitat, and wetlands;
- Groundwater quality from seepage and drainage of mine facilities;
- Fish health and loss of fish habitat; and
- Loss of traditional lands for hunting, trapping, fishing, gathering, and cultural practices.

Methods to reduce or eliminate the Project's potential environmental effects were incorporated into the overall project planning and design. For example, the proponent relocated storage piles based on constraints mapping to avoid direct impacts to aquatic habitat. Additional mitigation is described throughout this comprehensive study report.

A follow-up program is required under the former Act to verify the accuracy of the environmental assessment and to determine the effectiveness of the proposed mitigation measures for this Project. The follow-up program would include consideration of impacts on all relevant environmental and socio-economic valued components. For example,

the follow-up program would confirm effects predictions for end-of-pipe project discharge into the Saskatchewan River.

The Canadian Environmental Assessment Agency prepared this comprehensive study report in consultation with Environment Canada, Fisheries and Oceans Canada, Health Canada, Natural Resources Canada, Aboriginal Affairs and Northern Development Canada, and Transport Canada. It was prepared following a technical review of the proponent's Environmental Impact Statement and associated information. The comprehensive study report was also informed by comments received from Aboriginal groups and the public.

The Agency concludes that the Project is not likely to cause significant adverse environmental effects when the implementation of proposed mitigation measures is taken into account.

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List of Acronyms and Abbreviations

Agency	Canadian Environmental Assessment Agency
EIS	Environmental Impact Statement
FalC forest	Fort à la Corne Provincial Forest
Former Act	The Canadian Environmental Assessment Act S.C. 1992, c. 37
LSA	Local Study Area
RSA	Regional Study Area
Métis	Métis Nation – Saskatchewan Eastern Region II and Western Region II
Minister	Minister of the Environment
Project	Star-Orion South Diamond Project
Proponent	Shore Gold Inc. and Fort à la Corne Joint Venture

1. Introduction

1.1 Project Overview

Shore Gold Incorporated and the Fort à la Corne Joint Venture (the proponent) proposes to construct and operate the Star-Orion South Diamond Mine (the Project) to commercially extract diamonds from kimberlite, a type of volcanic rock. The Project is located within the Fort à la Corne Provincial Forest (FaC forest) approximately 60 kilometres east of the City of Prince Albert, Saskatchewan.

Table 1.1-1: Project Summary

Project Summary	The Project will involve two open pits, the Star pit and Orion South pit, and associated infrastructure within the FaC forest. The Project would excavate approximately 45 000 tonnes per day of kimberlite over a projected 20-year period. The footprint of the project facilities and mine enclosure is approximately 5381 hectares or four percent of the FaC forest.
Proponent	Shore Gold Inc. and Fort à la Corne Joint Venture 300, 224 - 4th Avenue South Saskatoon, SK S7K 5M5 Telephone: 306-664-2202 shoregold@shoregold.com
Location	The Project is located approximately 60 kilometres east of the City of Prince Albert, Saskatchewan.
Federal Environmental Assessment Contact	Canadian Environmental Assessment Agency Prairie and Northern Region #1145, 9700 Jasper Avenue Edmonton AB T5J 4C3 Telephone : 780-495-2037; Fax : 780-495-2876 StarOrionDiamondProject@ceaa-acee.gc.ca
Canadian Environmental Assessment Registry (CEAR)	http://www.ceaa-acee.gc.ca CEAR number: 09-03-46277
Provincial Environmental Assessment Contact	Saskatchewan Ministry of Environment Environmental Assessment Branch 4th floor - 3211 Albert Street Regina SK S4S 5W6 Telephone : 306-787-5793; Fax : 306-787-0930 http://www.environment.gov.sk.ca; Project Number 2008-089

1.2 Environmental Assessment Context

1.2.1 Purpose of the Comprehensive Study Report

The comprehensive study report provides a summary of information and analysis considered by the Canadian Environmental Assessment Agency (the Agency) in reaching its conclusion on whether the Project is likely to cause significant adverse environmental effects. The Minister of the Environment (the Minister) will consider this report and comments received from the public and Aboriginal groups when issuing the environmental assessment decision statement.

The Minister may request additional information or require that public concerns be addressed further before issuing the environmental assessment decision statement. The Minister will refer the Project to Fisheries and Oceans Canada, Natural Resources Canada, and possibly Transport Canada following the environmental assessment decision statement to allow them to take the appropriate course of action, under the *Canadian Environmental Assessment Act, 1992* (former Act).

1.2.2 Environmental Assessment Process

An environmental assessment under the former Act is required when federal authorities contemplate certain actions or decisions that would enable a project to proceed in whole or in part. Projects undergoing a comprehensive study when the *Canadian Environmental Assessment Act, 2012* came into force will continue to follow the requirements of the former Act.

A federal environmental assessment is required for this Project because Fisheries and Oceans Canada, Transport Canada, and Natural Resources Canada may make regulatory decisions in relation to the

Project specific to the *Fisheries Act*, *Navigation Protection Act*, and *Explosives Act*, respectively. The Project does not require an authorization from Transport Canada pursuant to the *Navigation Protection Act* however, the proponent could opt-in to seek an authorization under this Act.

Under the *Comprehensive Study List Regulations* of the former Act, the Project is subject to a comprehensive study type of environmental assessment as a component of the Project is described in Section 10:

“The proposed construction of a facility for the extraction of 200 000 cubic metres per annum or more of groundwater.”

The Agency is responsible for the conduct of the comprehensive study and prepared this comprehensive study report in consultation with Fisheries and Oceans Canada, Transport Canada and Natural Resources Canada. Health Canada, Environment Canada, and Aboriginal Affairs and Northern Development Canada provided advice in relation to their respective mandates and areas of expertise.

The Project constitutes a major resource project and is subject to provisions of the Cabinet Directive on Improving the Performance of the Regulatory System and the associated memorandum of understanding.

1.2.3 Cooperative Environmental Assessment Process

The Project requires a provincial environmental assessment pursuant to the *Saskatchewan Environmental Assessment Act*. The governments of Canada and Saskatchewan conducted the federal and provincial environmental assessment cooperatively in accordance with the principles of the *Canada-Saskatchewan Agreement on Environmental Assessment Cooperation (2005)*.

2. Project Overview

2.1 Purpose of and Need for the Project

The purpose of this Project is to create economic activity in the region, generate revenue for the provincial economy, and return value to the proponent. The need for this Project relates to the production and sale of diamonds for jewellery and industrial purposes.

2.2 Project Description

2.2.1 Project Location and Setting

The Project is located within the FalC forest approximately 60 kilometres east of the City of Prince Albert, Saskatchewan (Figure 2.2.1-1). The FalC forest is an island forest of 132 502 hectares surrounded by agricultural land.

The climate of the FalC forest has long cold winters and short hot summers. The mean temperatures in January and July are -19.1 degrees Celsius and 17.5 degrees Celsius, respectively.

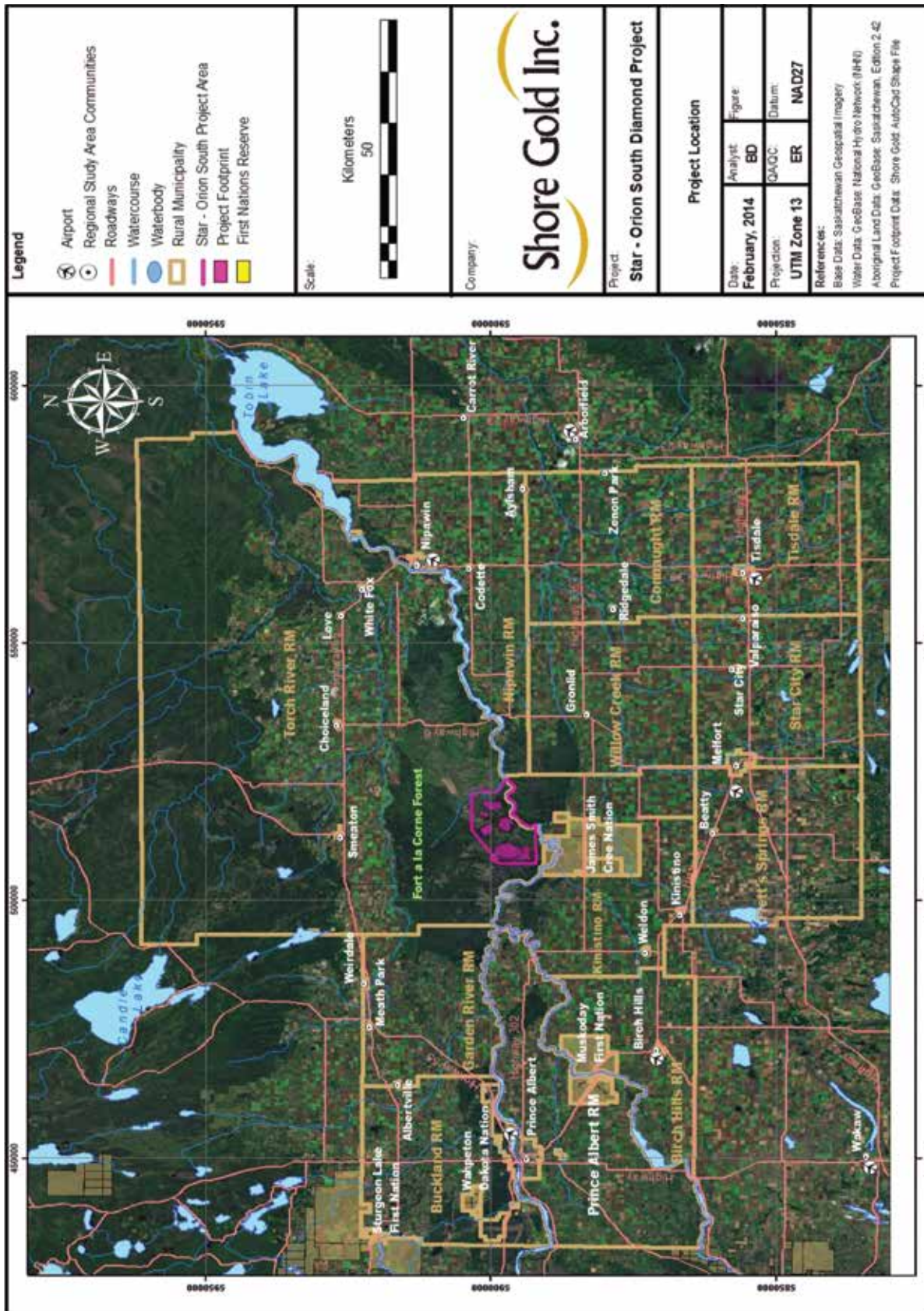
The FalC forest provides suitable habitat for a wide variety of wildlife species, including elk, white-tailed deer, moose, black bears, beaver, and muskrat. It supports non-traditional and recreational uses such as snowmobiling, berry picking, skiing, hunting, fishing, and hiking.

Traditional land use by Aboriginal peoples such as trapping, hunting, fishing, gathering, and cultural practice also occur in the FalC forest. Asserted traditional territories of Aboriginal groups that overlap the project area are described in Section 7 Potential Adverse Impacts of the Project on Potential or Established Aboriginal or Treaty Rights and Interests.

The Project is located north of the Saskatchewan River just downstream of the confluence of the north and south branches of the Saskatchewan River. The Saskatchewan River and English Creek are known fish-bearing waters in the project area. The Saskatchewan River supports 23 fish species and English Creek supports juvenile white sucker and walleye.

The Project is close to the cities of Prince Albert and Melfort, and to several First Nation communities. The closest First Nation community to the project site is the James Smith Cree Nation Indian Reserve 100/100A.

Figure 2.2.1-1: Location of the Star-Orion South Diamond Project



Source: Shore Gold Inc

2.2.2 Project Components

The Project includes:

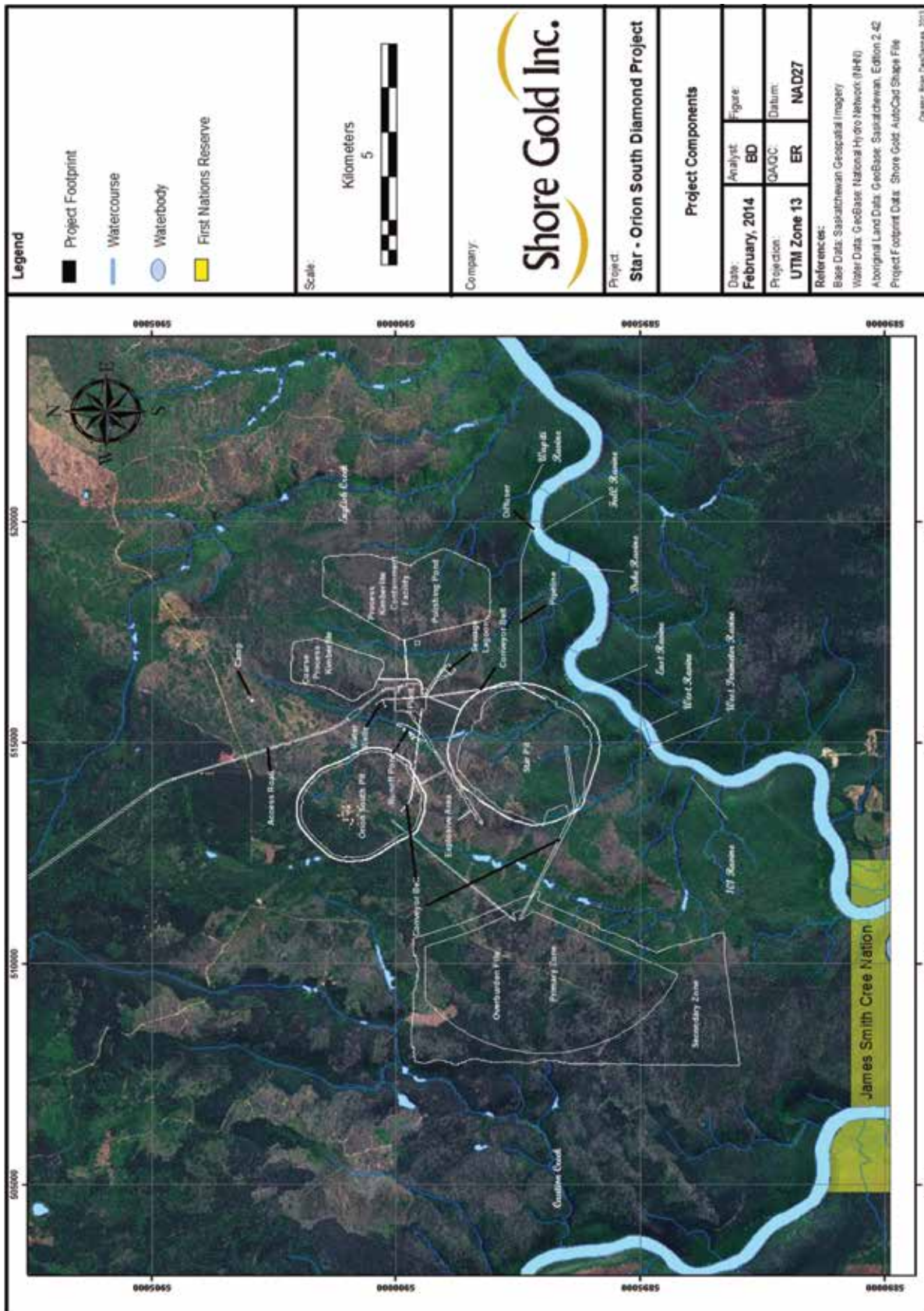
- Decommissioning and removal of existing facilities from exploration activities;
- Excavation of two pits (Star pit and Orion South pit) and a conveyor system to transport material around the site;
- Plant site facilities such as a processing plant, maintenance and administration buildings, product stockpiles, a potable water treatment system, and explosives mixing and storage facilities;
- A temporary construction camp to house off-duty workers for the duration of construction;
- An overburden and rock storage pile;
- A processed kimberlite containment facility that would contain processed water from the processing plants, contact water, and precipitation;
- A coarse processed kimberlite pile;
- Water management infrastructure including a pit dewatering system, outfall-diffuser, intake, and mixing facility; and
- An access corridor including a roadway, communication lines, and natural gas pipeline.¹

Each project component is described in detail in Appendix A – Project Component Details. A map illustrating the general layout of the project components is provided in Figure 2.2.2-1. The footprint of these project components is 3936 hectares or three percent of the FalC forest.

A project fence line, which is a physical brush barrier, will be constructed around project facilities and maintained throughout the life of the mine. The project fence line is illustrated in Figure 2.2.2-2 and will enclose a maximum area of 5381 hectares or approximately four percent of the FalC forest during the Star phase.

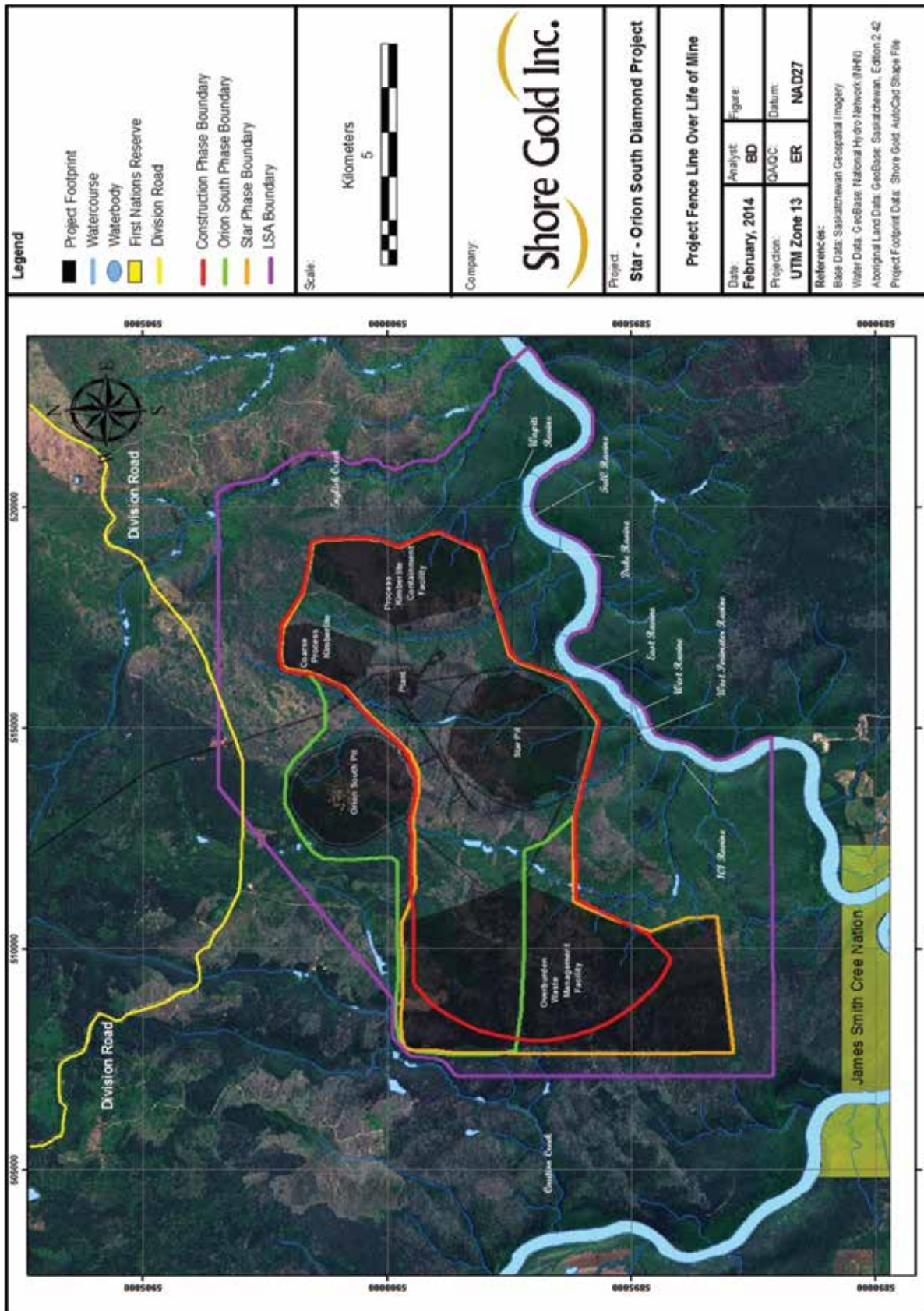
¹ The Project will require a 15.6 to 18.5 kilometre power line, main substation, a distribution network and utilization systems. The power line and associated components are not within the scope of the Project but subject to a provincial environmental assessment.

Figure 2.2.2-1: Project Components and Layout



Source: Shore Gold Inc.

Figure 2.2.2-2: Project Fence Line during Mine Construction and Operations



Source: Shore Gold Inc.

2.2.3 Project Activities

Table 2.2.3-1 summarizes proposed activities during the construction, operation, and decommissioning phases of the Project.

2.2.4 Project Schedule

Project construction is estimated to take four years and mining operations may extend beyond 20 years. As progressive reclamation would be used during operations, decommissioning the project site would take approximately three years after the end of operations.

Table 2.2.3-1: Project Activities within Each Project Phase

Project Phase	Project Activity
Construction	<ul style="list-style-type: none"> • Preparatory activities – decommissioning and removal of existing facilities; site clearing and timber removal, including removal of portions of existing roads; Lars Road relocation around the perimeter of the overburden pile • Construction of an access corridor • Construction of site facilities including: a processing plant, bulk sample plant, warehousing and administrative buildings, maintenance and technical services building, vehicle wash facility, warm-up shed, fire and emergency response building, interpretative centre, security facilities, helicopter landing pads, explosives mixing and storage facilities, fuel storage and distribution facilities, solid waste incinerator and sewage lagoon and mixing facility • Overburden removal and excavation at Star and Orion South pits, and construction of mine support facilities (e.g. internal roads and conveyors) and gravel extraction from overburden to support infrastructure development • Development of a live ore stockpile (i.e. unprocessed ore) and recovery reject pile within the plant footprint • Construction of dewatering facilities and installation of dewatering wells and/or dewatering trenches and collectors • Construction of an overburden and rock storage pile and a coarse processed kimberlite pile • Construction of containment facilities for mine water, process water, and fine processed kimberlite • Construction and installation of surface water management infrastructure • Construction of works to offset the loss of fish habitat caused by the Project
Operations	<ul style="list-style-type: none"> • Management of mining operations – excavation; use of explosives; backfilling; kimberlite processing; overburden and rock storage and management; processed kimberlite management; fuel and materials management; explosives manufacturing, handling, storage, and use • Water management operations – surface and ground water management including drainage control • Waste management operations including discharge and recycling of processed water, domestic sewage treatment and disposal, and solid waste management • Erosion control and soils and till stockpile management • Progressive reclamation such as revegetation of disturbed areas
Decommissioning	<ul style="list-style-type: none"> • Pit closure and site reclamation such as decommissioning of mine roads and revegetation of disturbed areas • Equipment, facility, and machinery removal, recycling or disposal • Re-contouring of site to either blend into the surrounding topography or provide drainage and variations in microsite conditions • Surface and ground water management, including flooding of Star and Orion South pits with groundwater • Disposal of non-hazardous demolition wastes • Stream drainage restoration • Ongoing monitoring and site management

3. Environmental Assessment Context and Process

3.1 Scope of the Project

The scope of the Project includes physical works and activities associated with the construction, operations, and decommissioning of the Project as described in Section 2 of this report.

3.2 Factors to be Considered

The following factors were considered as part of the comprehensive study pursuant to sections 16(1) and 16(2) of the former Act:

- Environmental effects of the Project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out;
- Significance of the environmental effects referenced above;
- Comments from the public that are received in accordance with the former Act and associated regulations;
- Measures that are technically and economically feasible that would mitigate any significant adverse environmental effects of the Project;
- Purpose of the Project;
- Alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means;
- Need for, and the requirements of, any follow-up program in respect of the Project;
- Capacity of renewable resources that are likely to be significantly affected by the Project to meet present and future needs; and
- An articulation of benefits to Canadians.

Under the former Act, an environmental effect is:

- Any change that a project may cause in the environment;
- The effect of any such change on:
 - health and socio-economic conditions
 - physical and cultural heritage
 - current use of lands and resources for traditional purposes by Aboriginal persons or
 - any structure, site or thing that is of historical, archaeological, paleontological or architectural significance; and
- Any changes to the project that may be caused by the environment.

Based on the above definition, indirect economic and social changes that are caused by biophysical modifications of the environment are considered to be environmental effects under the former Act and may be assessed in the comprehensive study. However, the comprehensive study will not examine the direct economic and social effects of a project. For example, the economic effects of a decline in commercial fishing success that is related to a loss of fisheries resources may be considered in the comprehensive study but not economic effects related to the construction of a project.

3.3 Scope of Factors

The scope of factors sets the boundaries of the comprehensive study by focusing on relevant environmental components potentially affected by the Project and concerns expressed by the public and Aboriginal persons.

3.3.1 Identification of Valued Components

The comprehensive study focuses on aspects of the natural and human environments that have particular value or significance and may be affected by the Project. These are referred to as valued components.

Selection of valued components for the comprehensive study was based on the environmental setting (i.e., temporal and spatial scope of the Project and anticipated Project-environment interactions), professional judgment, public, and Aboriginal comments received on the Comprehensive Study Scoping Document², and environmental components considered by the proponent in its Environmental Impact Statement.

Environmental valued components considered in this comprehensive study are:

- Atmospheric Environment, including air quality, greenhouse gases, and noise (Section 6.2);
- Surface Water Resources, including quality and flows (Section 6.3);
- Groundwater Resources, including quality and flows (Section 6.4);
- Vegetation and Plant Communities (Section 6.5);
- Terrestrial Wildlife Habitat and Species, including species at risk (Section 6.6); and
- Fish and Fish Habitat (Section 6.7).

Socio-economic valued components considered in this comprehensive study are:

- Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons (Section 6.8); and
- Human Health (Section 6.9).

This comprehensive study report also discusses changes to the Project that may be caused by the environment (Section 6.10), potential accidents and malfunctions (Section 6.11), capacity and sustainability of renewable resources (Section 6.12), and cumulative effects (Section 6.13).

3.3.2 Spatial and Temporal Boundaries

The spatial boundaries for each valued component encompass the geographic extent over which the Project's potential environmental effects are expected to be measureable. These include the local study area for consideration of direct and indirect effects on the selected valued components, and a regional study area for consideration of cumulative effects on the selected valued components. Spatial boundaries for each valued component are described in Table 3.3.2-1 below.

² This document is available on the Agency's Website (<http://www.ceaa-acee.gc.ca/050/documents/46680/46680E.pdf>) or by contacting the Agency.

Table 3.3.2-1: Valued Components and their Local and Regional Assessment Spatial Boundaries

Valued Component	Spatial Boundaries (Local Study Area [LSA] & Regional Study Area [RSA])
Atmospheric Environment	LSA (Air Quality) = 3 kilometre domain surrounding the project fence line RSA (Air Quality) = 30 by 30 kilometre domain and extending 5 kilometres on each side of the domain beyond the defined RSA LSA/RSA (Greenhouse Gas) = Estimated fuel combustion in diesel engines within the Project footprint
Surface Water Resources	LSA = Watersheds of the nine streams that drain into the Saskatchewan River and area of Saskatchewan River contained between Caution Creek and English Creek RSA = Portion of the Saskatchewan River watershed including the confluence of the North and South Saskatchewan Rivers to the Whitefox River confluence
Groundwater Resources	LSA = Project footprint RSA = Area extending approximately more than 50 kilometres in radius from the project footprint
Vegetation and Plant Communities	LSA = Project footprint plus a buffer zone (approximately 500 metres) encompassing direct project-specific effects, and 1 kilometre buffer on either side of the proposed access corridor RSA = Project footprint and surrounding area that follows the FaIC Forest boundary
Terrestrial Wildlife Habitat and Species	LSA = Project footprint plus a buffer zone (approximately 500 metres) encompassing direct project-specific effects, and 1 kilometre buffer on either side of the proposed access corridor RSA = Project footprint and surrounding area that follows the FaIC Forest boundary
Fish and Fish Habitat	LSA = Watersheds of the nine streams that drain into the Saskatchewan River and area of Saskatchewan River contained between Caution Creek and English Creek, includes the White Fox River, Duke Ravine, and East Ravine crossings RSA = Portion of the Saskatchewan River watershed including the confluence of the North and South Saskatchewan Rivers to the Whitefox River confluence
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	LSA = Project footprint plus a buffer zone (approximately 500 metres) encompassing direct project-specific effects, and 1 kilometre buffer on either side of the proposed access corridor RSA = Project footprint and surrounding area that follows the FaIC Forest boundary
Human Health	LSA (Noise) = Project footprint plus an additional 1.5 kilometres surrounding the Project RSA (Noise) = Project footprint plus 3 kilometres surrounding the Project LSA and RSA (Country Foods) = Refer to the spatial boundaries used for the Terrestrial Wildlife Habitat and Species, and Vegetation and Soils valued components LSA and RSA (Drinking Water) = Refer to the spatial boundaries used for the Groundwater Resources and Surface Water Resources valued components

The temporal boundaries are related to specific project phases and activities, and as such are based on the timing and duration of project activities. Temporal boundaries for this comprehensive study

include the construction (approximately four years), operations and maintenance (approximately 20 years), and closure and decommissioning (approximately three years) of the Project.

4. Project Alternatives

4.1 Alternatives to the Project

Alternatives to a project are different ways a project's need and purpose, as described in Section 2.1, can be functionally met.

The proponent indicated that alternatives to the Project are constrained by the economics of removing the kimberlite deposits. The proponent identified two project alternatives:

- Proceed with the Project to develop the kimberlite deposits through mining; and
- Abandon the Project.

The proponent indicated that abandoning the Project would avoid all potential adverse socioeconomic and environmental effects. However, this alternative would not fulfill the proponent's purpose for the Project. The proponent also indicated that proceeding with the Project is the preferred alternative and the only one that fulfills the need for and purpose of the Project.

4.2 Alternative Means of Carrying Out the Project

Alternative means of carrying out a project are defined as the various technically and economically feasible ways a project can be carried out. The proponent considered two alternative means of carrying out the Project:

- **Open pit mining** – the proponent's preferred mining method. Open pit mining is the only economically feasible way to extract the required tonnage to achieve large economies of scale.
- **Underground mining** – the proponent determined that underground mining was not economically feasible at either of Star or Orion South kimberlite deposits because the extraction of high tonnage from these relatively low grade deposits would require large daily mining rates. Given that this alternative was not economically feasible, no further consideration was given.

The proponent also considered the following alternative means of carrying out mining activities:

- **Kimberlite processing** – Based on detailed processing test work and simulations, autogenous grinding milling over conventional crushing was shown to be beneficial for diamond liberation because it can accommodate variations in rock hardness, causing less diamond damage than conventional crushing equipment.
- **Mining methods** – Two options were examined: in-pit ore crush and convey, and standard truck and shovel. Detailed cost analysis led to the in-pit ore crushing and convey system being selected.
- **Coarse processed kimberlite and overburden and rock storage** – The location and design of the coarse processed kimberlite and overburden and rock piles incorporates a combination of economic and environmental considerations such as: avoiding aquatic habitat, avoiding known potentially economic kimberlite deposits and minimizing impacts on traditional and non-traditional activities in the 101 Ravine. The chosen location of the coarse processed kimberlite pile was to the northeast side of the plant between Duke Ravine and English Creek to ensure drainage could easily be directed away from the open pit. To avoid direct impacts on the 101 Ravine, the overburden and rock storage pile was sited west of the pit locations and an irregular pile design shape was chosen.
- **Fine processed kimberlite management** – Two slurry management options were examined: use a thickening circuit or place total fines directly in the containment facility. The Project has a surplus of water from pit dewatering; therefore, the addition of a thickening circuit to recycle water was considered unnecessary. Also, the inclusion of a thickening circuit would increase the cost and create potential environmental issues at closure due to the uncertain settling characteristics of the thickened tails. The alternative of placing total fines in slurry form directly into the processed kimberlite containment facility was chosen.

- **Processed kimberlite containment facility**

- The location and design of the processed kimberlite containment facility incorporates a combination of environmental and economic considerations such as: avoiding aquatic habitat, presence of known economic kimberlite deposits, fulfilling storage volumes and containment requirements while minimizing the footprint, incorporating surface water management, minimizing impacts on traditional and non-traditional activities in the 101 Ravine, and creating a facility that can be successfully and safely constructed, operated and reclaimed. A self-containment facility using a ring dyke was the chosen layout. The chosen location for the facility was to the east of the plant, directly upstream of the Duke Ravine outside the immediate pit watersheds.

- **Road access** – Upgrading existing roads to the northwest connecting to Highway 55 near Shipman was selected as the preferred option based on technical, economic, and environmental considerations and public input. Other alternatives did not meet the design criteria (e.g., provide a good road connection from Prince Albert and local communities) or would require additional costs and result in greater environmental impacts from constructing a large bridge over English Creek or the Saskatchewan River.

- **Water management** – Alternatives were chosen that considered government and public comments and the regulatory context. Considerations such as the potential Mining Effluent Regulations for diamond mines, minimizing the impact on aquatic biota, and cost were taken into account.

- The water management strategy alternative that was chosen includes a water recycling program and separate management of processing and pit dewatering. This strategy was the preferred choice because it was more flexible and less costly than the other options, avoids direct impacts to watercourses, and provides greater control on the release of excess water without the construction of a large diversion channel and an additional water reservoir.

- The Saskatchewan River was the selected water source for processing kimberlites as it was the only viable option that could be used to blend groundwater prior to it being discharged into the Saskatchewan River (see below) to ensure compliance with the *Fisheries Act*.
- The use of a mixing facility to blend the discharge and piping the discharge through a diffuser into the Saskatchewan River were the chosen options for groundwater management and disposal. These chosen alternatives would avoid impacts on the Duke Ravine and ensure compliance with the *Fisheries Act*.
- Wells for deep water systems and residual passive inflow collection in-pit were selected for pit dewatering since the inflow from the surface water system could be collected from the residual inflow to the pit. The deeper groundwater systems would need to be dewatered using dewatering wells.

Details on the alternative means listed above and alternatives for surface water runoff, water supply, sewage handling and disposal, waste handling and storage, and support and administrative facilities are found in Appendix B.

The proponent considered environmental and socio-economic effects of each alternative means. These effects are outlined in Appendix B.

4.3 Agency's Assessment

The Agency is satisfied with the proponent's consideration of alternatives to the Project and alternative means of carrying out the Project. Environmental effects of these alternative means were adequately considered by the proponent in identifying preferred alternatives.

5. Consultation

5.1 Public Consultation

5.1.1 Agency Consultation

The former Act requires that the public be provided with a minimum of three formal public participation opportunities during the conduct of a comprehensive study. For this Project, three public participation opportunities were provided for soliciting comments on the:

1. Scope of the Environmental Assessment and Project (28 April to 31 May 2010),
2. Conduct of the comprehensive study (19 July to 20 August 2010), and the
3. Environmental Impact Statement Summary (14 August to 13 September 2013).

Public notices of these opportunities were posted on the Canadian Environmental Assessment Registry Internet website and issued in various local newsletters and radio stations. The Agency offered funding to support the public's participation in the comprehensive study process through its Participant Funding Program. No members of the public requested funding from this program.

All public comments received from these public participation opportunities were shared with federal departments involved in the review of the Project, the Saskatchewan Ministry of Environment, and the proponent. To date, public concerns about the Project include the:

- Effects on surface water and groundwater resources from the project discharge into the Saskatchewan River;
- Effects of pit dewatering on Saskatchewan River water levels due to the close proximity of the pits to the river; and
- Effects on the city of Prince Albert's socio-economic conditions such as housing, city services, and labour market.

The Agency invites the public and Aboriginal groups to comment on this comprehensive study report in the fourth and final public participation opportunity for this Project.

5.1.2 Proponent Engagement

The proponent engaged with stakeholders who pursued some activity or demonstrated interest in the region and with communities located in the vicinity of the Project. Engagement was primarily achieved through the Diamond Development Advisory Committee, which consisted of stakeholder groups that were typically elected leaders such as mayors, reeves, Chiefs, or councillors. This committee assisted the proponent with the planning, content and delivery of community events, disseminating information, and collecting feedback at the local level.

Other proponent engagement activities included: hosting open houses, site tours, workshops, and in-person meetings; disseminating information on its website and in its company newsletter; and issuing press releases in various local media such as newspapers and radio. Over 1800 people attended the open houses held in 2009 and 2010.

5.2 Aboriginal Consultation

The federal government has a legal duty to consult and, where appropriate, to accommodate when its proposed conduct might adversely affect established or potential Aboriginal or treaty rights. Aboriginal consultation is also undertaken more broadly as an important part of good governance and sound policy development and decision making.

In addition to the federal government's broader obligations, the former Act requires that federal environmental assessments consider the effect of any project-related change in the environment

and also the effect of that change on current uses of land and resources for traditional purposes by Aboriginal persons. The former Act also requires consideration of the effect of any project-related change in the environment on physical and cultural heritage, and “any structure, site, or thing that is of historical or archaeological significance,” such as sites historically occupied by Aboriginal peoples.

The Agency served as Crown Consultation Coordinator for this comprehensive study. The Agency, together with federal responsible authorities, integrated consultation activities into the environmental assessment process to the extent possible.

The Agency served as Crown Consultation Coordinator for this comprehensive study. The Agency, together with federal responsible authorities, integrated consultation activities into the environmental assessment process to the extent possible.

5.2.1 Cooperative Consultations with the Province of Saskatchewan

The federal government worked cooperatively with the Government of Saskatchewan to coordinate Aboriginal consultation activities where feasible. These activities included organizing joint information sessions and meetings, and sending joint written correspondence. Aboriginal consultation workplans for a select number of Aboriginal groups were also developed collaboratively between the governments.

5.2.2 Agency Consultation

The Agency provided funding through its Participant Funding Program to Aboriginal groups to support their participation in the comprehensive study process. Funding was provided to the following groups:

- Cumberland House Cree Nation (\$16 020)
- James Smith Cree Nation (\$25 000)
- Métis Nation – Saskatchewan Eastern Region II and Western Region II (\$26 100)
- Muskoday First Nation (\$25 000)
- Red Earth Cree Nation (\$15 580)
- Peter Ballantyne Cree Nation (\$7 595)
- Wahpeton Dakota Nation (\$5 650)

The Agency invited Aboriginal groups, identified as having potential or established Aboriginal or treaty rights that could be adversely affected by the Project, to review and provide comments on key documents relating to the environmental assessment. These documents included: the project proposal, the draft Project Specific Guidelines, the draft and revised versions of the Environmental Impact Statement, and the draft comprehensive study report. The Agency also received feedback from Aboriginal groups through meetings and written correspondence. Consultation activities are summarized in Appendix C.

The Agency considered comments received from Aboriginal groups in preparing this comprehensive study report. Aboriginal comments on the Project are elaborated in section 6 of the effects assessment. A summary table of comments, with associated proponent and Agency responses, can be found in Appendix D.

5.2.3 Proponent Engagement with Aboriginal Groups

Engagement efforts of the proponent can assist the Crown's consultation process by identifying potential adverse impacts of the Project on potential or established Aboriginal or treaty rights and providing appropriate mitigation or accommodation measures that may be required to address these potential impacts.

Proponent engagement with Aboriginal groups involved meetings and workshops to share project information and receive feedback on the Project. The proponent also provided capacity funding for a select number of Aboriginal groups to collect traditional land use and traditional knowledge information required for the environmental assessment. Information collected by the proponent from its Aboriginal engagement was considered in the Agency's assessment of potential adverse impacts of the Project on asserted or established Aboriginal or treaty rights.

Through memorandums of understanding and one mutual cooperation agreement, the proponent and four Aboriginal groups are committed to developing impact benefit agreements should the Project receive regulatory approval. Impact benefit agreements aim to address Aboriginal interests such as training, employment, and contracts. The proponent has secured memorandums of understanding with the:

- Métis Nation – Saskatchewan Eastern Region II,
- Métis Nation – Saskatchewan Western Region II,
- Sturgeon Lake First Nation,
- James Smith Cree Nation, and
- Wahpeton Dakota Nation.

Negotiations with other Aboriginal groups are still ongoing.

The proponent will continue its engagement with Aboriginal groups throughout the environmental assessment and regulatory process, and during construction, operations, and closure activities should the Project receive regulatory approval.

6. Environmental Effects Assessment

6.1 Approach to Environmental Effects Assessment

Identifying potential environmental effects

The Agency, in collaboration with federal departments, identified potential environmental effects of the Project using the:

- Proponent's assessment of potential environmental effects and identification of mitigation measures as described in the proponent's Environmental Impact Statement (EIS), and
- Federal government, public, and Aboriginal comments during the conduct of the environmental assessment, and the proponent's responses to those comments.

Identifying and characterizing adverse residual effects

Environmental effects remaining after the implementation of mitigation measures are called *residual effects*. Mitigation, as defined in the former Act, means the elimination, reduction, or control of the adverse environmental effects of the Project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation, or any other means.

The Agency assessed the residual environmental effects of the Project using the proponent's residual environmental effects analysis as described in its EIS and comments received from federal government departments, the public, and Aboriginal groups.

The Agency evaluated and characterized adverse residual effects by using the following attributes:

- **Magnitude** – Nature and extent of the environmental effect quantified by the change in a parameter or variable from an appropriate threshold value for environmental valued components, or qualitative change using likely risk and level of management required to address the effect for socio-economic valued components;
- **Geographic Extent** – Spatial area within which an effect occurs;
- **Duration** – Length of time that the environmental effect would likely be evident, which is closely related to the project phase or activity that would cause the effect;
- **Frequency** – How often an effect will occur, e.g. continuous or at specific time intervals; and
- **Reversibility** – Ability of the physical parameter, or biological or social community to return to conditions that existed before the environmental effect.

Each attribute and its associated rankings are defined in Table 6.1-1 below.

Table 6.1-1: Residual Effects Attributes and Definitions

Attribute	Ranking	Ranking Definition
Magnitude (Environmental Valued Component)	Low	<1% change in the valued component or predicted effect is at or minimally exceeds threshold or recommended guidelines
	Medium	1–10% change in the valued component or predicted effect exceeds threshold or recommended guidelines
	High	>10% change in the valued component or predicted effect greatly exceeds threshold or recommended guidelines
Magnitude (Socio-economic Valued Component)	Low	Individuals are affected; effect may or may not be detectable or within the normal range of variability
	Medium	Effect is clearly distinguishable at the community or population level but is unlikely to pose a serious risk to the valued component or represent a management challenge
	High	Effect is likely to pose a serious risk to the valued component and represents a management challenge
Geographic Extent	Low	Effect is limited to the local study area
	Medium	Effect extends throughout the regional study area
	High	Effect extends beyond the regional study area
Duration	Short-term	Effect is expected to last during the construction period
	Medium-term	Effect extends past construction and throughout operations
	Long-term	Effect extends past closure
Frequency	Low	Effect occurs infrequently and is difficult to predict; is effectively a one-time event during a specific phase of the Project
	Medium	Effect occurs at regular but infrequent intervals during the project phase in which it occurs
	High	Effect occurs at regular and frequent intervals during the project phase in which it occurs
Reversibility	Low	Effect is readily reversible over a relatively short period of time, i.e. throughout the Project's lifecycle
	Medium	Effect is reversible but only at substantial cost, and over a long period of time, i.e. extending past the Project's lifecycle
	High	Effect is not readily reversible despite implementation of mitigation or compensation

Assessing the significance of adverse residual effects

The ranking of residual effect attributes, as reflected in Table 6.1-1, is a criterion used to determine significance of an adverse residual effect. Adverse residual effects that frequently have low attribute rankings, such as negligible or minor magnitude, short-term duration, and local extent, are unlikely to produce significant effects.

Further, adverse residual effects that frequently have moderate to high attribute rankings, such as moderate or high magnitude, long-term duration, regional or beyond regional extent, and irreversible, could produce significant effects. Refer to Table 6.1-2 for a list of possible significance outcomes.

Table 6.1-2: Significance Ratings and Associated Residual Effect Attributes

Significance Rating	Associated Residual Effect Attributes
Negligible - Not Significant	Residual effects which, after taking into consideration mitigation measures, have a low ranking for the majority of the assessment criteria and are short-term in duration.
Minor - Not Significant	Residual effects which, after taking into consideration mitigation measures, are local in extent or low in magnitude, despite rankings in the other criteria.
Moderate - Not Significant or Significant	Residual effects which, after taking into consideration mitigation measures, have a medium ranking for the majority of the criteria, are regional or beyond regional ³ , and occur in any duration.
High - Not Significant or Significant	Residual effects which, after taking into consideration mitigation measures, have high ranking for the majority of the criteria, are regional or beyond regional, and are long-term in duration.

Adverse residual effects that frequently have moderate to high attribute ranking would require careful consideration prior to making a final significance determination. These considerations include:

- Likelihood of the effect occurring,
- Scientific data and Aboriginal knowledge,
- Quantitative thresholds set in regulations, guidelines or standards,
- Socio-economic importance, and
- Ecological importance.

6.2 Atmospheric Environment

The atmospheric assessment includes air quality and greenhouse gases. Project noise is assessed in section 6.9 Human Health. Baseline air quality in the FalC forest was rated good because particulate matter, metal elements, and gaseous air contaminants fell below air quality detection limits. No significant sources of greenhouse gas emissions exist in a 30 kilometre radius from the Project.

There are no known permanent residences within 10 kilometres of the Project; however, there are two seasonal cabins located within five kilometres of the project fence line. There is one cabin directly across the Project south of the river. There are several residences on the James Smith Cree Nation Reserve within the 20 kilometres of the Project. Air

quality effects on temporary land users of the FalC forest are described in section 6.9 Human Health.

Potential Environmental Effects and Proposed Mitigation

The EIS states that the Project would emit air contaminants, including particulate matter (dust), nitrogen dioxide, and sulphur dioxide. Blasting, excavation, materials hauling, crushing and sizing, stockpiling, and overburden and rock disposal would be the main sources of dust. Mobile and stationary diesel engines, waste incineration, and natural gas heating would be the main sources of nitrogen dioxide and sulphur dioxide.

Proposed mitigation measures include applying dust suppressants, providing vegetation cover on stripped areas, and using delayed blasting techniques to reduce air contaminants. As haul trucks are the dominant source of air contaminants, particularly nitrogen dioxide, new haul trucks will be used that meet lower emission standards.

The EIS estimates that the Project would emit greenhouse gas emissions from natural gas and diesel combustion at a rate of 32.09 kilotons of carbon dioxide per year. Proposed mitigation measures to reduce greenhouse gas emissions include using new haul trucks, implementing a no idling policy, and a fleet maintenance program.

³ Significant adverse residual effects on **socio-economic valued components** could also be local in extent.

Additional mitigation measures for the atmospheric environment are listed in Appendix F.

Public, Aboriginal, and Government Comments

The James Smith Cree Nation stated that the proponent did not include its reserve as a sensitive receptor for air quality. This Nation, along with the Muskoday First Nation and the Wahpeton Dakota Nation, expressed concerns over the predicted exceedances of one-hour nitrogen oxide concentrations at the project fence line. The proponent stated that new haul trucks would be used and that ambient air quality objectives would now be met for all potential contaminants at the project fence line. Air quality effects on the reserve are therefore unlikely. Passive monitoring of nitrogen oxide will be included in the air quality monitoring program.

Agency's Analysis of Residual Effects

Predicted concentrations of air contaminants caused by the Project would comply with established ambient air quality objectives set in the *Saskatchewan Clean Air Act* (1989) and by the Canadian Council of Ministers of the Environment (CCME 1999). These air quality objectives set provincial and national goals for outdoor air quality that protect public health, the environment, or aesthetic properties of the environment. Considering that the predicted air quality parameters would be below recommended guidelines at the project fence line, and that the area surrounding the Project would not be easily accessible by the public, the Agency finds that residual adverse effects on air quality would be negligible.

Project greenhouse gas emissions would account for 0.15 percent of provincial and 0.0122 percent of national annual emissions reported in 2008. The project contribution to greenhouse gases would be negligible compared to national emissions. The Agency therefore finds that there would be negligible residual climate change effects.

Agency Conclusions on the Significance of Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse residual effects on the atmospheric environment taking into account the implementation of mitigation. Follow-up measures, including the monitoring of air emissions, will be implemented.

6.3 Surface Water Resources

The surface water resource assessment focuses on water quality and the flows of nine local tributaries and the adjacent reach of the Saskatchewan River. The annual mean discharge of the Saskatchewan River is 439 cubic meters per second, with the local tributary streams contributing 0.39 cubic meters per second to the river's total inflow. A few baseline water quality parameters, such as iron and aluminium, naturally exceeded guidelines for the protection of aquatic life as set by provincial and federal governments (SKMOE 2006, CCME 2011). Sediment concentrations of macroelements, metals, and nutrients were found to vary between monitoring sites.

Potential Environmental Effects and Proposed Mitigation

Water Quality

The EIS states that sediments from vegetation clearing, road and mine construction, and erosion of the stockpiles could be transported by surface runoff and deposited into receiving water bodies, thus degrading water quality. Overburden and rock storage management, and kimberlite management could adversely alter sediment quality from the absorption and adsorption of contaminants. These sediments, along with the other source pollutants from site water, sewage effluent, blasting reagents, and process water, could degrade water quality if they enter water bodies.

The EIS states that the Mannville aquifer groundwater from pit dewatering is saline and high in total

dissolved solids. Its disposal into the Saskatchewan River could degrade water quality. Seepage and drainage from mine facilities, and spills of hazardous wastes and mine infrastructure failures could also degrade water quality; these effects are discussed in section 6.4 Groundwater Resources and section 6.11 Accidents and Malfunctions, respectively.

The EIS predicts that water quality in the local tributaries and Saskatchewan River following the implementation of proponent mitigation would be within pre-mining background ranges of variability throughout the life of the Project and at closure.

Proposed mitigation measures for water quality include:

- Implementing standard practices to minimize sediment transport and runoff, such as the use of sediment fencing, bank stabilization, and erosion control on stockpiles;
- Diverting drainage upstream around the facilities to reduce water volumes that could be affected during operations;

- Using retention and drainage structures to capture and manage seepage and surface runoff (e.g. sedimentation ponds);
- Using a two-stage sewage treatment lagoon, constructed as per regulatory standards, to treat wastewater to meet applicable regulations and guidelines prior to discharge;
- Following industry best practices in explosives handling and use to minimize nitrate and blasting residue contamination of site runoff and adjacent water bodies;
- Blending processed kimberlite containment facility decant water with excess groundwater prior to discharge into the Saskatchewan River; and
- Installing a diffuser to optimize mixing of the discharge in the river.

At closure when tributary drainage is restored, the EIS predicts that the overflow of the Star pit lake could affect the water quality of East Ravine and subsequently the Saskatchewan River. Overflow from Star pit lake will be retained until it is suitable for discharge. Star pit will be actively filled with Saskatchewan River water to accelerate pit filling and improve pit water quality.

The EIS predicts that water quality in the local tributaries and Saskatchewan River following the implementation of proponent mitigation would be within pre-mining background ranges of variability throughout the life of the Project and at closure. Water quality parameters that exceeded guidelines prior to the Project would remain above the guidelines. The EIS states that the diffuser would increase the dispersion rate of the discharge, ensuring that water quality parameters guideline values would not be exceeded within 40 meters from the point of discharge.

Water quality of watercourses will be monitored throughout the life of the mine and monitoring will continue for at least 20 years post closure, until the site is returned to an appropriate state, or until the site can be returned to provincial control. Monitoring results will be used for adaptive management in response to changes in water quality and lessons learned. If predictions for water

quality are not met, contingencies for management, such as adjusting recycling rates from the processed kimberlite containment facility and altering water volume pumped from the river, will be implemented as necessary to protect Saskatchewan River water quality.

Water Flows

The EIS states that project activities during construction and operations could:

- Reduce the baseflow of local tributaries caused by the capture of groundwater from pit dewatering that would otherwise provide interflow to local streams, i.e. drawdown effects;
- Increase or decrease tributary flows from the alteration of drainage areas and impoundment of tributaries; and
- Alter Saskatchewan River net flows from water withdrawal for kimberlite processing, altered discharge from tributaries, reduced groundwater discharge caused by drawdown from pit dewatering, and disposal of process water and excess groundwater from pit dewatering.

There will be maximum recycling of water within the plant site to reduce water withdrawal from the Saskatchewan River. The proponent will also supplement flows during low-flow conditions for local fish-bearing streams—English Creek, Duke Ravine, and 101 Ravine—using water sources such as the East Ravine diversion or Saskatchewan River. Flow rates in regional fish-bearing streams affected by drawdown from pit dewatering will also be supplemented as warranted.

At closure, the EIS predicts that the pits will be filled with precipitation, surface runoff, Saskatchewan River water for Star pit, and inflow from groundwater. The inflow of groundwater into the pits could create drawdown effects by reducing groundwater interflow to local and regional tributaries, and the Saskatchewan River until the pits are filled with water and aquifers reach

equilibrium. The active filling of the pits with Saskatchewan River water could affect river flows if water is excessively withdrawn during low-flow periods.

Tributary drainage areas will be restored after mining operations, except for the East Ravine drainage area because the Star pit would remain part of the closure plan. The Star pit will be actively filled with Saskatchewan River water to accelerate pit filling and reduce local drawdown effects. Pumping will be suspended during low flow period in the Saskatchewan River. The decision and method to actively fill Orion South pit will be determined based on experience with closure of the Star pit.

The Northern Mine Decommissioning and Reclamation Guidelines (SKMOE 2008) for the decommissioning and reclamation of open pits and other facilities will be followed where appropriate. A detailed decommissioning and reclamation plan, along with an assurance fund to ensure the completion of the plan, will be in place prior to construction, as per provincial regulatory requirements under the Mineral Industry Environmental Protection Regulations, 1996.

After the implementation of mitigation, the EIS predicts that the amount of river water withdrawn and returned to the Saskatchewan River, and a slight increase in tributary discharge into the river, would result in a net increase of less than one percent during operations. At closure when the Star pit is actively filled, drawdown caused by groundwater inflow into the pits and change in tributary discharge is negligible compared to the river's annual discharge. Furthermore, the amount of water withdrawn from the river for active pit filling is negligible (0.2 percent) compared to the river's annual discharge.

The proponent proposes to supplement flow to English Creek, 101 Ravine, and Duke Ravine due to their ecological importance for fish habitat. The EIS predicts that other local tributaries not

receiving supplemented flow, i.e. those with little productive fish habitat, during operations and post closure could experience flow reductions of up to 52 percent. East Ravine flows would be virtually eliminated during operations. Local tributary flows would return to between 68 to 92 percent of baseline by year 350 after the end of mining, assuming the pits are not actively filled. Given that the pits will be actively filled, this effect from drawdown is expected to be of a lesser magnitude. East Ravine flows will be re-established when Star pit overflows.

The EIS predicts that regional tributaries south of the Saskatchewan River could also be affected by drawdown from pit dewatering during operations and pit filling post closure but potential for changes in stream flow south of the river are less than that for streams north of the river as the Saskatchewan River valley interrupts the direct connection of the surficial aquifers to the pits. Monitoring will determine whether flow supplementation will extend to these affected regional tributaries.

Water flows will be monitored throughout the life of the mine and will continue for at least 20 years post closure, until the site is returned to an appropriate state, or until the site can be returned to provincial control.

Additional mitigation measures for surface water resources are listed in Appendix F.

Public, Aboriginal, and Government Comments

A member of the public and many Aboriginal groups (Métis Nation of Saskatchewan Eastern and Western Region II (the Métis), Cumberland House Cree Nation, Red Earth Cree Nation, Wahpeton Dakota Nation, Muskoday First Nation, and James Smith Cree Nation) expressed concerns about the water quality effects from the direct discharge of brackish groundwater from the Mannville aquifer into the Saskatchewan River. The Métis and the Cumberland House Cree Nation also expressed concern about the downstream effects from the project discharge into the river.

The proponent asserted that the discharge would not degrade the river's water quality and that water quality parameters would fall within their natural range of variability. Baseline water quality parameters that exceeded federal and provincial guidelines for the protection of aquatic health and drinking water would remain above applicable guidelines. In 2013, the proponent revised its water management strategy to further improve the end-of-pipe water quality discharge (refer to section 6.7 Fish and Fish Habitat). This revised strategy involved blending the Mannville groundwater with process water from the processed kimberlite containment facility prior to discharge into the river.

The Wahpeton Dakota Nation expressed concern about blasting reagents and their effect on water quality, and how this effect would be mitigated. The proponent included residual nitrate and ammonia in its water quality assessment. Best practices in explosives management will mitigate blasting effects on water quality.

Environment Canada commented on the potential effects on water quality of other loading sources such as the sewage lagoon used to treat camp wastewater. The proponent responded with additional water quality information and assured Environment Canada that any discharge will meet provincial and federal requirements prior to release into the receiving environment.

The Muskoday First Nation and the Wahpeton Dakota Nation raised the concern that tributary flows would not be fully restored post closure and expressed its desire that all ecosystem function be restored to pre-disturbance conditions. They also requested that the proponent periodically update predictions with real monitoring data and develop a long-term monitoring and mitigation plan for the affected watercourses. Both groups stated concerns over how mitigation, such as supplementing flow, would be enforced if peak drawdown on tributaries is predicted to occur 20 years post closure. The proponent assessed the effects on hydrology in

the EIS and concluded that project effects on regional hydrology would be negligible despite the long term effects on local tributary flows. Flows of select tributaries will be maintained by flow supplementation throughout the life of the mine and at least 20 years post closure, until the site has returned to an appropriate state, or until the site can be returned to provincial control. An aquatic effects monitoring plan to monitor water quantity and other valued aquatic components will be developed pre-construction based on similar plans developed for diamond mines in the Northwest Territories. An adaptive management approach will be applied during the whole project lifecycle and post closure. Regulatory permits and associated conditions, along with follow-up post closure, will ensure that mitigations are enforced.

The Muskoday First Nation questioned the robustness of the proponent's baseline data and its use in predictive modelling. The proponent stated that the three years of flow data collection is representative of dry, normal and wet years, and that all streams from which water quality information was collected can be considered potential exposure areas. Should the Project be approved, the proponent will develop a monitoring plan in accordance with the Protocols Manual for Water Quality Sampling in Canada (CCME 2011); monitoring requirements will also be provided as part of regulatory approval conditions.

The majority of Aboriginal groups expressed concern about the end pit lake water quality and the length of time required to passively fill the pits from groundwater, i.e. over 300 years for the Star pit and over 1000 years for the Orion South pit. The Muskoday First Nation expressed preference for actively filling the Orion South pit from the Saskatchewan River provided that the experience with Star pit does not impact the Saskatchewan River and is an effective method to prevent development of brackish water quality in the lake. Environment Canada also commented on the liability and monitoring requirements for the long time frame required for the pits to completely fill.

The Agency requested that the proponent evaluate the feasibility, time frame, and potential effects of actively filling the pits with Saskatchewan River water. The proponent indicated that passive infilling was used to make conservative predictions in its assessment, but will commit to actively filling Star pit to improve water quality, accelerate closure of the pit, and reduce local drawdown effects. It would take 9.6 years to fill the Star pit, neglecting inputs from precipitation and groundwater inflow. The decision to actively fill the Orion South pit would be determined based on experience with closure of the Star Pit. A detailed monitoring and reclamation plan will be developed prior to development and would require further consultation on the plan as per provincial permitting requirements.

Based on Natural Resources Canada's comments related to the calibration of the hydrogeological model (refer to section 6.4 Groundwater Resources), Environment Canada, Fisheries and Oceans Canada, and the Agency requested that the proponent describe any risk management strategies associated with the level of uncertainty in the hydrogeological model with respect to predicting environmental effects on water quality and flows. A member of the public questioned the effects of dewatering on the Saskatchewan River due to the close proximity of the Star pit. The proponent is of the view that due to the uncertainty identified in the hydrogeology model, the magnitude of effects on surface water flows and quality cannot be predicted with certainty.

The proponent evaluated possible risks associated with this uncertainty and concluded that its water management strategy and mitigation to supplement tributary flows would address probable worst case scenarios. The proponent does not anticipate effects on Saskatchewan River flows as project dewatering would add water to the river making up for the amount removed, and because drawdown effects on the river are predicted to be negligible compared to the overall flow of the river.

The proponent has committed to providing a full update of the hydrogeology model and surface water impact predictions to relevant federal and provincial regulators during detailed design and construction when additional information is gathered. Environment Canada, and Fisheries and Oceans Canada considered the proponent's follow-up on updating the hydrogeology model and surface water impact predictions as a reasonable approach to resolving the issue.

The proponent does not anticipate effects on Saskatchewan River flows as project dewatering would add water to the river making up for the amount removed, and because drawdown effects on the river are predicted to be negligible compared to the overall flow of the river.

Agency's Analysis of Residual Effects

Residual Effects on Water Quality

The EIS assessed water quality effects against applicable guidelines set by the provincial and federal governments for the protection of aquatic life (SKMOE 2006; CCME 2011) and for drinking water (Health Canada 2008). Guidelines set the maximum allowable concentrations for the protection of aquatic health and drinking water.

The Agency is of the view that adverse residual effects on water quality would be negligible because water quality in the local tributaries and Saskatchewan River are expected to be within pre-mining background ranges of variability throughout the life of the Project and at closure.

Residual Effects on Water Flows

The Agency is of the view that the Project would have negligible residual effects on the net flows of the Saskatchewan River during operations and closure since river flows are predicted to remain within the natural range of variability. The Agency notes that provincial reclamation guidelines also require that there be no impacts on water levels of the source water body from pit infilling (SKMOE 2008).

The Agency notes that reduced flows of local and regional tributaries during operations and post closure are not predicted to affect Saskatchewan River flows. The proponent states that the availability of recharge from precipitation and relatively large release of water from storage within the shallow groundwater system would attenuate the effect of drawdown on local and regional tributaries during operations and post closure.

Recognizing that some uncertainty remains with the magnitude of the environmental effects on tributary flows caused by the lowering of groundwater levels, the Agency considers that the effects to key tributaries supporting fish

habitat are unlikely after taking into account the implementation of mitigation measures proposed by the proponent should effects be identified during the monitoring of surface water and groundwater levels and the implementation of follow-up by federal regulatory authorities.

The Agency is of the view that residual effects on local and regional tributary flows during operations and at closure would be *negligible* in magnitude for targeted tributaries that will receive flow supplementation, but *low to high* in magnitude due to the removal of East Ravine during operations and the baseflow reductions of affected tributaries that would not be receiving flow supplementation. The residual effects on tributary flows would also be *regional* in extent, *long-term* in duration, *continuous* in frequency, and *reversible* as aquifers will reach equilibrium after closure. The Agency understands that residual effects on tributary flows would have negligible effects on the overall regional hydrology because Saskatchewan River flows are predicted to remain within the natural range of variability. The Agency notes that the Project's residual effect on tributaries would not likely have adverse ecological consequences as mitigation would be targeted to tributaries with productive fish habitat (refer to section 6.7 Fish and Fish Habitat). Further, the availability of recharge from precipitation and relatively large release of water from storage within the shallow groundwater system would attenuate the effect of drawdown on local and regional tributaries during operations and post closure. Although there would be a complete removal of East Ravine during construction and operations, its flows will be restored when the Star pit lake overflows post closure.

Agency Conclusions on the Significance of Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on surface water resources taking into account the implementation of mitigation. A surface water monitoring program will be in place throughout

the life of the Project and will continue for at least 20 years post closure, until the site is returned to an appropriate state, or until the site can be returned to provincial control. This program will include the monitoring of water flows, water quality, and sediment quality in the receiving environment.

6.4 Groundwater Resources

The groundwater assessment includes groundwater levels and quality. The groundwater system within and surrounding the project site can be described as three units or systems:

1. A surficial system that is shallow and comprised of the surficial sands, silts, and clays. Groundwater from this system is relatively fresh and a source of drinking water in the region. The surficial aquifer collects rain and snow melt during the year and plays an important role in providing baseflow to most of the local streams.
2. A confining layer comprised of till, locally referred as the Empress Formation, and underlain by the Joli Fou Shale. Generally, this layer of till and shale is understood to prevent flow between the surficial and deep aquifer systems. There are a number of thin intermittent aquifers within or beneath the confining layer that are sometimes used for water supply. The extent of these aquifers is unknown.
3. A deep system comprised of the Mannville and upper portions of the Souris River Formation (referred to as the Mannville aquifer). Groundwater from the Mannville aquifer is slightly brackish with elevated total dissolved solids and trace metals, and not a common source of drinking water as it would require treatment. The Mannville aquifer does not have a good connection to local streams or the Saskatchewan River.

The closest wells to the project site are located approximately 8 kilometres south of the Project on the James Smith Cree First Nation, and 12 kilometres west of the Project in the rural municipality of Kinistro.

Potential Environmental Effects and Proposed Mitigation

Groundwater Levels

The EIS predicts that operational pit dewatering could lower the Mannville aquifer by more than 200 metres in the vicinity of the pits, and less than 100 meters at 10 kilometres from the pits. The surficial aquifer could be lowered by less than one meter at locations outside the FalC forest. Groundwater effects on the surficial aquifer would likely peak at approximately 10 to 20 years post closure, assuming pits are passively filled.

The EIS predicts that approximately 144 private wells at depths greater than 25 metres within 30 kilometres of the Project could be affected. These wells are assumed to be completed within sand lenses, within the till, or within layers between till sheets. Approximately 85 of the 144 wells could experience water level drops between 25 to 50 meters; 59 of the 144 wells could be slightly affected depending on the exact depth and location of the well, pumping setting in the well, performance of the aquifer and water usage.

As most springs are fed from the surficial aquifer, the EIS states that springs located closer to the Project could see a decrease in water discharge. Effects from the lowering of groundwater levels on surface water resources and wetlands are discussed in section 6.3 Surface Water Resources and section 6.5 Vegetation and Plant Communities, respectively.

At closure, the EIS states that levels in the surficial aquifer could be reduced in the immediate vicinity of the pit lakes from drawdown created by the inflow of groundwater toward the pit lakes. Private wells

within the regional area impacted by drawdown from operational pit dewatering would also likely be affected by drawdown at closure. Springs located close to the Project could see a decrease in water discharge.

If lowered groundwater levels affect private wells throughout the life of the mine and post closure, pump settings will be changed or pumps in local wells will be replaced by the proponent with more efficient high-lift pumps. For wells that are severely impacted, alternate water supplies and treatment, e.g. new wells, well improvements, above ground storage for water, will be provided. There will also be an extensive program to educate local well owners of the proposed works and monitoring, and provide them with contact information and a resolution process should problems arise with their wells.

Monitoring of groundwater levels will begin at construction and continue post closure for at least 20 years, until the site is returned to an appropriate state, or until the site can be returned to provincial control.

Groundwater Quality

The EIS states that seepage and acid mine drainage from mine facilities could affect groundwater quality in the surficial aquifer. To prevent seepage and drainage water from entering into the surficial aquifer and subsequently into the receiving environment, perimeter collection ditches will be used to capture seepage and drainage around mine facilities. This seepage and drainage will be treated at the processed kimberlite containment facility during the Star phase. All process water, seepage, and drainage will be treated in the Star pit during the Orion South phase.

Drainage from the overburden pile will be mitigated by capping the shale with till or clay; the recovery rejects pile will be lined with till or clay. The processed kimberlite containment facility will be capped with appropriate overburden including

low permeability till or clay in low-lying areas and revegetated at closure to prevent seepage. The processed kimberlite containment facility will be decommissioned eight years prior to overall site closure and not used during the mining of Orion South pit.

The proponent will determine during detailed design if subsurface drainage, such as drainage pipes or shallow wells, would be required to further reduce seepage. The proponent will develop a monitoring program as per provincial regulatory requirements to ensure seepage and drainage water is contained within the collection system. The proponent will update the seepage model using laboratory and field monitoring data to verify predictions of seepage flow dynamics and chemical composition, and adaptively manage seepage throughout the life of the mine by identifying and implementing new mitigations or modifying existing ones as appropriate.

Unintended or incidental releases of contaminants could also affect groundwater quality. The effects of spills and associated mitigation are described in section 11 Accidents and Malfunctions.

The EIS predicts that filling of the Star and Orion South pits from the inflow of groundwater could create a hydraulic connection between the Mannville and surficial aquifers at closure. This connection could potentially affect water quality in the surficial aquifer from the upward movement of brackish Mannville groundwater through the open pits. Star pit water could also flow out of the pit lake towards the lower elevation of the Saskatchewan River valley through one or more deeper intertill aquifers. This water could reappear at one or more of the existing springs on the pit side of the river.

The EIS predicts that this volume of water would be very small due to the limited potential for the thin, discontinuous aquifers to move water, low hydraulic gradient from the pit lake to the spring locations in the river valley, and the covering of aquifers by back filled materials in the Star pit.

Monitoring of groundwater quality will begin at construction and continue post closure for at least 20 years, until the site is returned to an appropriate state, or until the site can be returned to provincial control.

Additional mitigation measures for groundwater resources are listed in Appendix F.

Public, Aboriginal, and Government Comments

The James Smith Cree Nation and the Muskoday First Nation stated concerns about the uncertainties of the proponent's groundwater predictions. The Muskoday First Nation requested for a detailed mitigation and monitoring plan to minimize effects on a more regional scale and in the long term. The Wahpeton Dakota Nation requested more information on the interaction between the surficial and Mannville aquifer. The Muskoday First Nation requested that the hydraulic conductivities used for the predictive model should be derived from measured, not assumed, values. This Nation also requested that additional testing of the hydraulic conductivity of the Colorado Shale be completed as the vertical hydraulic conductivity appeared to be more permeable in the vicinity of the Star pit.

Natural Resources Canada requested that the proponent examine high conductivity zones and use better recharge values to improve calibration of the hydrogeology model to reproduce existing hydrogeological conditions at the site. It recommended that the model be recalibrated to include a permeable layer at the interface of the till and the fractured top layer of the Colorado shale, and a location for the water to drain to, as supported by piezometric and hydrogeochemical data.

The proponent responded to these review comments by revising the hydrogeology model based on additional field data collected from a 20-day pump test. The proponent re-evaluated the hydraulic conductivity values for the various geological units to generate over 66 separate scenarios.

The James Smith Creek Nation, Métis, and the Muskoday First Nation expressed concerns about the project effects on wells from drawdown and the permanent changes to groundwater levels.

While modification to the model showed some improvement in calibration, Natural Resources Canada noted that the hydrogeology model provided by the proponent still did not calibrate to baseline site conditions. The proponent is of the view that due to the local geology, which includes a complex mix of glacial, sedimentary, and volcanic lithologies, calibrating the model adequately is difficult despite the large amount of local and regional data considered. The proponent has committed to providing an updated recalibrated model to relevant federal and provincial regulators during detailed design and construction when additional information is gathered.

The James Smith Creek Nation, the Métis, and the Muskoday First Nation expressed concerns about the project effects on wells from drawdown and the permanent changes to groundwater levels. The proponent asserted that the existing utility wells on the reserve are in the shallow aquifer and outside the area of significant drawdown. Further, there is a large amount of groundwater storage in the shallow aquifer therefore the long-term changes in level would be low in magnitude. The proponent also stated that it will develop a monitoring

and contingency plan, including landowner compensation, and that monitoring will continue for at least two decades after the cessation of pumping, or until a clear recovery trend is measured or the site is released to provincial control.

The James Smith Cree Nation raised concerns about the effects on groundwater quality from metal leaching and acid rock drainage. The Muskoday First Nation stated that the coarse kimberlite pile and processed kimberlite containment facility would not be lined, causing a concern for seepage. Both the Wahpeton Dakota and Muskoday First Nations stated that continual monitoring, additional treatment or mitigation, and additional tests should be completed with respect to metal leaching and acid rock drainage. Natural Resources Canada commented on the need for the proponent to install appropriate seepage quality and flow monitoring devices in the processed kimberlite containment facility to better predict the effects of seepage on the receiving environment. Natural Resources Canada also questioned the proponent's predictions of seepage from the processed kimberlite containment facility, particularly post closure when the facility is reclaimed.

The proponent stated that as the overburden pile has low permeability, it essentially acts as a clay cap that will minimize infiltration and leaching. Drainage from the overburden and processed kimberlite storage facilities will be monitored regularly during operations and post mining. Monitoring would indicate whether treatment of site drainage is necessary. The proponent will continue field leach pad testing during construction and operations, and will inspect and sample the Joli Fou Formation when it outcrops within the pit to ensure that acid seepage is not being generated. Suspect seepage will be sampled and analyzed for acid rock drainage and metal leaching indicators. The proponent will also update its seepage model using laboratory and field monitoring data to verify predictions in seepage flow dynamics and the chemical composition of the processed kimberlite containment facility during operations and post closure.

The James Smith Cree Nation, the Wahpeton Dakota Nation, and the Muskoday First Nation expressed concerns about the Project's long-term effect on springs. The proponent stated that the springs are mostly fed from the upper aquifer which would not be greatly impacted by dewatering. Some springs located closer to the Project would see a decrease in water discharge but changes in water quality in most springs are not expected. The proponent assured the First Nations that springs would be included in the monitoring plan.

Agency's Analysis of Residual Effects

Groundwater Levels

Based on the EIS, local wells completed in the shallow aquifer would be minimally affected during operations due to the attenuation of the underlying shale and till (confining layer) to prevent permeability, availability of recharge from precipitation, and large amount of groundwater storage in the aquifer. The proponent also commits to mitigating effects on potable groundwater wells.

The Agency is of the view that the Project's effect on shallow groundwater with consumptive or productive value would be *low* in magnitude, *regional* in extent, *long-term* in duration because it would extend past closure, *continuous* in frequency, and *reversible* as aquifers will reach equilibrium after closure. The active filling of Star pit would

accelerate aquifer recovery. Residual effects on deep saline groundwater levels were not included in the residual effects analysis because the groundwater is confined, and has no consumptive or productive value and no ecological linkages to other valued environmental components.

Recognizing that some uncertainty remains with the magnitude of the environmental effects on local water wells caused by the lowering of groundwater levels, the Agency considers that effects to those wells are unlikely after taking into account the implementation of proposed mitigation measures by the proponent should effects be identified during the monitoring of groundwater levels.

Groundwater Quality

The Agency is satisfied with the proposed mitigation to capture and treat seepage and drainage, and the proponent's contingency plan to install other collection systems should ditches alone not be sufficient to achieve 90 percent or better capture. Therefore, the Agency is of the view that residual effects on groundwater quality from seepage and drainage would be negligible.

The Agency is of the view that the residual effect on groundwater quality from the movement of brackish groundwater through the confining layer or surficial aquifer at closure is negligible. This conclusion is based on the proponent's analysis that the volume of water would be negligible due to the limited potential for the thin, discontinuous aquifers to move water, low hydraulic gradient from the pit lake to the spring locations in the river valley, and the covering of aquifers with back filled materials in the Star pit.

Agency Conclusions on the Significance of Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on groundwater resources taking into account the implementation of mitigation. Groundwater levels

**The proponent also
commits to mitigating
effects on potable
groundwater wells.**

and quality will be monitored using monitoring wells and private water supply wells throughout the life of the Project and post closure. As part of adaptive management, groundwater monitoring data will be used to recalibrate and update the hydrogeology model and other groundwater-reliant models throughout the life of the Project to determine whether additional mitigation or adjustments to existing mitigation would be required.

6.5 Vegetation and Plant Communities

This section assesses project effects on plant communities from the direct loss of vegetation caused by project clearing, and indirect project effects on vegetation that would alter plant community dynamics.

The FalC forest, with an area of approximately 132 500 hectares, is an island forest complex mainly consisting of upland vegetation community types. Approximately 51 624 hectares or 39 percent of the FalC forest is upland vegetation, and includes jackpine, trembling aspen, balsam poplar, black spruce, white spruce, brushland and grassland. Wetland vegetation types occupy 17 743 hectares or 13 percent of the FalC forest. The rest of the FalC forest consists of areas burned and harvested within the last 30 years, insect and diseased infested areas, salvage areas (previously burned or cleared areas that had timber removed for sale), human-disturbed areas, and flooded and wet areas.

There are 47 plant species provincially listed as rare in the FalC forest; six species are found in the local study area. There are 136 occurrences of rare plants in the local study area. Four percent or 5901 hectares of the FalC forest is old growth. Old growth forest includes stands that are more than 120 years of age. The quality and availability of plants are important because they are linked to other valued components such as terrestrial wildlife habitat and species (Section 6.6), and traditional land use (Section 6.8).

Potential Environmental Effects and Proposed Mitigation

Direct Loss of Vegetation

The EIS states that plant communities would be lost from the clearing associated with project development. A total of 3936 hectares will be cleared. The majority of the clearing, 76 percent, is of regenerating forest, i.e. burned, salvage, insect and diseased infested, and agricultural areas.

The EIS estimates that six of 47 rare plant species (13 percent) would be affected from direct clearing, and the swamp fly honeysuckle species would be completely removed from the FalC forest. Thirteen of 136 rare plant occurrences (10 percent) and seven hectares (less than one percent) of old growth forest within the FalC forest would be cleared by the Project.

Known locations of rare plants will be avoided or transplanted prior to disturbance. Pre-disturbance rare plant surveys to locate additional occurrences outside the project disturbance area will be conducted.

Disturbed areas will be progressively reclaimed. Most of the overburden and rock storage area, which accounts for 2247 hectares, would be reclaimed during operations. The majority of disturbed areas would be reclaimed to upland vegetation types including areas that were previously regenerating forest. This would result in an increase of 2502 hectares of upland vegetation types after reclamation. The reclamation of the pits and retention facilities, such as the processed kimberlite containment facility and sewage lagoon, would see an increase of 725 hectares of open water and 214 hectares of wetland. Refer to Table 6.5-1 for a summary of changes in vegetation types from project clearing and post-reclamation activities.

The proponent views the loss of regenerating forest and replacement with upland vegetation types to be a neutral effect as these regenerating areas were likely upland vegetation prior to fire or insect disturbance.

Table 6.5-1: Predicted changes from baseline of vegetation types in the FalC forest from project clearing (direct loss) and post-reclamation activities.

Vegetation Type	Baseline (Hectares)	Project construction/operations: change from baseline (Hectares/Percent)	Post-reclamation: change from baseline (Hectares/Percent)
Upland	51 624	-401/ - <1%	+2502/+5%
Wetlands	17 743	-19/ - <1%	+214/ +1%
Other (regenerating forest, agriculture)	60 758	-3 515/ -6%	-3364/ -5.5%
Open water	1009	-1/ - <1%	+725/ +72%
Human disturbance	1635	+3936/ +241%	-78/ -5%
Total	132 768	N/A	N/A

Indirect Effects on Vegetation

The EIS states that the introduction of weeds and non-native plants, and dust deposition could alter plant community dynamics, such as growth, competition, and reproduction. Ten percent of vegetation types within the 400 metres dust zone of influence would have moderate sensitivities to dust. An appropriate weed management strategy to prevent the spread of weeds will be implemented. Dust will be reduced by applying dust suppressants and erosion prevention techniques on stockpiles such as vegetation cover.

The EIS predicts that hydrological effects (lowered water table) from the construction of project facilities and roads, operational dewatering, and inflow of groundwater into the pits at closure could also alter plant community dynamics. Fens, and to some degree bogs, may be more sensitive to the effects of water table drawdown. Swamp and marsh wetland types are better adapted to seasonal wet and dry cycles.

The EIS predicts that approximately 3917 hectares of vegetation in the FalC forest could be affected from water table drawdown greater than 0.5 meters during construction, operations, and post closure. Specifically, 2950 hectares of wetland and 967 hectares of vegetation types classed as other

and open water could be affected by drawdown. Peak drawdown is expected to occur 10 to 20 years after closure of the mine, assuming the pits are passively filled.

Drawdown effects will be offset from creating 214 hectares of wetlands from the reclamation. The proponent expects that the majority of wetlands would recover once aquifer levels stabilize. Flow supplementation of local streams during operations and post closure will also offset the effect of drawdown on wetlands by 142 hectares within the local study area. If bogs and fens have changed substantially in the interim, restoration of these wetland types through natural processes post closure could occur in the very far future.

Due to the uncertainties of drawdown effects on wetlands, additional mitigation strategies would be considered once new information is gathered and the hydrogeology model is updated during detailed design and construction. These mitigation strategies could include adjusting the timing of flow supplementation, and early adoption of reclamation techniques to accelerate replacement of wetland communities. Wetland monitoring will continue post closure for at least 20 years, until the site is returned to an appropriate state, or until the site can be returned to provincial control.

Additional mitigation measures for surface water resources are listed in Appendix F.

Public, Aboriginal, and Government Comments

The Wahpeton Dakota Nation, the Muskoday First Nation, and the James Smith Cree Nation expressed concerns about the proponent’s vegetation assessment and the regional long-term or permanent loss of wetlands due to drawdown. They stated that disturbed wetlands areas, rare plants, and old growth cannot be successfully reclaimed. The proponent stated that project effects on wetlands, rare plants, and old growth were assessed in the EIS. Success of rare plant mitigation is variable and requires a unique approach for each rare species. Detailed rare species mitigation will be determined prior to project clearing and mitigation can be targeted at particular species of concern, particularly those with legislated protection. The proponent stated that the loss of old growth forest caused by project clearing is negligible, i.e. less than one percent of old growth in the FaIC forest, and the area to be cleared mainly consists of regenerating forest. The proponent has committed to mitigating the effects on wetlands and predicts that wetlands affected by drawdown would recover once aquifer levels stabilize.

The Métis, the Muskoday First Nation, the Wahpeton Dakota Nation, and the James Smith Cree Nation expressed concerns about the length of time required to reclaim the land to pre-disturbance conditions. These concerns include the length of time to reclaim wetlands and passively fill the pit lakes, i.e. more than 300 years for the Star Orion pit and more than 1000 years for the Orion-South pit. The Wahpeton Dakota Nation and the Métis commented that it was unacceptable to leave the Orion-South pit unfilled in perpetuity, and requested further detail on the plans to actively fill the pits including the predicted effects from water withdrawal on river flow. The proponent stated that with progressive reclamation, the length of time to reclaim the landscape would be shortened. The proponent committed to using direct replacement

where appropriate and planting shrub and understory species to introduce native species early on reclaimed sites. The proponent also proposed a research program to gain a better understanding of reclamation. The proponent committed to actively filling the Star pit with Saskatchewan River water to accelerate the closure of the pit lake; active filling of the Orion-South pit will be considered depending on the results of Star pit. The proponent predicts negligible effects from the active filling of Star pit on Saskatchewan River flows because the amount of water withdrawn is negligible compared to the river’s annual discharge. The length of time to reclaim wetlands would be offset by the creation of wetlands that would exceed the direct loss of wetlands caused by the Project and by flow supplementation post closure.

The Wahpeton Dakota Nation requested that the proponent implement a monitoring program to assess the effects of invasive and non-native plants, dust deposition, and drawdown on vegetation communities. The majority of groups requested involvement in the vegetation and reclamation monitoring program. The proponent’s follow-up program includes vegetation and soil monitoring to assess indirect project effects on vegetation communities. The proponent is open to discussing community-based programs and mitigation with Aboriginal groups.

The proponent is open to discussing community-based programs and mitigation with Aboriginal groups.

The Métis and the Wahpeton Dakota Nation requested information about reclamation liability and how the reclamation bond would be determined. The proponent stated that it is a provincial requirement to post a bond and that this bond would be for approximately 80 years. The proponent will require a financial assurance of \$85 million prior to the province issuing construction permits.

The Wahpeton Dakota Nation stated concerns that biodiversity was not adequately assessed and should have assessed effects without reclamation because of the long time frame involved in reclamation. The Nation stated that biodiversity objectives should be incorporated into the reclamation objectives, including returning ecological function to pre-disturbance conditions. The proponent responded that a detailed reclamation plan will be developed prior to development and would require further consultation on the plan as per provincial permitting requirements.

The Muskoday First Nation and the Wahpeton Dakota Nation stated that the proponent's reclamation plan does not apply industry standards and best practices, and because the plan lacks sufficient detail such as soil salvage and material balance, it was doubtful of whether reclamation objectives could be successfully met. The Nation stated concerns over liability if reclamation was found unsuccessful and how the proponent's commitment to monitoring and mitigation post closure would be enforced. A detailed reclamation plan will be provided to the province for regulatory approval prior to construction and will be subject to Aboriginal consultation. The EIS guidelines only required the EIS to provide a conceptual level of detail for the closure and reclamation plan. The proponent stated that the soil quality of the area overall is low in productivity. As a result, the proponent will target soil salvage and short-term stockpiling of fair, good, and organic rated material, and directly replace soil where feasible. Reclamation and revegetation trials indicate that revegetation is possible on bare sand. Reclamation and revegetation trials will continue during

construction and operations to refine practices. The province will require an updated reclamation plan every five years to ensure the site would be successfully reclaimed.

Environment Canada questioned how the proponent would restore the function, type, and area of wetlands directly and indirectly lost from project effects. The Muskoday First Nation requested that the proponent describe the nature, magnitude, geographic extent, and duration of adverse effects on wetlands. The Agency requested that the proponent describe any risk management strategies associated with the level of uncertainty in the hydrogeology model with respect to predicting environmental effects on wetlands. The proponent indicated that the reclamation of wetlands at closure would exceed the direct loss of wetlands; restored wetlands would mostly be reclaimed to willow shrubby fen and seaside arrow grass marsh ecosites. The proponent notes that most wetland types affected by drawdown would be restored to their original wetland vegetation type after closure. Flow supplementation would also mitigate drawdown effects on wetlands.

The proponent is of the view that the magnitude of effects on wetlands cannot be predicted with certainty. As such, additional wetland mitigation would be considered once hydrologic effects could be better estimated during detailed design and construction. The proponent has committed to providing a full update of the wetland impact predictions to relevant federal and provincial regulators during detailed design and construction when additional information is gathered.

Agency's Analysis of Residual Effects

Residual Effects from the Direct Loss of Vegetation

Most project clearing occurs in regenerating areas, is local in extent, and reversible with site reclamation. Furthermore, the decline in natural vegetation community types, not including regenerating plant communities and human disturbed areas,

is predicted to be less than one percent when compared to the baseline area of each respective vegetation type in the FalC forest.

The Agency notes that the area of upland vegetation types that are replaced by wetland and open water at closure is negligible compared to the total upland vegetation in the FalC forest. The Agency is of the view that there would be negligible residual effects on natural plant communities from project clearing.

The Agency notes that success of rare plant transplantation is low. However, the proponent is committed to developing a targeted mitigation approach for each rare species to increase transplantation success. The EIS states that swamp fly honeysuckle is listed as an S2 species by the Saskatchewan Conservation Data Centre, meaning that it has between five to 20 occurrences in the province. The Agency is of the view that extirpation of this plant species from the Project would be unlikely as there are other known occurrences in the province.

The Agency is of the view that, due to the effects on rare plants from project clearing, there would be residual effects on plant communities throughout the life of the mine and at closure. These residual effects would be *low* in magnitude as the effect is limited to rare plants and that mitigation for rare plants would reduce the magnitude of the effect, *local* in extent, *infrequent* as the removal of rare plants would be a one-time event, *short-term* in duration as replanting would occur during construction, and *reversible* upon success of transplantation.

Residual Effects from Indirect Effects on Vegetation

The Agency is of the view that there would be no residual effects from weeds and invasive species, and dust on vegetation, after taking into account mitigation. There would be, however, residual effects on wetlands from drawdown effects. These residual effects would be *moderate* in magnitude

as the estimated percentage of wetlands affected by drawdown would be approximately seven percent of total vegetation types in the FalC forest, *regional* in extent as wetland community types outside the local study area would be affected, *long-term* in duration as it would extend past closure, *continuous* in frequency, and *reversible* for the majority of wetland types once aquifer levels stabilize. Active filling of the pits could accelerate stabilization of aquifers and therefore wetland recovery. The Agency notes that 214 hectares of wetlands would be created from site reclamation.

Recognizing that some uncertainty remains with the magnitude of the environmental effects on wetlands caused by the lowering of groundwater levels, the Agency considers that effects to wetlands are unlikely after taking into account the implementation of proposed mitigation measures by the proponent should effects be identified during the monitoring of groundwater levels and wetland vegetation.

The Agency recommends that the proponent develop appropriate wetland mitigation strategies in cooperation with the provincial government and stakeholders once long-term changes can be determined with greater confidence through monitoring. Currently there is no wetland or land use policy for the FalC forest; however, there is a province-wide wetland conservation policy (SWA 2002) that would serve to guide the proponent in developing appropriate wetland mitigation strategies.

Agency Conclusions on the Significance of Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on vegetation and plant communities taking into account the implementation of mitigation. Wetlands will be monitored throughout the operation phase and after closure to ensure mitigation measures are adequate and to determine whether additional mitigation is required. Rare plant surveys will be conducted pre-construction to identify additional

occurrences and vegetation monitoring will be conducted throughout the life of the mine and post closure.

6.6 Terrestrial Wildlife Habitat and Species

This section discusses project effects on terrestrial wildlife and species at risk, and their associated habitat. White-tailed deer, moose, and elk are the most common ungulates in the FalC forest. There is a large diversity of bird species (up to 251 species), and furbearers such as beaver, muskrat, weasels, otter, mink, marten, red squirrel, and snowshoe hare, that is supported by the FalC forest. Home ranges of twelve avian and one amphibian species listed in the *Species At Risk Act* overlap the FalC forest. These species, along with a species listed as endangered by the Committee on the Status of Endangered Wildlife In Canada (2010), are tabled in Appendix G.

Sensitive habitats are found in the Saskatchewan River valley, and the wetlands and ravines that extend into the river valley. Such habitats provide forage variety, escape terrain, travel corridors, and thermal cover for wildlife. They also provide excellent breeding and nesting habitat for migratory birds. Baseline road and trail densities in the FalC forest and local study area are 1.45 and 1.60 kilometres per square kilometre. According to the EIS, the road and trail densities suggest that the FalC forest is highly fragmented.

Potential Environmental Effects and Proposed Mitigation

Loss of Wildlife Habitat

The EIS states that wildlife habitat would be lost from the clearing of 3936 hectares of vegetation for the construction and operation of mine facilities and access corridors in the FalC forest.

Additional habitat could be lost from the enclosure of habitat by the corridor windrow (fence line) that would surround the mine facilities. Although areas within the fence line could offer some habitat value such as cover and denning, direct habitat loss during operations from the mine enclosure and project footprint was estimated by the proponent to be up to 5381 hectares or four percent of the FalC forest.

The Agency notes that project effects outside of the project fence line on hydrology, and water, soil, and air quality could alter plant community dynamics, such as growth and reproduction. Changes in vegetation can in turn alter forage quality and availability, and habitat structure, leading to indirect habitat loss. Project effects on vegetation and plant communities are described in section 6.5 Vegetation and Plant Communities.

The EIS states that the FalC forest does not contain high quality waterfowl breeding habitat, which largely occurs in the Prairie ecoregion and farmland portions of the Boreal transition ecozone. Breeding habitat in the FalC forest is limited by a lack of suitable wetlands and adjacent upland cover types preferred by nesting waterfowl.

Project activities, such as the operation of equipment and facilities, blasting, human presence, and vehicular traffic, would cause sensory disturbances to wildlife, such as noise, light, and movement. The EIS predicts that these disturbances could deter wildlife from using habitat surrounding the Project, and consequently cause indirect habitat loss.

Habitat loss will be mitigated by:

- Avoiding sensitive wildlife habitat through project siting and implementing activity setback distances, where possible;
- Avoiding any vegetation clearing or grading during sensitive wildlife periods, such as nesting, breeding, rut, and calving periods;
- Reclaiming disturbed areas during operations to vegetation and wetland types compatible with the Fa/C forest vegetation associations, with the exception of the project access road which will not be reclaimed;
- Reclaiming the Star and Orion South pits and retention facilities, such as the runoff pond, and sewage lagoon, to aquatic habitat suitable for wildlife;
- Supplementing flows of local streams during operations and after closure;
- Implementing traffic speed limits to reduce sensory disturbances to wildlife; and
- Using low intensity lighting to minimize disturbance to nocturnal wildlife.

Wildlife Movement and Mortality

The EIS states that project activities, such as road development and sensory disturbances, could disrupt or create barriers to wildlife movement. The Project could also cause wildlife mortality from increased traffic or if vegetation is cleared during sensitive periods. There would be no substantial change in road density caused by the Project since existing access would be used and upgraded.

Project facilities will be sited to minimize disturbance to important wildlife corridors such as riparian areas by implementing setback distances. To prevent mortality of migratory birds, pre-construction wildlife surveys will be conducted to identify active nests or dens of migratory birds and species of conservation concern, and clearing vegetation will be avoided during sensitive periods. Speed limits and hunting prohibitions within the lease area will be enforced to prevent wildlife mortality.

Additional mitigation measures on terrestrial wildlife habitat and species are listed in Appendix F.

Public, Aboriginal, and Government Comments

The James Smith Cree Nation expressed concerns that sensory disturbances such as blasting and habitat loss caused by the Project would displace wildlife. The Nation was also concerned that the displaced wildlife would not be able to find other suitable habitat in the area due to existing land disturbances in the Fa/C forest, and disagreed with the proponent's assumption that wildlife would acclimate to sensory disturbances caused by the Project. The proponent stated that continuous project noise would be relatively low beyond the fence line to not adversely affect wildlife behaviour and that wildlife would habituate to the noise including sonic booms. The proponent also stated that other mitigations such as setback distances from active nests and buffers in riparian areas would minimize project disturbance to wildlife. The proponent is committed to monitoring effects to confirm the accuracy of the predictions and effectiveness of mitigation.

The Muskoday First Nation expressed concerns about the effects of the access corridor and powerline on wildlife, and generally about the protection of non-random pathways of connectivity (ravines and wetlands) and critical habitat. The proponent considered the effects of the access corridor on wildlife in the effects assessment, and effects of the powerline on wildlife in the cumulative effects assessment. From the habitat constraints mapping, the proponent avoided the majority of wetlands and ravines (critical habitat for waterfowl, fish, and furbearers) by relocating and redesigning project facilities. Waterfowl habitat is generally poor quality in the project area and suitable ungulate habitat was modelled to be of better quality outside the project area. The proponent stated that the access corridor is unlikely to create a significant barrier effect, particularly once vegetation begins to regenerate to a level providing forage and hiding cover.

The James Smith Cree Nation stated that the proponent's suggestions on provincial wildlife management strategies are invalid mitigation because they are outside the proponent's influence and governed by the provincial government. These suggestions included adjusting hunting season draw quotas for non-Aboriginal hunters, adjusting bag limits, and closing active trails within the FalC forest. The Wahpeton Dakota Nation requested that project effects on wildlife should be reassessed if there were no commitments to provincial wildlife management strategies. The proponent stated that these suggestions were directed to Saskatchewan to consider in the overall management plan for ungulates.

The Métis, the Muskoday First Nation, and the Wahpeton Dakota Nation expressed concerns about the project effects on wildlife movement and displacement, habitat loss, and mortality from increased traffic and predation. The James Smith Cree Nation, the Métis, and the Muskoday First Nation expressed concerns over project effects on wolves, amphibians, bats, black bear, and beaver populations. The Métis stated that ungulate populations are known to cluster in the project area due to good escape habitat provided by the ravines and river valley, and browse habitat located across the river. It also stated that wildlife displacement caused by the Project would expose ungulates to wolf predation, which are currently a problem in the FalC forest, and could therefore cause ungulate population decline.

Project effects on wildlife movement and displacement, habitat loss, and mortality were considered in the EIS. The proponent stated that the Project would not affect wolf pack territory size as the project footprint is substantially smaller than their territorial range and thus any population change caused by the Project is predicted to be minimal and localized. Wildlife mortality caused by traffic collisions will be mitigated by straightening the Shipman Trail and imposing speed limits for the road. No amphibian species would be displaced

because the project design is intended to maximize the avoidance of wetland habitat used by amphibians. Bats were not selected as a valued component and therefore no baseline data were collected.

The James Smith Cree Nation, the Wahpeton Dakota Nation, and the Muskoday First Nation expressed concerns about the proponent's methodology in assessing wildlife effects, which included historical data not being representative of the FalC forest. They requested that the proponent conduct wildlife surveys, in collaboration with the Wahpeton Dakota Nation, to update its model. The EIS was updated to provide the error range in the model, and included current baseline survey and historical data sources deemed relevant to the FalC forest.

The Wahpeton Dakota Nation stated concerns about the uncertainty in reclaiming the landscape back to pre-disturbance function for wildlife, and that the proponent should consider mitigation such as habitat offsets elsewhere in the FalC forest. It also requested that reclamation planning and offsets should incorporate key wildlife species important to the Wahpeton Dakota Nation. The proponent stated that there are minimal existing land disturbances in the FalC forest and therefore the effects of displacement and habitat loss on wildlife would be minimal.

The Wahpeton Dakota Nation requested that access management planning be implemented for the main access road and Division road to minimize impacts on wildlife, and that wildlife monitoring studies be conducted in consultation with the First Nation, including the provision of funding to support its participation in the studies. It stated skepticism towards the province's ability to manage the Project's residual effects on wildlife and, as such, requested that regulators consider developing an access management plan for the FalC forest to ensure wildlife habitat and populations, and biodiversity are maintained. The proponent stated that wildlife and access on any public access road in the FalC forest is provincially managed and would require a response from the provincial government.

The Métis and Environment Canada expressed concern about the health risks to wildlife posed by the open pits at closure and retention ponds. The proponent confirmed that fencing around the sewage lagoon will be in place to prevent wildlife access. Other project facilities, such as the settling ponds, that may attract wildlife are not considered harmful to wildlife. Environment Canada provided comments and recommendations on mitigation measures for migratory birds and species at risk. The proponent commits to complying with Environment Canada's recommendations on species at risk setback distances and the key sensitive periods for migratory bird and species at risk, and will avoid clearing vegetation for construction and maintenance of the access right of way during these times.

Agency's Analysis of Residual Effects

The Agency's analysis indicates that the key adverse residual effect to terrestrial wildlife habitat and species would be from the loss of wildlife habitat. The Agency is of the view that there would be negligible residual effects to wildlife from disturbances to wildlife movement and mortality after taking into account mitigation.

Residual effects to wildlife from habitat loss, as indicated in the EIS, would vary depending on the timing and duration of the project activity, species, species behaviour, population status, site characteristics, and existing landscape disturbances. The Agency focused residual effects on the following wildlife species: ungulates, black bears, beaver, waterfowl, songbirds, and species at risk.

Ungulates: The Project could reduce ungulate habitat by 2.8 percent during construction and operations, and 0.5 percent after closure within the FalC forest due to the loss of upland habitat from the creation of pit lakes according to habitat suitability models in the EIS. Ungulate populations could be reduced by up to 9.1 percent for moose, 12.4 percent for elk, and 10.7 percent for white-tailed deer within the FalC forest, based on population modelling in the EIS and assuming the conservative

estimate of a 100 percent indirect habitat loss within a kilometre from the Project.

According to the proponent, it is unlikely that habitat loss would result in a population decline as ungulates would likely be displaced to other suitable habitat within the region or acclimate to the disturbances. This assumption is supported by the minimal existing human disturbances within the FalC forest. The Agency notes that the sustainability of wildlife populations are managed by the province within the FalC wildlife management zone, and wildlife management strategies, such as adjusting draw quotas and access management, would prevent populations from declining to unsustainable levels.

Black Bears and Beavers: According to the EIS, black bear habitat within the FalC forest could be reduced by 2.6 percent during operations and 0.4 percent at post closure due to the loss of upland habitat from the creation of pit lakes.

Beaver habitat within the FalC forest could be reduced by 2.9 percent during construction and operations, and 2.3 percent after closure due to the loss of riparian habitat from the Star pit lake. The proponent states that most of the affected habitat would be at the upstream ends of seasonally flowing creeks, whereas beaver activity would most likely occur downstream where sufficient water could accumulate and be impounded.

Waterfowl: The EIS states that waterfowl habitat within the FalC forest could decrease by less than one percent from the direct loss of wetlands caused by the project footprint. Waterfowl habitat could also be indirectly affected from the drawdown of approximately 3917 hectares of total vegetation types in the FalC forest caused by operational pit dewatering and inflow of groundwater for pit filling at closure. Details can be found in section 6.5 Vegetation and Plant Communities - Indirect Effects on Vegetation.

The proponent is of the view that the project area and broader FaIC forest are not typical of high-quality waterfowl breeding habitat that largely occurs in the Prairie ecoregion and farmland portions of the Boreal transition ecozone. Breeding habitat in the FaIC forest is limited by a lack of suitable wetlands and adjacent upland cover types preferred by nesting waterfowl.

Songbirds: The EIS states that interior forest and wetland-dependent songbirds could be adversely affected by the Project from habitat fragmentation and wetland habitat loss. Other songbirds could benefit from the Project because they favour habitat edges and access to multiple habitat types. The proponent views these residual effects as local.

The Agency notes that blasting could be a significant source of habitat disturbance for birds, and therefore stresses the importance of mitigating sensory disturbances during the bird breeding season. According to Environment Canada’s Avoidance

Guidelines (2014), pre-construction nest surveys have limited ability to detect nests through nest search techniques while the risk of disturbing active nests is high. These guidelines recommend that non-intrusive search methods be considered if further investigation is required to determine the presence of breeding birds, e.g., observation of singing birds, alarm calls, distraction displays, and that work activities should be planned to avoid affecting nesting birds.

The Agency further notes that migratory birds, which include migratory songbirds and their eggs and nests, are protected under the federal *Migratory Birds Convention Act*. Under this Act, the disturbance, destruction or taking of a nest, egg, or nest shelter of a migratory bird is prohibited. Since blasting is a potential disturbance to migratory birds, the proponent must consult with Environment Canada to ensure proposed avoidance measures and blasting mitigations

Table 6.6-1: Summary of residual effects on species at risk.

Rationale	Species At Risk
Residual effects are not likely. There are no historical occurrence records in the Saskatchewan Conservation Data Center database or the project area occurs outside of the periphery of their breeding range and primary distribution, or lacks suitable habitat to support the species.	<ul style="list-style-type: none"> • Whooping Crane • Loggerhead Shrike • Piping Plover • Sprague’s Pipit • Short-eared Owl
Residual effects are neutral. Species would be tolerant of local disturbances planned within the project area. The species is common and habitat within the FaIC forest is not in short supply.	<ul style="list-style-type: none"> • Canada Warbler
Residual effects are not likely. Species is at the extreme periphery of its continental range in Saskatchewan. Potential habitat is readily available in the FaIC forest and project area.	<ul style="list-style-type: none"> • Whip-poor-will
Residual effects are positive. Species favours edge and therefore would be less affected because of the increased access to multiple habitat types.	<ul style="list-style-type: none"> • Olive-sided Flycatcher • Common Nighthawk • Chimney Swift
Residual effects are negligible. The Project is unlikely to affect habitat availability or use by this species within the project area or FaIC forest. Potential local habitat may be created from reclamation.	<ul style="list-style-type: none"> • Rusty Blackbird • Horned Grebe
Residual effects are not likely. Species not found within the local study area or FaIC forest. The Project is unlikely to affect habitat availability or use by this species within the project area or FaIC forest.	<ul style="list-style-type: none"> • Northern Leopard Frog • Yellow Rail

are appropriate. The proponent has committed to complying with this legislation by applying appropriate mitigations such as setback distances and timing restrictions for construction activities.

Species at Risk: Table 6.6-1 describes residual effects on species at risk. The Agency concludes that these residual effects would either be unlikely to occur, or positive, neutral, or negligible.

The Agency considers that the residual effects on ungulates and black bears would be *moderate* in magnitude from the direct loss of habitat and from sensory disturbances, *regional* as the effects would extend past the local study area, *long-term* in duration, *continuous* in frequency, and *reversible* when the disturbed areas are reclaimed to suitable wildlife habitat. The Agency is of the view that residual project effects on these species would be managed by the province, and that wildlife management strategies, such as adjusting draw quotas and access management, would prevent populations from declining to unsustainable levels.

The Agency considers that the residual effects on beaver would be *moderate* in magnitude from the direct loss of habitat, *local* as the effects would not extend past the local study area, *long-term* in duration, *continuous* in frequency, and *reversible* when the disturbed areas are reclaimed to suitable wildlife habitat. Most of the affected habitat would be at the upstream ends of seasonally flowing creeks whereas beaver activity would most likely occur downstream where sufficient water could accumulate and be impounded.

The Agency considers that the residual effects on waterfowl would be *moderate* in magnitude from indirect effects such as sensory disturbances and drawdown effects on wetland habitat, *regional* as the effects would extend past the local study area, *long-term* in duration, *continuous* in frequency, and *reversible* when the disturbed areas are reclaimed and wetlands recover from drawdown. Residual effects are unlikely to occur because, according to the EIS, breeding habitat for waterfowl within the FalC forest is of poor quality.

The Agency considers that the residual effects on songbirds would be *minor* in magnitude from indirect effects such as sensory disturbances and drawdown effects on wetland habitat, *local* as the effects would not extend past the local study area except for wetland-dependent birds, *long-term* in duration, *continuous* in frequency, and *reversible* when the disturbed areas are reclaimed and wetlands recover from drawdown.

The Agency considers that the residual effects on species at risk (Rusty Blackbird and Horned Grebe) would be *negligible* in magnitude from direct habitat loss, and indirect effects such as sensory disturbances and drawdown effects on wetland habitat, *local* as the effects would not extend past the local study area, *long-term* in duration, *continuous* in frequency, and *reversible* when the disturbed areas are reclaimed and wetlands recover from drawdown.

Agency Conclusions on the Significance of Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse residual effects on wildlife habitat and species, taking into account the implementation of mitigation. Wildlife populations will be monitored throughout operations to ensure the adequacy of mitigation.

6.7 Fish and Fish Habitat

Twenty-three fish species can be found in the Saskatchewan River. The fish and fish habitat assessment includes Lake Sturgeon, White Sucker, Walleye, small-bodied fish, and their associated habitat for rearing, spawning, feeding, and overwintering. Benthic invertebrates are also included in the assessment due to their importance for providing a food source for juvenile fish, and juvenile and adult Lake Sturgeon.

Lake Sturgeon is a species listed as endangered by the Committee on the Status of Endangered Wildlife in Canada (2010) but is not designated under the *Species at Risk Act*. There are currently no recovery plans in Saskatchewan for Lake Sturgeon.

Potential spawning and rearing habitat for Walleye and White Sucker were found in the Saskatchewan River and most local tributaries. Most of these local tributaries have numerous barriers to fish movement including steep gradients, shallow water depth and obstructions despite the potential for habitat. Suitable rearing and feeding habitat for Lake Sturgeon is not unique and is found throughout the Saskatchewan River system.

Potential Environmental Effects and Proposed Mitigation

Indirect Effects on Fish and Fish Habitat

The EIS states that project-induced changes in surface water flows and quality from project activities could adversely affect fish and fish habitat. These activities include:

- Vegetation clearing;
- Construction of mine facilities;
- Installation and decommissioning of culverts, an intake, and outfall diffuser system;
- Expansion of White Fox Bridge;
- Alteration of drainage areas; tributary impoundment;
- Pit dewatering;
- Blasting; and
- Water and wastewater management.

Effects on surface water flows and quality are described in section 6.3 Surface Water Resources.

Sedimentation during construction, operations, and closure will be mitigated through the application of Fisheries and Oceans Canada guidelines (DFO 2013) and Saskatchewan Ministry of Environment requirements for the design, installation, and removal of water management infrastructure, e.g. culverts, intake, outfall diffuser system, and bridge upgrade. Effects on water quality will be mitigated through drainage ditches to capture seepage and runoff, sedimentation ponds, and a processed kimberlite containment facility to contain sediment and treat seepage, and erosion control techniques, such as sediment fences, rip rap, and slope revegetation to minimize sediment transport.

**Twenty-three fish species
can be found in the
Saskatchewan River.**

**The fish and fish habitat
assessment includes**

Lake Sturgeon,

**White Sucker, Walleye,
small-bodied fish,**

and their associated

habitat for rearing,

**spawning, feeding, and
overwintering.**

Flows will be supplemented with water of suitable quality using water sources such as the East Ravine runoff pond to mitigate adverse effects caused by reduced local and regional tributary flows during operations and to protect overwintering fish habitat. The EIS predicts that there would be no project residual effects on Saskatchewan River flows during operations and post closure (refer to section 6.3 Surface Water Resources).

At closure, the EIS predicts that the inflow of groundwater into the pits could cause drawdown of local and regional tributaries, thus reducing baseflows and adversely affecting fish habitat. Local tributary flows could return to between 68 and 92 percent of baseline 350 years after the end of mining, assuming the pits are not actively filled. Furthermore, the peak drawdown created from the

filling of the pits is expected approximately 10 to 20 years post closure, assuming the pits are passively filled. The proponent will account for far future effects on fish habitat in the Offsetting Plan (formally known as the Fish Habitat Compensation Plan). The proponent has further committed to actively filling the Star pit with Saskatchewan River water to accelerate pit filling, thus reducing the duration of drawdown effects.

The EIS states that the overflow of Star pit and seepage from the processed kimberlite containment facility at closure could alter water quality and thus fish habitat. The proponent will cap the processed kimberlite containment facility with till or clay in low lying areas and contain the Star pit overflow behind a water retention structure if the water quality is not suitable for discharge. The proponent's commitment to actively fill Star pit with Saskatchewan River water will also serve to improve pit water quality. Experience with filling the Star pit will determine what is done for the Orion pit. The proponent will monitor the pit lakes for at least two decades and until a clear recovery trend is measured post closure.

Direct Effects on Fish and Fish Habitat

According to the EIS, the impoundment of East Ravine would eliminate nearly all flows and cause the destruction of 76 103 square meters of fish habitat, the largest loss of fish habitat caused by the Project. Fish habitat would also be lost from the footprint caused by the culverts, outfall-diffuser system, intake, and temporary cofferdam(s).

The proponent will create 81 161 square meters of fish habitat. This habitat offset is described in its Offsetting Plan. To minimise fish mortality, fish rescues will be implemented in East Ravine prior to construction, and in-stream construction will be timed to avoid vulnerable fish life stages by adhering to restricted activity timing windows for the protection of fish and fish habitat, as per Fisheries and Oceans Canada guidelines (DFO 2013).

As well as effects on surface water quality as discussed in section 6.3, discharge of the Mannville aquifer groundwater into the Saskatchewan River has the potential for chronic toxicity test effects. Water from the aquifer passed acute toxicity tests on rainbow trout and Daphnia; however chronic toxicity tests on *Ceriodaphnia dubia* resulted in complete mortality. To reduce the potential for chronic toxicity, the water management strategy was revised to include blending the Mannville groundwater with decant water from the processed kimberlite containment facility prior to discharge. The EIS predictions indicate that the final discharge is likely to meet the requirements of the *Fisheries Act*. The proponent will also monitor and conduct field-based studies to confirm toxicity and ecosystem effects of the end-of-pipe discharge, and to ensure that the final discharge point does not contravene pollution prevention sections of the *Fisheries Act*.

The proponent states that blasting causing shockwaves and particle velocities are not expected to cause serious harm to fish as the distance between the closest blast and fish habitat exceeds the minimum setback distance defined in the Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (DFO 1998).

Additional mitigation measures for fish and fish habitat are listed in Appendix F.

Public, Aboriginal, and Government Comments

The Cumberland House Cree Nation, the Métis, the Wahpeton Dakota Nation, and the James Smith Cree Nation expressed concerns over the loss of fish habitat in the small streams and Saskatchewan River, including downstream effects and post closure drawdown effects that could last several decades. The proponent stated that fish habitat losses will be compensated and takes into account far future effects associated with drawdown. Regulatory permits and associated conditions, along with follow-up post closure, will ensure that mitigations are enforced. An adaptive management approach will

be applied during the whole project lifecycle and post closure. The proponent also stated that no significant effects are anticipated after taking into account the Offsetting Plan and other mitigation measures such as flow supplementation of fish-bearing tributaries.

The James Smith Cree Nation, the Muskoday First Nation, and the Wahpeton Dakota Nation requested consultation on the Offsetting Plan, and involvement in the implementation and monitoring of the plan to ensure traditional knowledge is taken into consideration. Some Aboriginal groups requested direct discussions with Fisheries and Oceans Canada over the plan including the calculated loss of fish habitat productivity. The proponent stated that any interested Aboriginal group is welcome to participate in the development of the Offsetting Plan and had offered opportunities for various Aboriginal groups to meet and discuss the conceptual plan. Fisheries and Oceans Canada stated it will discuss the plan with affected Aboriginal groups prior to considering the issuance of an authorisation under the *Fisheries Act*.

The Muskoday First Nation suggested that virile crayfish, Brook Trout and Lake Chub be considered in the assessment. The proponent stated that although virile crayfish were frequently encountered in the minnow traps, suitable habitat for the species occur throughout the Saskatchewan River system. The proponent further stated that Brook Trout was not observed in the baseline studies or identified as a valued component in traditional land use studies. Lake Chub can be adequately represented by White Sucker as they have the same forage base; further, White Sucker was more common throughout the study area than Lake Chub.

The James Smith Cree Nation stated that a Lake Sturgeon recovery plan should be required prior to project approval to ensure proper measures are taken to preserve the population. The Agency referred the First Nation's concern to the provincial Water Security Agency as recovery planning for the Lake Sturgeon population falls under provincial jurisdiction.

The Wahpeton Dakota Nation stated concerns about Star pit overflow post closure, and its toxicity effects on aquatic biota. The proponent asserted that the water quality parameters of the Star pit overflow will meet federal and provincial guidelines for the protection of aquatic life (SKMOE 2006; CCME 2011). Further, actively filling the Star pit with Saskatchewan River water will improve water quality. The proponent further noted that water quality parameters that had exceeded guidelines in baseline conditions would remain above the guidelines.

The James Smith Cree Nation, the Muskoday First Nation, and the Wahpeton Dakota Nation expressed concern over the project discharge effects on aquatic biota. Environment Canada reviewed the toxicity tests of the Mannville groundwater pumped from the pits on various types of aquatic biota. Given the potential for chronic toxicity test effects, Environment Canada concluded that the Mannville groundwater, if released without treatment, would be deleterious as defined under the *Fisheries Act* and its discharge would therefore be prohibited under this Act.

The proponent redesigned its water management strategy to include a mixing facility to blend the Mannville groundwater with process water from the Processed Kimberlite Containment Facility. The proponent asserted that the project redesign will improve the water quality of the discharge, reduce the likelihood of toxicity effects and not be deleterious as defined under the *Fisheries Act*, and meet provincial and federal water quality guidelines. The proponent also proposed to develop an aquatic effects monitoring plan pre-construction based on plans developed for diamond mines in the Northwest Territories (Golder 2013). This plan aims to monitor project discharges to all aspects of the aquatic environment so that potential ecological risks can be identified, and appropriate actions can be developed to mitigate potential adverse effects. Environment Canada stated that the proponent's revised water management strategy was a reasonable approach to meeting the requirements of the *Fisheries Act*.

Fisheries and Oceans Canada requested additional information on fish habitat losses from the installation of the water intake, and on whether the fish habitat offset calculations included the uncertainties of loss caused by drawdown post closure. The proponent provided additional information on the water intake including habitat losses associated with the temporary cofferdam. The proponent also asserted that its Offsetting Plan accounts for far future effects associated with drawdown.

Fisheries and Oceans Canada requested additional details on the proponent's surface water monitoring methodology. To its satisfaction, the proponent provided details of its monitoring including a commitment to monitor sediments in Codette Reservoir.

Based on Natural Resources Canada's comments related to the calibration of the hydrogeological model to predict drawdown effects (section 6.4 Groundwater Resources), Fisheries and Oceans Canada and the Agency requested that the proponent describe any risk management strategies associated with the level of uncertainty in the hydrogeological model with respect to predicting environmental effects on fish and fish habitat from project-induced changes in water quality and flows. The proponent is of the view that the magnitude of effects on surface water flows and quality cannot be predicted with certainty. The proponent evaluated possible risks associated with this uncertainty and concluded that its mitigation to supplement tributary flows would address probable worst case scenarios.

The proponent has committed to providing a full update of the hydrogeology model, and fish and fish habitat impact predictions to relevant federal and provincial regulators during detailed design and construction when additional information is gathered. Environment Canada, Fisheries and Oceans Canada, and the Agency consider this proponent commitment a reasonable approach to resolving the issue of uncertainty in impact prediction.

Agency's Analysis of Residual Effects

The Agency's analysis indicates that there would be negligible adverse residual effects to fish and fish habitat from the Project. Based on the EIS and the proposed mitigation measures, water quality in the local tributaries and Saskatchewan River would remain within pre-mining background ranges of variability throughout the life of the Project and at closure. Water quality parameters that exceeded guidelines in baseline conditions are expected to remain above the guidelines and the proponent's analysis indicates that the final project discharge would likely meet the requirements of the *Fisheries Act*.

Project-induced changes in surface water flows will be addressed through the mitigation of tributary flow supplementation and contingency plan to improve additional habitat in the Offsetting Plan. Direct fish habitat loss would also be addressed taking into account the implementation of the Offsetting Plan.

Agency Conclusions on the Significance of Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse effects on fish and fish habitat, taking into account the implementation of mitigation. A surface water and groundwater monitoring program will be conducted throughout the life of the Project to allow for early identification of potential issues and to monitor aquatic ecosystem health. As well, follow-up on the Offsetting Plan will be implemented in accordance with applicable permitting to ensure the effectiveness of the plan.

6.8 Current Use of Land and Resources for Traditional Purposes

This section assesses project effects on the current use of land and resources for traditional purposes by Aboriginal persons (traditional land use). The assessment considers project effects on traditional land use that are a result of project-induced effects on the environment. Traditional land use includes hunting, fishing, trapping, gathering and cultural practice.

The James Smith Cree Nation, the Muskoday First Nation, the Sturgeon Lake First Nation, the Red Earth Cree Nation, the Wahpeton Dakota Nation, and the Métis have indicated that they practice traditional activities in the project area and broader FaIC forest. The Cumberland House Cree Nation and the Peter Ballantyne Cree Nation did not indicate any traditional land use within the project area or FaIC forest. Traditional land use by these Aboriginal groups is linked to potential or established Aboriginal and Treaty rights and interests. Project impacts on Aboriginal and treaty rights are discussed in section 7.

Potential Environmental Effects and Proposed Mitigation

Loss of Traditional Lands

The EIS states that traditional lands for hunting, trapping, gathering, and cultural use would be lost from the clearing of 3936 hectares of vegetation for the construction and operation of mine facilities and access corridors in the FaIC forest. Additional traditional lands could be unavailable from the enclosure of land by the corridor windrow (fence line) that would surround the mine facilities. As a result, up to 5381 hectares could potentially be lost or not available during operations from the mine enclosure and project footprint.

Trapping could be affected as the project area intersects fur conservation area P-085. The EIS

predicts that approximately 4.8 percent of the fur conservation area P-085 would be affected from the mine enclosure and mine footprint. The James Smith Cree Nation manages all trapping in the fur conservation area P-085, which is encompassed by the FaIC forest.

According to the EIS, approximately 282 hectares or less than one percent of plants ranked moderate for traditional use potential could be directly affected by the mine footprint. There were no areas within the project footprint that ranked high for traditional land use. Traditional plant potential is defined by the capability of a vegetation type to support plant species used for traditional production rather than known traditional use. Based on traditional land use studies, one Métis and one James Smith Cree Nation traditional gathering site are located wholly within the project fence line, and 16 percent (10 out of 56 plant gathering sites) of James Smith Cree Nation traditional gathering sites would be partially within the project fence line. One Métis traditional gathering site would be bisected by the access road right of way.

The loss of traditional lands which could lead to the displacement of traditional users to other areas in the FaIC forest is another effect identified in the EIS. This displacement could lead to increased user density and resource competition between traditional and non-traditional land users.

The proponent is of the view that residual effects on traditional land use from the loss of traditional lands from the mine footprint and project fence line would be low in magnitude because alternative areas in the FaIC forest are equally accessible and would support biophysical resources relied on for traditional land use. The proponent notes that existing land use disturbances, such as forestry and exploration activities, are minimal in the FaIC forest based on existing surface leases and thus the Project would not likely affect the availability, accessibility, and productivity of traditional resources within the FaIC forest.

A notification procedure to facilitate traditional activities within the mine enclosure and progressive reclamation, which will decrease the enclosed mining area to 4781 hectares during the Orion South phase, would serve to mitigate the loss of traditional lands during operations. Any remaining disturbed areas will be reclaimed at closure and the fence line will be removed to allow access for traditional land use. The Star pit lake will be actively filled to accelerate its reclamation for traditional land use. The decision and method to actively fill Orion South pit would be determined based on experience with closure of the Star pit. Reclamation and closure planning will consider traditional use plants in consultation with Aboriginal groups.

The EIS states that hunting within the FalC forest is managed by the provincial government and that hunting pressures would be managed by applying strategies such as adjusting draw quotas, season timing, bag limits, and access management. Provincial hunting regulations only apply to non-Aboriginal hunters. The EIS notes that while the provincial management strategies will mitigate pressures on availability of resources, traditional users may have less opportunity to hunt if they face access restrictions.

Trappers will be compensated for direct trapping losses. Engagement with the Trapper's Association, including early notification of project development, will be undertaken prior to and throughout the life of the Project.

The Project's effects to cultural heritage from the loss of traditional lands are assessed under the "Cultural Heritage" section below.

Changes in Access to Traditional Lands

Access, as defined in the EIS, includes roads, all-terrain vehicle trails, cut lines, and natural corridors such as streams and rivers. Traditional use areas within the FalC forest are currently accessed by several sand roads, typically passable by four wheel drive and high clearance two-wheel drive vehicles all year round.

According to traditional land use studies, the James Smith Cree Nation, the Métis, the Muskoday First Nation, and the Wahpeton Dakota Nation were reported to use major trails to access traditional lands throughout the FalC forest. The Wahpeton Dakota Nation estimated the use of approximately 137 kilometres of traditional trails, and the James Smith Cree Nation identified the importance of Lars Road in accessing its reserve lands and a traditional fishing site.

Project components that could affect access include:

- Upgrades to Highway 55, White Fox River Bridge, and Shipman Trail, i.e. the access road to the Project;
- Development of a new access corridor that would be 30.9 kilometres long and 127 hectares in area; and
- Relocation of a portion of the Lars Road to allow for the stockpiling of overburden.

The EIS states that the upgrades and new access corridor could benefit traditional land use by improving travel routes from providing year-round versus seasonal access, improving the ease of access, i.e. less travel time on paved versus sandy roads, or creating access to new traditional use areas that were not previously accessible. The EIS also noted that these changes could provide new access for non-traditional users and thus increase resource competition with Aboriginal users.

The EIS also states that the project effects on travel cost (time and gas consumption) incurred from travelling to other traditional lands within the FalC forest is minimal as it is a shorter distance to other areas of the FalC forest than to the project area.

Relocation of Lars Road could restrict access to traditional use areas. Based on the James Smith Cree Nation's traditional land use study, the relocation of Lars Road would restrict access to preferred traditional hunting, fishing, and gathering areas proximal to and within its reserve.

Adverse effects on access will be mitigated by developing rerouting options for Lars Road with Aboriginal and stakeholder input. Existing roads and trails will be used where possible, and any new access routes will be reclaimed at closure. Mitigation for the change in access will also mitigate displacement effects on traditional users.

According to traditional land use studies, the Saskatchewan River is regarded by many Aboriginal groups as a major travel corridor used to access traditional fishing sites along the river. The majority of Aboriginal groups traditionally fish in areas of the Saskatchewan River that are adjacent to the project site. The James Smith Cree Nation also fishes in English Creek but these traditional fishing sites are located outside the project fence line.

The construction and decommissioning of the intake and outfall-diffuser system could temporarily disrupt access to traditional fishing sites located along the Saskatchewan River. Proper control measures will be taken during the installation and decommissioning of in-water works to ensure that debris or other materials do not accumulate in the rivers and alter navigation. Navigation will be possible during the installation of the temporary coffer dam in the Saskatchewan River as it will not span more than two thirds of the river's channel. The coffer dam will be removed after intake construction. The intake and outfall-diffuser system will be submerged to allow ample room for vessel navigation.

Changes in Resource Availability

Based on traditional land use studies, common resources relied on for traditional land use in the FalC forest include:

- Hunting: elk, deer and moose (ungulates), bear, waterfowl, and small game;
- Fishing: Walleye, Jackfish, Perch, Sucker, Whitefish, Sturgeon, Burbot, Rainbow Trout, Brook Trout, and Goldeye;
- Trapping: beaver, coyote, squirrel, otter, marten, muskrat, lynx, mink, rabbit, black bear and wolf; and
- Gathering: sweetgrass, rat root, sage, and various berries such as cranberry, raspberry and blueberry.

The EIS assessed project effects on ungulates, waterfowl, and aquatic and semi-aquatic furbearers as representing the groups of species primarily hunted and trapped. Changes to water quality, water flow and fish habitat in the Saskatchewan River are the key environmental changes that may lead to an effect on traditional fishing. Mitigations for these project effects include creating and enhancing fish habitat to offset the loss of fish habitat caused by the Project and progressively reclaiming disturbed areas during operations. Refer to sections 6.7 Fish and Fish Habitat and 6.6 Terrestrial Wildlife Habitat and Species for further details on these assessments.

Dewatering of the open pit during operation and inflow of groundwater into the pits at closure could also adversely affect wetland-dependent plant species by lowering the water table. The EIS estimates that approximately 328 hectares or less than one percent of plants ranked high and moderate for traditional use potential in the FalC forest could be indirectly affected by this effect. Measures proposed to mitigate this effect on wetlands would also mitigate effects on traditional plants. Refer to section 6.5 Vegetation and Plant Communities for further details on this assessment.

The EIS states that the Project could also alter the palatability and growth of traditional use plants from dust deposition. Project effects on air quality are discussed in section 6.2 Atmospheric Environment. The majority of dust affected plants, which mostly rank as having moderate traditional plant potential, would have moderate sensitivity to dust. Dust will be mitigated by applying dust suppressants and providing vegetation cover on stripped areas.

The proponent concluded that there would be no likely significant effects on resource availability after taking into account mitigation. The proponent as a result concluded no likely significant effects on the availability of traditional resources.

Cultural Heritage

According to the EIS, the Project could affect cultural heritage that is associated with the use of traditional resources within the FaIC forest. The EIS describes project effects on tangible aspects of cultural heritage, which included physical alteration, access restrictions, and sensory disturbances to cultural sites. Cultural sites within the FaIC forest are reported by the James Smith Cree Nation, Métis, and the Wahpeton Dakota Nation, and include property, sites, and structures having prehistoric, paleontological, historical, cultural, artistic, and religious values.

Cultural sites that could be removed by the mine footprint include:

- A small portion of a camping zone along the Saskatchewan River reported by James Smith Cree Nation,
- A cultural site known as Bingo Hill (or Spy Hill) reported by the James Smith Cree Nation, and
- A large burial area at the end of the Melfort Ferry Road reported by the James Smith Cree Nation.

Cultural sites that could be affected by access restrictions from the project fence line include:

- A camping site and sacred site reported by the James Smith Cree Nation, and
- A cabin or camping site and cultural site reported by the Wahpeton Dakota Nation.

Cultural sites that are outside the project fence line but could be indirectly impacted from access modifications or sensory disturbances include:

- A ceremonial site located near the proposed right of way of the improved Shipman access road reported by the James Smith Cree Nation;
- Camping sites near the mine and a cabin on the James Smith Cree Nation reserve that is accessible only by Lars Road reported by the James Smith Cree Nation;
- A burial site along the Saskatchewan River near the project area reported by the Métis;
- A cabin or camping site along the proposed right-of-way of the improved Shipman access road reported by the Wahpeton Dakota Nation; and
- Three cabins or camping sites, and one cultural site located near the mine site reported by the Wahpeton Dakota Nation.

The access corridor - pipeline will be rerouted to avoid alteration of the burial area located at the end of the Melfort Ferry Road. Access to camp sites and sacred and cultural sites will be provided within the mine enclosure upon an established notification procedure to facilitate access during construction and operations. New rerouting options for Lars Road will be developed with Aboriginal and stakeholder input. These mitigations do not address the loss of Bingo Hill or the indirect effects of sensory disturbances to cultural sites located near the mine and access road right of way.

The proponent stated that there is no current evidence of spiritual or cultural use of Bingo Hill based on archaeological surveys performed from 2005 to 2010. The proponent further stated that, based on the draft Fort à la Corne Land Use Plan (SMOE 2005), Bingo Hill was not identified as a sacred or Aboriginal site to be protected from development. The James Smith Cree Nation participated in the development of this draft plan.

The proponent proposes to mitigate the Project's effects to cultural sites by sponsoring cultural and community activities and programs that would preserve and transfer traditional knowledge, and by sponsoring potential replacement initiatives, in consultation with directly affected Aboriginal groups. Consensus with Aboriginal groups on the specifics of sponsorship has not yet been reached. The proponent evaluated the environmental and economic feasibility of mitigating project effects on Bingo Hill, and concluded that removal of Bingo Hill and the provision of socio-cultural benefits as mitigation for the permanent loss of Bingo Hill would be the preferred option. The proponent remains open to any suggestions that may arise through future discussion with the James Smith Cree Nation.

Should there be any changes in the project footprint, the area will be screened for heritage sensitivity by a professional archaeologist; the Heritage Resources Branch and Aboriginal groups will be consulted to determine assessment and mitigation requirements. If unanticipated archaeological materials or features are encountered as a result of construction or reclamation activities, all work in the immediate area will cease and the Heritage Resources Branch and Aboriginal groups will be contacted.

The EIS assessed the Project's effects on other aspects of cultural heritage and stated that reduced traditional practice caused by the Project could reduce the sharing of meat, the opportunities to transfer traditional knowledge, and the ability to preserve and enhance cultural values through

on-the-land activities. Traditional land use studies have indicated that cultural aspects are integral with the practice of traditional hunting, fishing, trapping, and gathering within the FalC forest, and that cultural outcomes, such as language retention, spiritual fulfilment, and traditional knowledge transfer, can be derived from the practice of these traditional activities. Some traditional land use studies further indicate that the project area and FalC forest has cultural, spiritual and historical significance to Aboriginal groups and is thus important for maintaining cultural heritage.

The proponent stated that sponsoring cultural and community initiatives, and offering Aboriginal employment, contracts, and training could counterbalance the Project's effects on cultural heritage. Impact benefit agreements have yet to be negotiated between the proponent and directly affected Aboriginal groups, however the proponent has a representative workforce policy that aims to employ 27 percent of Aboriginals in the region. The proponent will also support Aboriginal education and training to develop the skills and qualifications necessary for employment related to the Project, and develop procedures that facilitate and support Aboriginal business participation in the Project.

The proponent concluded that environmental effects on traditional land use caused by the Project is low in magnitude and not likely significant after taking into account mitigation and commitments on Aboriginal employment, training and business participation.

Public, Aboriginal, and Government Comments

The James Smith Cree Nation, Métis, and the Wahpeton Dakota Nation have indicated that project effects on traditional land use would be likely significant due to the lack of adequate mitigation. Aboriginal groups have criticized the proponent's assessment methodology, stating that it failed to recognize the cultural significance and intrinsic value of the FalC forest and project area to the groups. The FalC forest is the closest and largest intact forested crown land available for which

they can practice traditional activities. The area surrounding the FalC forest consists of fragmented patches of forest and is predominantly agricultural and privately owned. Therefore, any loss of traditional lands is considered a significant amount by these groups.

Both the James Smith Cree Nation and the Wahpeton Dakota Nation stated that the direct loss of traditional lands, coupled with the indirect loss of traditional lands from the displacement of wildlife and plant resources⁴, disturbance to cultural sites, and interruption of traditional activities, and displacement of current and future generations of traditional users, would amount to higher loss of traditional lands than those noted by the proponent. According to the Wahpeton Dakota Nation, the right of way for road access and utilities corridors would also add to the loss of traditional territory. It is their view that the right of ways, as well as an additional 500 metre buffer on either side of these corridors should have been included in the exclusion zone for safety reasons because Wahpeton Dakota members would be prohibited from hunting near the access road. It is therefore their view that the proponent erred in calculating the exclusion area. According to their calculation, which was based on a slightly larger project footprint of 4210 hectares and the addition of a 400 metre buffer around the project footprint, the exclusion area represents an area closer to 9052 hectares (about 6.8 percent of the FalC). The James Smith Cree Nation is of the view that 100 percent of the local study area and 10 percent of the regional study area will be unavailable to their members for the duration of project operations, and likely beyond. This group argues that the entire local study area will be bermed and/or fenced to restrict access to the

project site for the life of the Project. It is therefore their view that 100 percent of the local study area should have been used to calculate the effect for the biophysical components, including wildlife and vegetation.

Some groups stated that their resiliency to adapt to cultural and environmental change requires a sufficient track of land to meaningfully practice traditional activities and support a diverse cultural landscape, and that the loss of seven to ten percent of highly valued traditional lands would be clearly distinguishable at the community level and would pose a serious risk to their culture and traditional practices. They also stated that their adaptability to respond to environmental changes and cultural resiliency needs to consider whether other areas in the traditional territory are comparable in terms of uses, environmental conditions, accessibility, proximity, resource availability, and intrinsic value to Aboriginal groups.

The Métis, the Wahpeton Dakota Nation, and the Muskoday First Nation stated that the project area is a preferred and more productive area for traditional practice compared to the broader FalC forest. They noted that traditional use of certain areas over others is influenced by a variety of factors, such as cultural and historical meaning, environmental conditions, and landforms. They view the quality of traditional lands not as homogeneous within the FalC forest, and that traditional lands taken up by the project, are of a higher quality and significantly important. They assert that the project area has physical and cultural features that make it unique compared to the interior FalC forest, such as access to shoreline, historical and cultural context, and known high concentrations of ungulates. Muskoday First Nation noted that cultural sites at risk from drawdown effects to wetlands need to be identified and protected.

4 The James Smith Cree Nation and the Wahpeton Dakota Nation noted that the ungulate population model in the EIS predicts that there could be approximately 10 percent loss in ungulate populations from the direct and indirect loss of habitat caused by the Project and that the drawdown of the water table caused by the pit dewatering would affect an additional 7 percent of total vegetation and 17 percent of wetland within the FalC forest (prior to the implementation of mitigation measures). They also noted the uncertainty of effects to wetlands caused by drawdown.

The proponent's conclusions on the alternate areas of the FalC forest being available for traditional land use are founded on the project effects assessment and baseline information on wildlife, vegetation, travel cost, and access within the FalC forest. Furthermore, based on surface lease information, there are no substantial industrial activities in the FalC forest that would additionally affect the availability and productivity of wildlife and vegetation resources. The quality of harvesting areas in the FalC forest was not considered as data were not available.

The James Smith Cree Nation, the Métis, the Muskoday First Nation, and the Wahpeton Dakota Nation also stated that the proposed mitigations are insufficient to address project effects on traditional land use. They dismiss progressive reclamation as mitigation because it would take more than a generation for the site to be reclaimed for appropriate traditional use. Further, they noted that reclamation success and length of time for the site to be reclaimed to traditional land use is highly uncertain and that this multi-generational interruption to traditional land use would therefore have a permanent effect on intangible aspects of cultural heritage. The James Smith Cree Nation stated that mitigations of sponsoring cultural programs and replacement initiatives are wholly inappropriate, and would not equally or fully compensate the project effects on culture and traditional land use.

They also questioned whether reclaimed areas would support traditional land use, considering that it would take more than 1000 years for Orion-South pit to passively fill and there is uncertainty about the water quality. The Métis noted that the end pit lakes would support different traditional activities that may not be desirable to their members because it would require changing their dietary preferences for hunting waterfowl instead of ungulates. The Agency notes that the proponent has committed to actively filling the Star pit with Saskatchewan River water to accelerate reclamation and that the decision and method to actively fill Orion South pit will be determined based on experience with closure of the Star pit.

The Muskoday First Nation noted that the proponent failed to incorporate the FalC Integrated Land Use Plan that identifies protected and environmentally sensitive areas, and required that forested (traditional) lands removed by the Project be replaced with functional comparable and accessible lands through additions to the FalC forest. The FalC Integrated Land Use Plan is a plan developed by Saskatchewan Environment and provides a zoning framework that divides the FalC forest into different levels of protection, acceptable and unacceptable uses, and reflects different resource values, uses and needs.

The Plan is a draft document and has not received provincial approval to proceed to the implementation stage. Despite this, the proponent considers that the proposed reclamation is proposed in keeping with meeting the intent of the draft plan. Reclamation would replace the land to a regenerating condition that would attract ungulates to use young and open stands, and promote berry plant growth. The length of time required for the land to be reclaimed would depend on end land use. Vegetation communities targeted by revegetation and reclamation are expected to develop into pre-disturbance ecosites. Reclamation plans also include commitments to replace traditional use plants and incorporate traditional knowledge into closure planning.

The Métis, the Wahpeton Dakota Nation, and the Muskoday First Nation provided traditional use maps that indicated traditional use throughout the FalC forest. The James Smith Cree Nation and the Wahpeton Dakota Nation cautioned about the interpretation of traditional land use maps, noting that unmapped areas of the FalC forest still holds potential for future and current traditional use. As such, quantifying the area or number of harvest sites or subsistence values overlapping the project area would be an inappropriate interpretation of traditional land use.

The traditional land use study for the James Smith Cree Nation identifies Bingo Hill as a hunting, gathering and camping area. One member that was interviewed for the traditional use study identified Bingo Hill as a sacred site. The James Smith Cree

Nation notes that since exploration activities started in the area, there has been a lack of access to Bingo Hill due to locked gates and road closures. As such, it is likely that the proponent found no current uses of Bingo Hill. The James Smith Cree Nation further notes that numerous artifacts were found from an excavation on Bingo Hill and that carbon-dating of these artifacts confirms the historical and cultural use of Bingo Hill.

The James Smith Cree Nation, the Métis, and the Muskoday First Nation commented on the proponent's assessment methodology on traditional land use, indicating concerns about the lack of traditional knowledge in the initial assessment. In response to this concern, the proponent updated the EIS to include information from traditional land use studies conducted by the groups that were not available when the initial EIS was released for review. The proponent jointly worked with the James Smith Cree Nation to develop traditional land use assessment methodology.

The Muskoday First Nation commented that trapping harvest statistics are not indicators of trapping importance. The Agency requested details about trapping within the fur conservation management area P-085 and the measures that would mitigate the indirect effects on trapping. The proponent responded that trapping statistics were used as an indication of trapping effort on species and not an indication of overall importance of traditional trapping to Aboriginal groups. The displacement of trappers to other areas of the fur conservation area would be an indirect effect from the direct loss of trapping area caused by the mine footprint. The proponent commits to compensating any financial losses in trapping to individual trappers or through the Trapper's Association.

The Wahpeton Dakota Nation and the Muskoday First Nation requested more details on monitoring programs related to reclamation and traditional land use. The Nation stressed the need to develop an access management plan for the FalC forest as effects to traditional land use from changes in access are regional in extent. The proponent

stated that these programs are subject for future discussion with Aboriginal groups. Details on the reclamation planning schedule will be provided during detailed design for the provincial permitting stage. The proponent further stated that any regional planning initiatives would require the cooperation of provincial regulators, and would include wildlife and access management. Mechanisms to have regional concerns addressed could go through the Diamond Development Advisory Committee.

Aboriginal groups are requesting a commitment from the proponent to provide compensation for cultural effects and the forgone opportunities to practice traditional activities in an area that they regard as culturally significant (project area and broader FalC forest), due to the lack of sufficient mitigation. They request that proponent commitments to employment, contracts, and training targeted to their community be negotiated through an impact benefit agreement prior to regulatory approval. Aboriginal groups assert that there is no legal obligation to have these agreements in place once the proponent obtains regulatory approval, especially when the proponent fails to recognize the significance of the project effects on traditional land use.

The proponent recognizes that the development of a satisfactory impact benefit agreement can be considered appropriate compensation for project effects on traditional land use. The proponent stated that it will provide reasonable funding for direct expenses related to engagement activities, as determined by future engagement. The proponent is proactively working with Aboriginal groups in the region to create a process whereby jobs, training, and contracting opportunities can be identified through an impact benefit agreement. The proponent also will strive to have a representative workforce where 27 percent of the workforce would be Aboriginal. Economic benefits would accrue to all communities in the region, including Aboriginal people through employment and contracting activities, regardless of the state of any discussions between the proponent and Aboriginal groups.

Agency's Analysis of Residual Effects

The Agency's residual effects assessment was informed by the EIS, traditional land use studies of select Aboriginal groups, and comments provided by Aboriginal groups. The analysis indicates that the key adverse residual effects to traditional land use are from loss of traditional lands and effects on cultural heritage. Residual effects on resources relied on for traditional practices, such as wildlife, fish, and vegetation, are negligible and that alternate traditional use areas within the FaIC forest would support these resources. The Agency is of the view that the effects linked to the creation of new access from the construction of the access corridor would be minimal, and that the rerouting of a section of Lars Road would not disrupt travel or lead to the displacement of traditional users after taking into account the proposed mitigation measures.

Residual Effects from the Loss of Traditional Lands

The Agency recognizes the divergent views of the proponent and Aboriginal groups on the magnitude of effects to traditional land use from the loss of traditional lands within the FaIC forest. Aboriginal groups quantify the loss of traditional lands to be up to ten percent and permanent or irreversible, whereas the proponent views the loss of traditional lands to be low in magnitude (four percent) and reversible once the project site is reclaimed. The Agency considers that the magnitude of the effects on traditional land use is most likely somewhere in between four to 10 percent of the FaIC forest and recognizes that some areas, including the local study area may be more valuable for traditional uses than other areas of the FaIC forest. The magnitude of this effect is therefore moderate in magnitude, long term in duration, and partially reversible with reclamation of the site at the end of mine life. The Agency notes that alternate areas in the FaIC forest would be accessible for traditional land use and that travelling to these areas would minimally affect travel cost given the close proximity of the area.

The Agency understands that the project area and broader FaIC forest have high intrinsic cultural values, including the value of preserving the area for future generation, and are important for maintaining cultural identity and integrity for Aboriginal groups in the area

Residual Effects on Cultural Heritage

The Agency understands that the project area and broader FaIC forest have high intrinsic cultural values, including the value of preserving the area for future generation, and are important for maintaining cultural identity and integrity for Aboriginal groups in the area. It recognizes that Aboriginal groups maintain a strong collective attachment to the FaIC forest because of its close proximity and it being the largest intact forested land publicly available to meaningfully practice traditional activities.

The Agency is of the view that there would be residual effects on cultural heritage from the direct and indirect effects to cultural sites and loss of traditional lands. Mitigation for effects on cultural

heritage cannot be made independently and would require proponent engagement with affected Aboriginal groups to understand what mitigation measures are culturally acceptable and feasible. The Agency notes that the proponent has committed to further discussions with Aboriginal groups on these mitigation measures and that this commitment is strengthened by memorandums of understanding to develop impact benefit agreements with affected Aboriginal groups (refer to section 5.2.3 Proponent Engagement with Aboriginal Groups). The Agency can reasonably expect that the proponent will uphold these commitments.

It is the Agency's view that the direct and indirect loss of traditional lands and transformation of the habitat may span over multiple generations. Within a socio-cultural context, changes to the cultural value of the area and preferred opportunities for traditional practice would be long-term at a community level and may be considered by certain individuals as permanent.

The Agency recognizes that alternate traditional use areas within the FalC forest may not have as high cultural importance or quality but these areas would have some degree of cultural relevance given the importance of the entire forest for traditional practices.

Agency Conclusions on the Significance of Environmental Effects

The Agency's analysis indicates that the key adverse residual effects to traditional land use are the effects to cultural heritage from the loss of traditional lands and indirect and direct loss of cultural sites. These residual effects are characterized as *moderate* in magnitude because effects may be distinguishable at the community or population level due to the loss of highly valued and preferred traditional lands and cultural sites (particularly with respect to the James Smith Cree Nation, the Métis, the Wahpeton Dakota Nation, and the Muskoday Nation), *regional* in extent as displacement of users to other areas in the FalC forest could occur, *long-term to permanent*

in duration depending on the cultural and environmental context, *continuous* in frequency, and *reversible* when the site can be reclaimed to a state where traditional land use can resume and *irreversible* for landscape features and cultural sites that would be permanently lost.

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on traditional land use and that Aboriginal groups would be able to continue traditional practices in a modified context within other areas of the FalC forest, taking into account the implementation of mitigation and proponent commitments.

6.9 Human Health

The human health section assesses project-induced changes in noise levels, air quality, country foods, and drinking water. Human receptors in the FalC forest are largely present on a temporary or seasonal basis. They include traditional and seasonal users, and forestry, agricultural and mining exploration industry workers. There are a number of traditional use cabins and unofficial camping areas that are also indicators of temporary or seasonal use. There are no permanent residences within 10 kilometres of the Project or within the FalC forest. The nearest residences are within 20 kilometres of the Project on the James Smith Cree Nation reserve.

Baseline noise levels fell within the typical range for undisturbed quiet areas ranging from 22.4 to 46.9 A-weighted decibels during the day and 22.4 to 32.1 A-weighted decibels at night. Baseline air quality is described as good because air contaminants fell below air quality detection limits. Refer to Section 6.2, Atmospheric Environment for further details on baseline atmospheric conditions.

Country foods, also known as traditional foods, include those foods trapped, fished, hunted, harvested, or grown for subsistence or medicinal purposes, or obtained from recreational activities such as sport fishing and game hunting (Health Canada 2010). Country foods in the FalC forest

include berries, animals, fowl, and fish. Naturally occurring contaminants in country foods in the FalC forest (berries, animals, fowl, and fish) are assumed by the proponent to be low to very low therefore, a baseline country foods assessment was not conducted.

There are two sources of drinking water in the regional study area: groundwater (shallow and deep aquifers) and the Saskatchewan River. Drinking water quality in the shallow aquifer is generally good. Water quality from deeper aquifers (greater than 25 meters) typically has high mineral content and often requires treatment. There are no local wells in the FalC forest and the closest well is eight kilometres from the Project on the James Smith Cree Nation reserve.

Drinking water sourced from the Saskatchewan River is treated before consumption. The river's water chemistry has several dissolved metals, such as aluminum, arsenic, and iron, which can naturally exceed the Guidelines for Canadian Drinking Water Quality (2012).

Potential Environmental Effects and Proposed Mitigation

Noise

The EIS states that ambient noise levels would be increased from construction activities such as levelling and grading, vehicle and heavy equipment traffic, excavation, and concrete pouring. There would also be noise from operational activities, such as blasting, crushing, hauling, and the disposing and processing of ore. Increased noise levels could temporarily affect quality of life factors (e.g. stress, annoyance) for temporary and seasonal users, and workers in the FalC forest if they are located in the vicinity of the project fence line.

Project-related noise levels were assessed in the EIS for periods during which the largest amount of material will be mined and processed. Noise

levels over 60 A-weighted decibels are predicted to be close to the sources of noise such as the overburden pile, the pit, and the processing plant areas. Noise levels within the project area would be managed under occupational health and safety regulations. Noise levels are predicted to be at 45 A-weighted decibels or lower beyond the project fence line.

The proponent will mitigate noise levels by scheduling noisy construction activities and blasting during daytime hours to the extent possible, enforcing speed limits, and regularly maintaining construction vehicles and equipment. The proponent will also monitor noise at the property line and at the location of sensitive receptors when the project attains full production capacity to confirm predictions and ensure compliance with noise guidelines. The proponent will develop noise management plans that will include community consultation and complaint resolution, if applicable.

Air quality

Operation of mining trucks, blasting, and wind erosion off stockpiles and roads, would emit air contaminants such as particulate matter (dust), nitrogen dioxide, and sulphur dioxide. These contaminants could affect human health if concentrations exceeded the ambient air quality objectives of the Saskatchewan Clean Air Act (1989) and Canadian National Ambient Air Quality Objectives (CCME 1999) at the point of exposure on a long term basis. Based on the EIS, air quality parameters would not exceed these objectives beyond the project fence line.

The proponent will implement mitigation measures such as applying dust suppressants, using new haul trucks with lower exhaust emissions, providing vegetation cover on stripped areas, and using delayed blasting techniques to reduce air contaminants caused by the Project.

Country foods

The EIS states that metals present in elevated concentrations in kimberlite ore could contaminate country foods. A potential pathway of these metals to food sources is through fugitive dust from ore mining and stock piles, i.e. kimberlite ore, that are deposited on plants and soil. Other potential pathways of these metals include seepage from mine facilities, sediment carried by site runoff, and process water discharge. Water contaminants could be taken up by plants and animals, including fish.

Potential human exposure from country foods could occur from ingesting: fish contaminated with metals accumulated from water and sediment uptake, vegetation contaminated with metals accumulated from uptake from soil, and game meats that have accumulated metals. The proponent will implement a country food baseline study, monitor contaminants of potential concern throughout the life of the Project, and undertake a human health risk assessment to analyze the potential risks associated with country foods consumption. Results of this assessment would be used to identify additional mitigation through adaptive management.

Drinking water

Based on the EIS, drinking water levels sourced from groundwater surrounding the project site could be affected by drawdown from operational pit dewatering and pit infilling at closure. Drinking water quality sourced from groundwater could be affected by seepage of contaminants from mine facilities, and from spills and leaks from accidents and malfunctions. Drinking water sourced from the Saskatchewan River would not likely be affected as water is treated prior to consumption. Effects on surface water and groundwater quality, levels, and flows are discussed in sections 6.3 Surface Water Resources and 6.4 Groundwater Resources.

The proponent will monitor groundwater quality and levels using monitoring wells and private water supply wells surrounding the project site. Should effects on drinking water be detected, appropriate mitigation measures, e.g. installing a new well, providing an alternate water source, or water treatment, will be implemented in consultation with well owners. Section 6.4 Groundwater Resources identifies additional mitigation measures applicable to groundwater.

Additional mitigation measures on human health are listed in Appendix F.

Public, Aboriginal, and Government Comments

The James Smith Cree Nation, the Wahpeton Dakota Nation, and the Muskoday First Nation stated that the proponent did not include sensitive noise receptors, such as traditional users, temporary camps, and cabins in the FalC Forest and did not include the reserve as a sensitive receptor. They also stated that the proponent did not include blasting and helicopter traffic in its noise assessment. Health Canada also requested information on noise effects on the temporary construction camp. The Wahpeton Dakota Nation requested that suitable noise mitigation be developed in consultation with the First Nation.

The proponent stated that noise levels will be below the recommended guidelines of 45 A-weighted decibels beyond the project fence line so that there would be no project noise effects on receptors such as temporary camps and cabins, and residences on the reserve. In addition blasting would not disrupt the sleep of temporary and seasonal users as it will only be done during the day. The proponent also stated that noise levels in the temporary construction camp would not be an issue as the thick camp walls (over 10 centimetres) would attenuate the ambient noise. Further, the construction camp would be located past the project fence line, six kilometres from the Star pit and four kilometres from the plant

construction site. Human response to noise from helicopter traffic and blasting would vary between individuals and circumstance. The proponent will develop a complaint resolution process, including community consultation on a noise management plan to address this issue.

The James Smith Cree Nation stated that the proponent did not evaluate project noise and vibration effects caused by blasting, and that helicopters were not used in the noise assessment model. The proponent asserted that the blasting would take place inside the pit, at a depth of up to 300 metres below grade, and that the pit walls would act as an effective noise barrier. At a distance, blasting would be heard as a low rumble or popping sound that would occur in a fraction of a second. The proponent also asserted that helicopters were not included in the noise assessment model because only small helicopters would be infrequently used and flown during the day.

The Red Earth Cree Nation and Métis stated concerns about the human health effects from consuming contaminated fish. Health Canada advised that there is uncertainty in the proponent's predictions on the baseline levels of contaminants of potential concern, and predicted effects of the Project on country foods utilized by Aboriginal peoples. The Wahpeton Dakota Nation requested that the proponent use secondary sources such as past and current diamond mines to validate their country food assessment and improve their monitoring program. This Nation along with the James Smith Cree Nation stated that baseline studies and the future monitoring program should be conducted in consultation with First Nations to ensure traditional knowledge is incorporated.

The proponent has committed to implementing a country foods baseline study and will include mercury, arsenic, and molybdenum in its monitoring as advised by Health Canada. The proponent's country foods monitoring program will incorporate traditional knowledge through consultations with Aboriginal groups.

Health Canada advised that a human health risk assessment should use the baseline data to analyze potential risks associated with the consumption of country foods that may result from impacts of the Project. This assessment compares baseline conditions to conditions under project operations. The proponent assured Health Canada that baseline levels of naturally occurring metal contaminants such as mercury, and water quality and quantity would be included in its monitoring plan in response to the Health Canada request for clarification. Should project effects be detected, the proponent will inform affected treatment facilities and well owners and implement measures to eliminate or reduce contaminants through water treatment and provide alternative sources of drinking water. Details on the country foods monitoring plan, including contingencies, will be developed in consultation with Aboriginal groups. Health Canada supports the proponent in continuing discussions on its monitoring plan with the James Smith Cree Nation.

The Métis expressed concerns about the effect of project discharge on drinking water quality downstream. The James Smith Cree Nation also expressed concerns about drinking water quality from local wells on its reserve. The proponent stated that the water quality of the project discharge would not adversely affect the water quality of the river (refer to section 6.3 Surface Water Resources). The EIS further notes that drinking water sourced from the Saskatchewan River is treated before consumption. The proponent stated that drinking water quality sourced from groundwater would not likely be affected as groundwater contaminants such as seepage, would be collected and contained within the project area, and would not be released in the receiving environment (refer to section 6.4 Groundwater Resources).

Agency's Analysis of Residual Effects

Noise

Human response to noise would vary between individuals and the circumstance. The closest exposed population receptors include temporary and seasonal users and workers in the FalC forest who are sporadically located outdoors, not stationary, and outside the Project fence line. The Agency is of the view that it is impractical to assess the acoustical exposure to these receptors, and therefore describes the health impacts of noise at the project fence line as the worst case scenario.

Hearing loss at the project fence line would not be likely as there is no known risk of hearing loss associated with sound levels below 70 A-weighted decibels regardless of the exposure duration (WHO 1999). Project fence line noise is predicted to be 45 A-weighted decibels or lower.

Further, impulsive noise exposure at the project fence line from blasting is unlikely to exceed World Health Organization (1999) recommendations of 140 Z-weighted decibels. According to the EIS, blasting noise could be as loud as 121 to 136 Z-weighted decibels at 30 meters from the blast noise, but this prediction assumes that blasting would occur at ground level on flat terrain with no noise mitigation. Blasting would occur at a depth of up to 300 metres below grade and would be attenuated by the pit walls.

As the threshold for impairment of speech comprehension is 55 A-weighted decibels (EPA, 1974), the Agency is of the view that project noise would not likely interfere with speech at or past the project fence line.

The Agency is also of the view that project noise is not likely to cause sleep disturbance as exposure levels predicted in the EIS would not exceed 45 A-weighted decibels, a threshold set by the World Health Organization (1999). The EIS states that camping areas near the Saskatchewan River will be buffered from noise effects by the river

valley. The Agency also notes that the sound of water would also attenuate the project noise for camping areas near the river. The proponent commits to only blasting during the day, thus limiting sleep disruption.

The Agency finds that there would be *negligible* residual human health effects from noise.

Air quality

Concentrations of particulate matter, sulphur dioxide, and nitrogen dioxide were predicted to not exceed ambient air quality objectives past the project fence line. These air quality objectives set provincial and national goals for outdoor air quality to protect public health, the environment, or aesthetic properties of the environment (Saskatchewan Clear Air Act 1989, CCME 1999). Based on the mitigation measures, the Agency is of the view that residual health effects due to air quality are *negligible*.

Country foods

According to the EIS, project effects on country foods related to contamination of soil or plants were predicted to be negligible since there is a limited pathway and extent of deposition of fugitive dust. Exposure to contamination of country foods via water was also considered negligible, taking into account mitigation for surface water and groundwater quality effects (refer to sections 6.3 Surface Water Resources and 6.4 Groundwater Resources). The EIS also states that fish passing through the 40 metre project discharge diffusion zone in the river would not be exposed for a sufficient length of time to allow for accumulation of metals in fish.

Considering the above and the proponent's commitment to implement a baseline study of contaminants of concern and human health risk assessment, the Agency is of the view that incremental increases in exposure to project contaminants from the contamination of soil and plants from dust, and fish consumption would have *negligible* potential to increase human health risk.

Drinking Water

All municipal drinking water from the Saskatchewan River must be treated to meet national (Health Canada 2012) and provincial (SKMOE 2006) drinking water guidelines before consumption. The proponent commits to providing alternative sources of water supplies and treatment should private wells be affected. The monitoring of wells will continue for at least two decades after operational dewatering ceases, until a clear recovery trend is established after mine closure, or until the site can be returned to provincial control.

The Agency is of the view that adverse residual effects on drinking water quality and availability from groundwater and the Saskatchewan River would be *negligible* after taking into account the implementation of mitigation.

Agency Conclusions on the Significance of Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on human health after taking into account the implementation of mitigation measures. A monitoring program on country foods, noise levels and potable wells will be conducted throughout the life of the Project. The monitoring of potable wells will continue for at least 20 years post closure, until the site is returned to an appropriate state, or until the site can be returned to provincial control.

6.10 Effects of the Environment on the Project

This section evaluates the following natural processes or events as having potential effects on the Project:

- Forest fires
- Climate change
- Extreme weather events, including floods

Potential Environmental Effects and Proposed Mitigation

Naturally occurring forest fires could adversely impact the Project by damaging or destroying property and interrupting operations for significant periods of time. The Project is located within the Prince Albert Community Full Response Area under the Saskatchewan Forest Fire Management Strategy. The province extinguishes all fires in Community Full Response Areas that pose a threat to communities.

In addition to the Saskatchewan Fire Management Strategy, the proponent will mitigate the likely effects of a forest fire on the Project through a Fire Management Plan that will take into account a full work force being on site at full mining operations. The plan includes provisions for fire-response training for employees and a description of how fire risk will be communicated to employees so that operations can be responsive to an increasing fire risk.

Climate change models in the EIS indicate a trend of increasing temperature and decreasing precipitation and as such, forest regeneration may be slow or inhibited. Climate change could have two effects on the Project:

1. Mine site reclamation to forest cover may be more difficult or impossible to achieve; and
2. Reclamation planning may have to contemplate grassland ecosystems and not boreal forest.

Drought-resistant seed will be planted to encourage forest regrowth and reclamation, a recommendation that was adopted from the Saskatchewan Research Council study (2008) entitled *Impacts of Climate Change on the Island Forests of Saskatchewan*.

Climate change models in the EIS also indicate an increased likelihood and severity of future forest fires. The fire management plan will be periodically reviewed to adaptively manage the increased fire risk and severity caused by climate change.

According to the EIS, flooding may be caused by extreme weather events or ice jamming in the Saskatchewan River, which could flood the Star or Orion pit from the overflow of ravines into the pit or cause slope failure of the Star pit wall which could lead to an incursion of the Saskatchewan River. Effects of slope failure and proposed mitigation are discussed in section 6.11 Accidents and Malfunctions. Flooding of the pits would cease mining activities.

Site design and mine planning will mitigate the risk of flooding. This includes designing redundancies into the dewatering system, minimizing slope angles and geotechnical monitoring programs to guard against the potential adverse impacts of erosive forces. The height of the East Ravine where it intersects the Star pit is 29 metres higher than the 1:250 flood event and will further mitigate the risk of flood effects on the Project.

The proponent has committed to undertaking adaptive management strategies including the application of new mitigation measures in response to new information, such as monitoring data, to assist in differentiating between project effects and climate change effects.

Agency Conclusions on the Significance of Environmental Effects

The Agency concludes that the proponent has adequately designed the Project to account for the effects of the environment on the Project.

6.11 Accidents and Malfunctions

Accidents and malfunctions can be defined generally as unplanned events that may result in adverse consequences but have a low probability of occurring. This section focuses on the assessment of accidents and malfunctions that could result in very large consequences for the Project or the environment. These hazards include infrastructure failure such as slope failure of the pit walls, an explosives magazine fire, and hazardous goods spills. Refer

to Section 6.10 Effects of the Environment on the Project for a discussion on how naturally occurring hazards such as wildlife and extreme weather could impact the Project.

Potential Environmental Effects and Proposed Mitigation

Infrastructure failure includes processed kimberlite containment facility berm failure, and pit wall and storage pile slope failures. Such failures could be caused by poor project planning and design, flooding or seismic activity. Infrastructure failure of the processed kimberlite containment facility could result in a release of deleterious substances, as it contains processed-affected mine water that could affect water quality and harm fish and aquatic organisms.

Infrastructure failure of a pit wall or storage pile could also cause physical changes to the surrounding environment, such as damaged or destroyed aquatic or terrestrial habitat from the mass movement of material. According to the proponent, failure of the Star pit wall and subsequent incursion of the Saskatchewan River into the pit could be the most environmentally damaging of all infrastructure failures. Other consequences from infrastructure failure include threatened mine operations and an increased public safety risk.

All slopes will be designed at a minimum safe angle as determined by industry best practices to reduce the risk and likelihood of mine infrastructure failures. Should mine infrastructure failure occur, the affected areas will be remediated by removing all hazardous material and reclaiming appropriate land cover. The Star pit will be backfilled when the Orion South phase begins, which should increase the geotechnical stability of the pit. If the structural integrity of the land between the Star pit and the Saskatchewan River is threatened, remedial actions, including adding soil and armouring it with rocks or geotextiles, will be taken. Monitoring programs will be implemented to detect and respond to any changes in slope stability that could lead to failure.

All slopes will be designed at a minimum safe angle as determined by industry best practices to reduce the risk and likelihood of mine infrastructure failures.

The EIS states that fire at the project site could be due to a fire in the explosives magazine. The environmental consequences of fire include loss of mining infrastructure, as described in section 6.10 Effects of the Environment on the Project, and an increased public safety risk should the fire extend past the project fence line. Hazardous goods spills could contaminate water supplies, damage shorelines, and pose an undesirable effect on aquatic organisms and wildlife. Land-based spills could penetrate soils thereby affecting soil structure and vegetation, and contaminating groundwater.

A Safety, Health, and Environmental Management System, which includes an emergency response plan, fire control plan, and hazardous materials response plan, will be implemented to mitigate effects related to fire and hazardous goods spills. The implementation of these plans would be subject to federal and provincial oversight. Industry best practices will be incorporated when creating management plans under this system.

In addition, explosive and hazardous goods will be properly sited, safe handling procedures will be implemented, and buffer zones around storage and

blasting zones will be established to reduce the likelihood of an explosives magazine fire. A training schedule for employees will be implemented to increase safety awareness and reduce the risk of accidental fire on the site.

Public, Aboriginal, and Government Comments

The Métis expressed concerns on how spills would be contained and how the affected area would be remediated. The proponent asserted that a hazardous materials response plan will include response plans for hazardous goods spills and compliance monitoring. This plan will be updated prior to construction to include site-specific details. The proponent will also consult with the public and Aboriginal groups on the development of the management plans.

The Muskoday First Nation stated concerns about the stability of the pit walls and the potential of the Star pit wall collapsing. The First Nation believed that the proponent did not fully identify hazards and associated mitigations to reduce the probability of its occurrence. In response, the proponent stated that two engineering reports were produced to garner a better understanding of pit design and that it will design all slopes at a minimum safe angle as determined by industry best practices and provincial guidelines. The proponent also stated that it is committed to backfilling the Star pit to strengthen the wall and that stockpiles will be monitored for any geotechnical issues. Adaptive management strategies will also be employed to include new mitigation measures in response to any new information on hazards.

Agency's Analysis of Residual Effects

The potential for mine infrastructure failure to occur is *negligible* but should mine infrastructure failure occur, the effects would be *low* (slope failure of piles) to *high* (pit incursion into the river) in magnitude depending on the magnitude of effects on environmental components such as surface water,

vegetation, and traditional land use, *local* in extent, *medium to long-term* in duration depending on if the mine infrastructure failure occurs on land or in water, *low* in frequency at it would be a one-time event, and *reversible* (slope failure of piles) or *irreversible* (pit incursion into the river). There would be few options for remediation but the Agency is satisfied that mitigations proposed by the proponent would reduce the likelihood of mine infrastructure failure occurring.

Effects from spills would be *low to moderate* in magnitude depending on if the spill was land- or water-based, occurred on or off site, and on the magnitude of the effects on environmental components such as surface water, groundwater, and traditional land use. Similarly, the effects from an explosives magazine fire would be *low to moderate* in magnitude depending on the extent of the fire. The Agency is of the view that should an explosives magazine fire or spills occur the effects would be *local* in extent, *short-term* in duration, *low* in frequency as it would be a one-time event, and *reversible* because site conditions would be remediated. The current hazardous materials response plan in the EIS would require updating prior to construction to include site-specific details on the use, transport, storage, and disposal of hazardous goods, along with response plans for hazardous goods spills and compliance monitoring. This plan will also include guidelines for staff training and orientation to spill procedures.

Agency Conclusions on the Significance of Environmental Effects

The Agency is satisfied that the proponent has identified and assessed the key potential accidents and malfunctions associated with the Project. The Agency notes that the Project has been designed to prevent such scenarios and that contingency and response plans would be in place should an accident occur. Overall, the Agency is of the view that accidents or malfunctions that could result in significant residual effects are unlikely to occur.

6.12 Effects on the Capacity of Renewable Resources

This section assesses project effects on the capacity of renewable resources to meet current and future needs. These renewable resources include water, forest, plants, and wildlife.

It is the Agency's view that significant adverse residual effects on these resources could result in a reduced capacity to provide drinking water, support forestry activities, or support sustainable traditional and non-traditional uses such as fishing, hunting, trapping, and gathering.

Each of these renewable resources was assessed in previous sections of this report. The Agency's assessment for each renewable resource concluded that adverse residual effects would not likely be significant, after taking into account implementation of mitigation.

Agency Conclusions on the Significance of Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse effects on the capacity of renewable resources, taking into consideration the implementation of mitigation.

6.13 Cumulative Effects Assessment

Cumulative environmental effects are environmental effects that are likely to result when a residual effect from the Project acts in combination with effects from other projects or activities that have been or will be carried out.

Scope of the Cumulative Effects Assessment

The cumulative effects assessment in the EIS considered the effects of past, present, and future activities and projects that will overlap spatially and temporally with the residual effects of the Project.

For future activities or projects, emphasis was placed on cumulative environmental effects arising from projects that are certain or reasonably foreseeable. Other projects and activities considered in the cumulative environmental effects assessment were identified through a review of available information on historical land use and existing projects and land use activities within the study area.

According to the EIS, projects and activities summarized in Table 6.13-1 were found to overlap with the Project either spatially or temporally. These projects and activities could cause changes to the physical, biological, and socio-economic environments when occurring in combination with project residual effects. The Pehonan Hydroelectric Project was not included in the cumulative effect assessment due to the high uncertainty of whether the project would ever proceed. Future projects that may result from a project's growth inducing ability were also not considered as part of the analysis.

According to the EIS, the study area considered for the cumulative effects assessment is comprised of 1 500 090 hectares that encompasses the FalC forest in addition to the surrounding communities and rural municipalities. The temporal scope is

based on the timing and duration of project-related activities. These activities include past exploration activities and planned project activities such as construction (year 1 to 4), operations (year 24), and closure and decommissioning (year 25 to 27).

Public, Aboriginal, and Government Comments

The Wahpeton Dakota Nation, the Muskoday First Nation, and the James Smith Cree Nation questioned the proponent on the exclusion of the Nipawin Dam and the proposed Pehonan Hydroelectric Project. Some groups commented on how the SaskPower transmission line should be included in the Project's scope of environmental assessment rather than in the cumulative effects assessment.

The proponent stated that future projects that are reasonably foreseeable in the cumulative effects assessment were considered. It did not include the Pehonan Hydroelectric Project as no project proposal has been developed. The proponent considered the SaskPower transmission line in its cumulative effects assessment because it is a separate project proposal by a different proponent and therefore could not be within the scope of the Project's environmental effects assessment.

Table 6.13-1: Activities and projects found to overlap spatially or temporally with the Project

Type of Project/ Activities	Name of Project or Description of Activity
Past	<ul style="list-style-type: none"> • Exploration drilling by the proponent • Limited oil and gas exploration • Logging and grazing management
Current	<ul style="list-style-type: none"> • Limited oil and gas exploration • Logging and grazing management
Future	<ul style="list-style-type: none"> • SaskPower transmission line to service the Project • Logging and grazing management of the FalC forest • Other uses of the re-routed and upgraded access road to the site • Development of additional kimberlite deposits such as expansion of the Star pit to include other kimberlite deposits, and extension of the Orion-South pit to include inferred resources and the Orion-Centre Deposit

The Muskoday First Nation and the James Smith Cree Nation expressed concerns about past exploration activities and the lack of Crown and industry consultation on these activities. The James Smith Cree Nation and the Wahpeton Dakota Nation have noted that past activities and projects such as exploration and road closure programs have already affected traditional land use opportunities in the FalC forest. The Wahpeton Dakota Nation noted that other natural factors, such as natural disturbances and biodiversity, should be considered in the cumulative effect analysis as these factors affect the ability of the landscape to support traditional land use. The Cumberland House Cree Nation expressed concerns about existing downstream effects from hydroelectric projects upstream.

The proponent stated that Aboriginal concerns about exploration and access within the FalC forest should be directed to the province. Natural disturbances and hydroelectric projects upstream of the Project were not included in the assessment. Biodiversity was indirectly considered in the cumulative effects assessment from assessing cumulative effects on biophysical resources. The proponent notes that any regional planning initiatives, including wildlife and access management, would require the cooperation of provincial regulators. Mechanisms to have regional concerns addressed could go through the Diamond Development Advisory Committee.

The James Smith Cree Nation commented that the analysis of other leases in the FalC forest and existing and potential effect on traditional land use was weak to non-existent. No other surface leases exist in the FalC forest other than for agricultural, forestry, and exploration activities. Agricultural leases do not have restrictions on traditional land use, and forestry harvest (current and potential) amount to one to two percent of the FalC forest. Both agricultural and regenerating forest could still facilitate traditional land use. The proponent estimated that exploration activities occupy

approximately 678 hectares or 0.5 percent of the FalC forest, taking into account a 500 metre buffer around facilities.

Agency's Analysis of Cumulative Effects

The Agency has focused its analysis of the cumulative effects on key valued components for which the main residual effects from the Project are anticipated. These valued components include: Surface Water Resources, Vegetation and Plant Communities, Terrestrial Wildlife Habitat and Species, and Current Use of Land for Traditional Purposes (Traditional Land Use).

Surface Water Resources

The Agency concluded that there would be negligible adverse residual effects from the Project on the hydrology of the Saskatchewan River. The net change in flow from all local catchments draining to the Saskatchewan River would be near zero based on the results of the predictive hydrological modelling provided in the EIS. The EIS reports that since the effects of the Project on regional hydrology cannot be detected, it would not contribute to cumulative effects on the hydrology of the Saskatchewan River. The Saskatchewan River is the main indicator of hydrologic function in the area and has high environmental and socio-economic value within the region and beyond.

The Agency agrees with the proponent's assessment that the Project is unlikely to contribute to cumulative effects on the Saskatchewan River, which is the main water body in the project area.

Vegetation and Plant Communities

The Agency concluded that there would be adverse residual project effects on vegetation and plant communities within the FalC forest caused by the clearing of vegetation, and indirect effects from drawdown during operations and post closure.

The Saskatchewan River is the main indicator of hydrologic function in the area, and has high environmental and socio-economic value within the region and beyond.

The EIS considered future projects, such as the SaskPower transmission line and ongoing and future forest harvesting, for the determination of the cumulative effects on vegetation and plant communities. The EIS did not include future exploration and mining in the scope of this assessment because the effects on vegetation and plant communities could not be quantified.

Based on the EIS, timber harvest in the FalC forest is minimal because only 20 243 hectares or 15 percent of the FalC forest is available for forest harvest. Approximately 20 percent of the FalC forest has been previously harvested and is in various stages of regeneration.

The EIS predicts that the future harvest of 1165 hectares in 2010 and 2202 hectares in 2014 would further disturb approximately 1 to 2 percent of the FalC forest. Based on the SaskPower transmission line proposal, the length of the transmission line would vary from approximately 16.5 to 18 kilometres, depending on the route selected. The maximum disturbed area from the transmission line could be up to 7.2 hectares, assuming a 40 metre width of all new right of way. It is the Agency's view that this area is nominal compared to the total area of the FalC forest.

The Agency is of the view that project effects on vegetation and plant communities, in combination with other project activities, would be localized and restricted to a small portion of the FalC forest.

Terrestrial Wildlife Habitat and Species

The Agency concluded that there were adverse residual project effects on terrestrial wildlife habitat and species within the FalC forest. Residual effects were found to vary from species to species. These residual effects are characterized in section 6.6 Terrestrial Wildlife Habitat and Species.

The EIS predicts that adverse residual effects of the Project on wildlife habitat and species could be expanded spatially and temporally when acting in combination with current and future projects, such as development of additional kimberlite deposits and logging in the FalC forest. The Agency notes that the SaskPower transmission line could further fragment wildlife habitat, which could adversely affect interior forest species and disrupt wildlife or displace the movement of certain animals that inhabit small territories or home ranges in mature forest stands (Manitoba Hydro 1995).

The Agency notes that the loss of habitat from known activities such as forestry and the transmission line would be small (1 to 2 percent). The spatial and temporal losses associated with future kimberlite deposit development were not included in the Agency's assessment because it is difficult to quantify. Recognizing that the Project's residual effects could expand spatially and temporally, the Agency concludes that the residual cumulative effects on wildlife habitat and species would not likely be significant given the small incremental effects that future activities, i.e. forestry and transmission line, would likely have on wildlife habitat. The Agency further notes that forest harvesting is a temporary disturbance (reversible effect) and that early seral stages of forest regeneration can benefit some wildlife species.

Current Use of Land for Traditional Purposes

The Agency concluded that during construction and operations there would be residual project effects on traditional land use within the FaIC forest. Residual effects are traditional use specific. These residual effects are described in section 6.8 Current Use of Land and Resources for Traditional Purposes.

The EIS predicts that the Project, in combination with other projects and activities, such as forestry, the SaskPower transmission line project, and future mining activities, would result in the loss of traditional lands. The proponent states that these cumulative effects on traditional land use would not have a noticeable impact.

The Agency is in agreement with the proponent's conclusion for the following reasons:

- a) Cumulative effects on traditional fishing from resource availability would be unlikely since there would be negligible project residual effects on fish and fish habitat;
- b) Cumulative effects on vegetation and plant communities, and terrestrial wildlife habitat and species, which are linked to resource availability for traditional land use, would be nominal or localized (for traditional plant use availability) or sustainably managed by the province (for wildlife resource availability);
- c) Cumulative effects on traditional land use from forest harvesting would be nominal since harvests between 2010 and 2014 are estimated to be one to two percent of the FaIC forest;
- d) Changes in access to traditional resources, and displacement of traditional users causing increased resource competition, would be addressed through regional planning or provincial wildlife management strategies; and
- e) Forestry activities in the FaIC forest are managed by the province such that other uses including wildlife, recreation, and Aboriginal use, would be considered and accommodated.

Agency Conclusions

The Agency concludes that the Project, in combination with past, present and future foreseeable projects, is not likely to result in significant adverse cumulative effects. The Agency notes that a FaIC forest regional land use plan would provide a long-term approach for managing current and future land uses within the FaIC forest, land use effects on wildlife and plant resources, and traditional land use.

7. Potential Adverse Impacts of the Project on Potential or Established Aboriginal or Treaty Rights and Interests

In total, nine Aboriginal groups were identified as having potential or established Aboriginal or treaty rights and interests that could potentially be adversely impacted by the Project. The Project is within Treaty 6 lands, and as such Treaty 6 First Nations who reside or have reserve lands close to the project location were included in the scope of assessment. These Treaty 6 First Nations include the: James Smith Cree Nation, Muskoday First Nation, Sturgeon Lake First Nation, and Peter Ballantyne First Nation. Two Treaty 5 First Nations, Cumberland House Cree Nation, and Red Earth Cree Nation, were also included in the assessment due to the potential of the Project to have downstream effects.

Signatories to Treaty 5 and 6 have the right to hunt and fish within their respective treaty boundaries. All treaty First Nations have the rights to hunt, fish and trap on all unoccupied Crown lands in the province subject to government regulation or legislation respecting game, pursuant to the Saskatchewan *Natural Resources Transfer Act, 1930*.

The Project also overlaps with the asserted traditional territory of the Wahpeton Dakota Nation. This First Nation is not a signatory to any of the numbered treaties as it was excluded by the Crown from the treaty process in the late 1800s. The Métis assert that the project area overlaps Métis traditional territory.

The Agency considered information collected through Crown consultation activities as well as information provided in the EIS on project effects on traditional land use, health and socio-economic conditions, and culture on Aboriginal people to assess the impacts of the Project on potential or established Aboriginal or treaty rights. The majority of these project effects are described in Section 6 of this report. Impacts were then assessed by linking

concerns expressed by Aboriginal groups with project effects that may relate to their established or asserted rights and interests.

7.1 Key Potential Impacts on Potential or Established Aboriginal or Treaty Rights and Interests

The following is a summary of the key project environmental concerns related to impacts on potential or established Aboriginal or treaty rights and interests:

- The mine footprint and enclosure would result in the loss of lands of high cultural value used for the exercise of rights such as hunting, trapping, gathering and fishing. Cultural sites within the project area would also be lost.
- Loss of the ability to use the mine footprint and enclosure area for the exercise of rights would result in the displacement of traditional users to other areas in the FalC forest and increased resource competition and conflict between traditional and non-traditional users.
- Loss of the area would be experienced by multiple generations and for some individuals the loss of the area would be permanent for their lifetime.
- Reduced wildlife, fish, and plant resource availability could affect the efficacy of traditional practices, which could result in reduced practice or displacement to other areas in the FalC forest or beyond.
- Lowering of the water table and seepage from the mine facilities could affect potable groundwater supplies.
- Contaminants in country foods could result in reduced practice or displacement to other areas in the FalC forest or beyond.
- Multiple projects and activities that erode the available land base, quality of the habitat and availability of wildlife resources could have cumulative impacts on the current and future ability to exercise rights in the FalC forest.

The James Smith Cree Nation, Métis, and the Wahpeton Dakota Nation indicated that the Project will impact their rights and interests to hunt, gather, and practice their culture within and surrounding the project area, and that conclusion of an impact benefit agreement with the proponent is required to provide adequate compensation for these impacts.

The Muskoday First Nation and the Cumberland House Cree Nation asserted that the Project impacts their interest in the purchase of land within the FalC forest pursuant to the treaty land entitlement agreement.

Appendix D summarizes all issues of concern raised by Aboriginal groups and the response of the proponent and the Crown to these issues.

7.2 Proposed Accommodation Measures within the Context of the Environmental Assessment

The proponent has committed to the following measures that can serve as accommodation for the potential impacts of the Project on potential or established Aboriginal or treaty rights include:

- Progressive reclamation of the mine site, which reduces the length of time that portions of the site are unavailable for traditional use;
- Re-routing of a pipeline to avoid a burial area;
- Facilitating access to camp sites and cultural sites within the mine enclosure;
- Measures to reduce effects on wildlife, plant and fisheries resources;
- Compensation for direct trapping losses due to the Project;
- Continuing engagement activities throughout the life of the Project;
- Supporting Aboriginal business participation in the Project;
- Providing employment opportunities for Aboriginal community members;

- Supporting Aboriginal education and training for employment related to the Project;
- Support for programs that would preserve and transfer traditional knowledge; and
- Sponsoring potential replacement initiatives for cultural sites that will be lost.

The proponent has signed memorandums of understanding to develop impact benefit agreements with the following Aboriginal groups:

- Métis Nation – Saskatchewan Eastern Region II
- Métis Nation – Saskatchewan Western Region II
- Sturgeon Lake First Nation
- Wahpeton Dakota Nation
- James Smith Cree Nation

These memoranda can enable the implementation of the commitments made by the proponent with respect to mitigation and accommodation measures. The proponent will continue to engage Aboriginal groups to monitor the effects of the Project on traditional land use. The proponent will consult Aboriginal groups on mitigation or avoidance measures such as environmental monitoring plans, reclamation and closure plans, emergency and spill response plans, and will negotiate benefit agreements.

Given that the Project will not affect the environment outside of the mine enclosure, there will be no effect on the land purchase interests of the Muskoday First Nation and the Cumberland House Cree Nation.

The Agency notes that, while the project itself will not significantly contribute to cumulative impacts on the exercise of rights, regional planning, which is managed by the province, would provide a long-term perspective and actions on how the FalC forest can continue to support the exercise of potential or established Aboriginal or Treaty rights as well as industrial and recreational activities.

The proponent will consult Aboriginal groups on mitigation or avoidance measures such as environmental monitoring plans, reclamation and closure plans, emergency and spill response plans, and will negotiate benefit agreements.

7.3 Consultation Matters and Issues to be addressed in the Regulatory Approval Phase

The regulatory approval phase of the Project consists of federal authorizations, approvals or permits related to areas of federal jurisdiction. The federal Crown will consult Aboriginal groups as appropriate prior to making regulatory decisions. The lead Crown Consultation Coordinator would be identified at that time. The decision to undertake additional consultation will take into consideration the consultation record resulting from the environmental assessment and outstanding concerns related to the regulatory approvals not addressed through the environmental assessment.

Issues to be addressed in the regulatory phase include consultation on the Offsetting Plan to avoid serious harm to fish, which is required for regulatory permitting by Fisheries and Oceans Canada.

7.4 Agency Conclusions Regarding Impacts to Potential or Established Aboriginal or Treaty Rights and Interests

The Agency has taken into account the following in reaching a conclusion on whether the Project is likely to cause adverse impacts on potential or established Aboriginal or treaty rights:

- Reports, comments, and other submissions of Aboriginal groups;
- Discussions with Aboriginal groups;
- The proponent's EIS;
- Environmental effects that may impact potential or established Aboriginal or Treaty rights and their associated mitigation measures; and
- Additional accommodation measures that the proponent has committed to in its environmental assessment documentation and correspondence.

The Agency considers that while the Project has the potential to cause adverse impacts on potential or established Aboriginal or treaty rights, through a loss or change to the preferred way for exercising these rights, these potential impacts will be accommodated through the proposed mitigation and the proponent's commitments.

8. Monitoring and Follow-up under the Former Act

Under the former Act, every comprehensive study must consider the need for, and the requirements of, a follow-up program. The purpose of a follow-up program is to verify the accuracy of the environmental assessment of a project, and determine the effectiveness of any measures taken to mitigate the adverse environmental effects of the project. Where appropriate, the results of a follow-up program may also support the implementation of adaptive management measures to address previously unanticipated adverse environmental effects and environmental management systems to manage the environmental effects of projects.

Fisheries and Oceans Canada, Transport Canada, and Natural Resources Canada, are responsible authorities under the former Act. These federal departments will be responsible to ensure the follow-up program is designed and implemented to their satisfaction with the support of relevant federal and provincial authorities.

The proponent has proposed to monitor several environmental components potentially affected by the Project. These monitoring programs include additional monitoring requirements identified by the responsible authorities, and other federal departments and agencies.

The proponent will work with regulators and other stakeholders to finalize its proposed follow-up program and to include further monitoring requirements stipulated by regulators in potential project permits. If unforeseen adverse environmental effects are identified during project monitoring or follow-up, existing mitigation measures would be adjusted or, if necessary, new mitigation or other measures developed to address those effects through adaptive management. The proponent's proposed follow-up program is outlined in Appendix H.

9. Benefits of the Comprehensive Study to Canadians

The environmental assessment process is designed to be a collaborative tool between the proponent, the public, governments, and other stakeholders to ensure that the Project incorporates the principles of sustainable development in its design and implementation. The comprehensive study of the Project allowed the public and aboriginal groups the opportunity to participate in the decision-making process intended to support this sustainable development, which in turn supports a balanced economic future for Canada.

Through the comprehensive study, water management was identified as a key issue for all stakeholders. Provincial and federal government agencies worked with the proponent to create an acceptable water management strategy that would conform to all legislative requirements. Similarly, the proponent heard and addressed other stakeholder concerns about water management through public and aboriginal engagement. The environmental assessment process was instrumental in streamlining and coordinating common concerns and issues, thus reducing duplication and redundancy in the review process. This is both a cost and time-saving benefit.

The proponent was able to engage the public and aboriginal groups throughout the comprehensive study. Through open houses, meetings, media releases, and the Diamond Development Advisory Committee, the proponent used stakeholder input to determine the appropriate valued ecosystem components to be studied, what outstanding issues might remain, and how best to work with local communities. Public participation on this Project allowed the proponent to gather valuable information about potential impacts, facilitated more effective mitigation measures, and led to better informed and better quality decisions.

Potential adverse project environmental effects and environmental concerns to Canadians were assessed through the comprehensive study environmental assessment process with the assistance of government, the public, Aboriginal groups, and the proponent. As a result of this process, the Project has been designed to ensure that any potentially adverse effects are mitigated or avoided and that any necessary monitoring and follow-up programs are in place.

10. Conclusions

The Agency has taken into account the following elements in reaching a conclusion on whether the Project is likely to cause significant adverse environmental effects:

- Documentation submitted by the proponent including the EIS and subsequent filings to federal information requests;
- Analysis and findings in this report;
- Opinions and comments of Aboriginal groups, the public and government agencies;
- The proponent mitigations as documented in this report and summarized in Appendix F; and
- The regulatory authorizations and permits the proponent will be required to obtain under the *Fisheries Act*, including an Offsetting plan containing measures required to offset serious harm to fish, the *Navigation Protection Act* (should approvals be sought), and the *Explosives Act*.

The Agency concludes that with the implementation of the proposed mitigation measures, the Project is not likely to cause significant adverse environmental effects.

Following a public consultation period on this report, the Minister of Environment will decide whether, after taking into account the implementation of mitigation measures, the Project is likely to cause significant adverse environmental effects. Should the environmental assessment decision allow the Project to proceed, the Project will then be referred back to Fisheries and Oceans Canada, Natural Resources Canada, and possibly Transport Canada for appropriate course of action in accordance with section 37 of the former Act.

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11. Appendix

Appendix A

Project Component Details

Project Component	Details
Star and Orion South Kimberlite Open Pits and Conveyor System	<ul style="list-style-type: none"> • The Star pit would be approximately 2.7 kilometres long by 2.6 kilometres wide to the crest of the pit and approximately 330 metres deep. • The Orion-South pit would be approximately 2.5 kilometres in diameter and 300 metres deep. • Both pits would have 15 metre high benches. • The in-pit crush and convey system would include four electric-powered 42 cubic metres shovels, four fully mobile sizers and in-pit transfer conveyors, an overland waste conveyor and stacking system at the overburden and rock storage pile, and ancillary equipment.
Plant Site Facilities: Processing and Bulk Sample Plants	<ul style="list-style-type: none"> • The dimensions of the processing plant would be approximately 142 metres long and 108 metres wide, with a maximum height of 47 metres. • The Bulk Sample plant would be attached to the processing plant and be approximately 110 metres long, 36 metres wide, with a maximum height of 26 metres. • The processing plant would have a nameplate capacity of 16.43 million tonnes per annum and operate at 87 percent of the nameplate. • The plants would include autogenous grinding, classification, dense media separation, diamond recovery, and reject disposal. The plants would withdraw water from the Saskatchewan River to process the kimberlites.
Plant Site Facilities: Potable Water Treatment System	<ul style="list-style-type: none"> • The treatment system would be located south of the plant building and provide potable water for hygiene and fire protection. • The system assumes a 50 cubic metres per day water requirement based on peak loading. • The water source is from groundwater and would be treated using a combination of media and membrane filtration. • Wastes from the treatment would be placed in the process plant pump box for disposal in the process kimberlite containment facility.
Plant Site Facilities: Fuel and Lubricant Storage Tanks and Fueling Stations	<ul style="list-style-type: none"> • Diesel fuel would be stored in double-walled storage tanks. • Three tanks are above ground, two of which have a storage capacity of 75 000 litres each and the third tank would have a storage capacity of 10 000 litres. • The fourth tank and lubrication station would be above ground with a capacity of 60 000 litres. • Two stations, with dimensions of 2 metres by 1.5 metres by 2 metres high, would provide gasoline, diesel, bulk oil, lubricants and coolant. They would be located at the plant site and in-pit to increase truck efficiency and reduce fuel consumption.
Plant Site Facilities: Buildings	<ul style="list-style-type: none"> • A number of buildings would be constructed for administration, maintenance and technical services, storage of supplies and parts, security, vehicle washing, fire and emergency response and visitors (interpretative) centre.
Plant Site Facilities: Helicopter Landing Pads	<ul style="list-style-type: none"> • Two helicopter landing pads would be located on the roof of the main plant building close to the interpretative centre.
Plant Site Facilities: Coarse Ore Stockpile	<ul style="list-style-type: none"> • The pile of coarse ore would be 43 metres high and 120 metres in diameter, and located west of the plant.

Project Component Details continued

Project Component	Details
Plant Site Facilities: Recovery Rejects Pile	<ul style="list-style-type: none"> • The pile of heavy minerals, which would be periodically audited for diamonds and then moved to the Coarse Ore pile, sold or reprocessed, would be stored in a secure area east of the plant. • The pile would be on a one metre till base, covered by a 60 millimeter high density polyethylene liner, and capped with one metre of Coarse processed kimberlite. • The liner would direct runoff to a small retention pond, where the water would be discharged or treated and discharged to meet discharge criteria.
Plant Site Facilities: Explosives Mixing and Storage Facilities	<ul style="list-style-type: none"> • There would be three storage facilities for explosives on site: a magazine for electric and non-electric detonators; a magazine for packaged explosives used for primers, boosters, and emulsion products; and storage silos for the ammonium nitrate. • The use of explosives is estimated at 70 tonnes per week. Up to 140 tonnes of ammonium nitrate or two week's supply would be stored at any one time. • The explosives area would be located approximately 3 kilometres from any point of public road access and 3 kilometres from the nearest site boundary, and 21 kilometres from Highway 6, at its closest point.
Plant Site Facilities: Solid Waste Incinerator and Sewage Lagoon	<ul style="list-style-type: none"> • The incinerator would dispose combustible refuse and have a capacity of 179 kilograms per hour to combust daily refuse. • The building would be 12 metres by 10 metres with a height of 5.4 metres. • The sewage lagoon would have two cells to treat up to 50 cubic metres of effluent per day. • The primary cell of 1.27 hectare in size would receive a biological oxygen demand 5-day loading of 30 kilograms per hectare-day from a biological oxygen demand 5-day contribution of 77 grams per capita per day (g/capita-day) and the secondary cell would hold 180 days of water (9 000 cubic metres). • Both cells would be lined either with a synthetic liner or suitable low permeability soil.
Temporary Construction Camp	<ul style="list-style-type: none"> • The camp would be comprised of modular units, powered by generator sets until completion of the powerline, and accommodate up to 700 people. It would be in place only for the duration of construction.
Overburden and Rock Storage Pile	<ul style="list-style-type: none"> • The overburden consisting of sands, silts and till, and other rock including shale and other kimberlites, would be placed using a stacker. • The size and shape of the overburden pile would be approximately 2 233 hectares and designed to contain up to 800 million tonnes of overburden. • The height of the pile would be no higher than 45 metres with slopes no steeper than 4:1.
Processed Kimberlite Containment Facility	<ul style="list-style-type: none"> • The processed kimberlite containment facility would contain process water from the processing plants (15-30 percent of Fine processed kimberlite and 70-85 percent process water), contact water, and atmospheric precipitation. • The processed kimberlite containment facility would be approximately 513.59 hectares and have a storage volume of approximately 170 million cubic metres. • The water from the processed kimberlite containment facility would be recycled to the processing plant or released into the environment through a pipeline to the Saskatchewan River outfall-diffuser system.
Coarse Processed Kimberlite (PK) Pile	<ul style="list-style-type: none"> • Coarse processed kimberlite would be conveyed from the plant to the pile. • The processed kimberlite would have a maximum height of 54 metres with a 241 hectares footprint, and final side slopes of 4:1. Pile run-off and contact water would be collected in perimeter ditches and pumped to the processed kimberlite containment facility as needed.

Project Component Details continued

Project Component	Details
Water Management Infrastructure: Pit Dewatering System	<ul style="list-style-type: none"> • Dewatering of the overburden would use an in-pit water collection system at a rate of 10 000 cubic metres per day. • The system would mainly consist of temporary and permanent ditches and sumps to maintain flexibility and be easily modified as the pit expands. • Additional horizontal and vertical drains or wells may need to be installed to address any water pressure built up behind the pit walls or sustained inflow into the pit. • Dewatering wells would be installed to dewater the deep groundwater flow system (mainly the Mannville aquifer). Approximately 22 pumping centres at Star and an additional 22 at Orion South would be installed for up to 154 000 cubic metres per day of groundwater. • The pumped water would be directed to the Mixing Facility.
Water Management Infrastructure: Outfall Diffuser	<ul style="list-style-type: none"> • The outfall diffuser would be located in the Saskatchewan River near the FalC Ravine. • The 1.37 metre diameter high density polyethylene diffuser pipeline would extend beneath the river bed and have discharge points every 10 meter along the pipe, totalling 60 metre in length. • The outfall diffuser pipeline would extend 190 metre into the channel and emerge in the deepest part of the channel. The 1.22 metre diameter high density polyethylene pipeline would handle overflow up to the 1:100 year event and direct overflow into a rip-rap structure to prevent erosion of the Duke Ravine.
Water Management Infrastructure: Intake	<ul style="list-style-type: none"> • The intake would have a constant intake flow rate of 68 900 cubic metres per day of Saskatchewan River water, with a maximum flow rate of 80 000 cubic metres per day. • Operational life of the intake is approximately 13 years or longer throughout the duration of the Project. • The intake would be located upstream of the outfall diffuser, near the mouth of the FalC Ravine.
Water Management Infrastructure: Mixing Facility	<ul style="list-style-type: none"> • This facility would blend effluent of the processed kimberlite containment facility decant water (i.e., contact water, atmospheric precipitation, and process water from the processing plants) and groundwater from pit dewatering.
Access Corridor	<ul style="list-style-type: none"> • The corridor would extend from Highway 55 near Smeaton south to the current bridge at White Fox on Shipman Trail, follow the existing alignment of Shipman Trail for 4.6 kilometres along the drainage divide between English Creek and Caution Creek, and then south to the proposed mine site. The access corridor would be approximately 30.9 kilometres long and 127 hectares in area. Up to 19 borrow areas each 1 hectare or smaller are planned. • An access road would be constructed along existing rural municipality rights-of-ways, with 9 kilometres built over existing provincial grid roads north of the FalC forest, and 21.9 kilometres built off grid within the forest. The road would be constructed for a 110 kilometres per hour design speed and posted to a speed limit of 80 or 90 kilometres per hour. Two 3.7 metres driving lands plus paved 2 m shoulders are proposed for additional safety and ease of maintenance. • White Fox River Crossing would be widened by installing a bin cell wall adjacent to each of the existing exterior bin walls at the abutments. The resulting abutments would be 15.2 metres wide. The old bridge would be realigned and connected to the new bridge to create a clear width of 12 metres between the rails, and a roadway width of 11.4 metres. • A 10 centimetre gas branch line from the TransGas trunk line south of Highway 55 near Shipman would be installed. Natural gas would be used to heat the building and fuel the incinerator at an estimated 87 500 gigajoules annually.

Appendix B

Summary of Alternative Means

Alternative	Factors Considered			Proponent Preferred Option
	Economic Feasibility	Technical Feasibility	Environmental/ Socioeconomic Considerations	
Mining Method				
Open Pit	Cost effective	<ul style="list-style-type: none"> • Proven technology • Effective 	<ul style="list-style-type: none"> • Land disturbance • Potential effects on land use 	✓
Underground	Not economically feasible	<ul style="list-style-type: none"> • Proven technology • Effective 	Footprint minimized	
Open Pit Mining Method				
Inpit ore crushing and convey	Cost effective	<ul style="list-style-type: none"> • Proven technology • Most effective 	<ul style="list-style-type: none"> • Less emissions and waste 	✓
Standard truck and shovel	More costly	<ul style="list-style-type: none"> • Proven technology • Effective 	<ul style="list-style-type: none"> • Emissions and tire waste • Increased risk of fuel spills 	
Processing Method				
Conventional crushing	Economically feasible	<ul style="list-style-type: none"> • Proven technology • More damage to diamonds during liberation 	Not applicable	
Autogenous grinding milling	Economically feasible	<ul style="list-style-type: none"> • Proven technology, can be adjusted to various kimberlite characteristics • Less diamond damage 	Not applicable	✓
Fine Processed Kimberlite Management				
Thickening of fine processed kimberlite prior to placement in processed kimberlite containment facility	More costly	<ul style="list-style-type: none"> • Processed kimberlite containment facility would need to be larger to contain all fines • Settlement and consolidation issues • Requires less water for processing as water is recycled through mining and processing systems 	<ul style="list-style-type: none"> • Additional area required • Potential environmental implications due to uncertain settling characteristics of thickened tailings • Water efficient 	
All fines in form of a slurry placed in processed kimberlite containment facility	More costly	<ul style="list-style-type: none"> • Processed kimberlite containment facility would need to be larger to contain all fines 	Additional area required	
All fines from Star pit placed into processed kimberlite containment facility; fines from Orion South placed into Star Pit	Cost effective	<ul style="list-style-type: none"> • Smaller processed kimberlite containment facility • Most effective 	<ul style="list-style-type: none"> • Footprint minimized • Recycling of water unnecessary because the Project has a surplus of water from pit dewatering 	✓

Summary of Alternative Means continued

Alternative	Factors Considered			Proponent Preferred Option
	Economic Feasibility	Technical Feasibility	Environmental/ Socioeconomic Considerations	
Coarse Processed Kimberlite Storage				
Single pile	Economically feasible	<ul style="list-style-type: none"> • Proven technology • Technical design criteria met 	<ul style="list-style-type: none"> • Avoids direct impact to waterways and riparian habitat • Environmental design criteria met 	
Two piles	Economically feasible	<ul style="list-style-type: none"> • Proven technology • More amenable to future reprocessing • Technical design criteria met 	<ul style="list-style-type: none"> • Avoids direct impact to waterways and riparian habitat • Environmental design criteria met • Location based on design criteria and constraints mapping: northeast of plant 	✓
Fine Processed Kimberlite Storage (Processed Kimberlite Containment Facility)				
Use of cycloned granular material	Cost effective	<ul style="list-style-type: none"> • Proven technology • Effective • Self-contained facility because little topographic relief and no significantly dry valleys 	<ul style="list-style-type: none"> • Less land disturbance due to smaller footprint • Avoids direct impact to waterways and riparian habitat • Location based on design criteria and constraints mapping: East of the plant between Duke Ravine and English Creek outside the pit watersheds 	✓
Use of overburden material	More costly	<ul style="list-style-type: none"> • Proven technology • Effective 	<ul style="list-style-type: none"> • More land disturbance due to larger footprint • Avoids direct impact to waterways and riparian habitat 	
Overburden and Rock Storage				
Only one viable location available	Economically feasible	<ul style="list-style-type: none"> • Proven technology • Effective 	<ul style="list-style-type: none"> • Land disturbance • Irregular outline avoids direct impact to waterways and riparian habitat • Siting west of pit locations only viable option because the coarse processed kimberlite pile and processed kimberlite containment facility are on the east side of the pits and plant 	✓

Summary of Alternative Means continued

Alternative	Factors Considered			Proponent Preferred Option
	Economic Feasibility	Technical Feasibility	Environmental/ Socioeconomic Considerations	
Groundwater Disposal and Treatment				
Diffuser system and dilution with Saskatchewan River water using a Mixing Facility	Economically feasible	Proven technology	<ul style="list-style-type: none"> • Potential effects on aquatic biota • Potential effects on land use • Required to mitigate effects on water quality and meet <i>Fisheries Act</i> requirements 	✓
Reverse osmosis treatment and deep well injection of solute	More costly	Technical issues	No effects on aquatic biota Potential effects on land use	
Process Plant Water Supply				
Saskatchewan River	Economically feasible	Requires an intake structure and increases the volume of water managed by the Project	<ul style="list-style-type: none"> • Potential effects on aquatic biota • Potential effects on navigation on the Saskatchewan River • Required to dilute groundwater prior to disposal to the Saskatchewan River 	✓
Surficial groundwater	Economically feasible	<ul style="list-style-type: none"> • Shallow aquifers would not produce enough water for the entire processing plant • Shallow groundwater has a suitable iron content for use in the recovery process 	Potential effects on shallow wells	
Deep groundwater from pit dewatering	Economically feasible	<ul style="list-style-type: none"> • Expected to supply more than enough water • Mannville water has an iron content that is not suitable for use in the recovery process 	Potential effects on deep water wells	
Combination of surficial groundwater and deep groundwater from pit dewatering	Economically feasible	<ul style="list-style-type: none"> • Provides sufficient quality for use in recovery process • Effective 	Minimizes use of water from surficial groundwater sources	

Summary of Alternative Means continued

Alternative	Factors Considered			Proponent Preferred Option
	Economic Feasibility	Technical Feasibility	Environmental/Socioeconomic Considerations	
Pit Dewatering				
Collect in pit residual passive flow	Cost effective	<ul style="list-style-type: none"> • Proven technology • Option discarded due to geotechnical and safety considerations 	<ul style="list-style-type: none"> • Potential effects on wetlands • Potential effects on land use 	
Dewatering wells for deep and surface water systems	Economically feasible	<ul style="list-style-type: none"> • Proven technology • Difficulties relating to spatial variability of aquifers 	<ul style="list-style-type: none"> • Potential effects on wetlands • Potential effects on land use 	
Dewatering wells for deep water systems and residual passive inflow collection in pit	More costly	<ul style="list-style-type: none"> • Proven technology • Inflow from surface water systems could be collected from the residual inflow to the pit 	<ul style="list-style-type: none"> • Potential effects on wetlands • Potential effects on land use 	✓
Water Management Strategy				
Use of the East Ravine area as a reservoir and diverting overflow to Saskatchewan River via Duke Ravine	More costly	<ul style="list-style-type: none"> • Two dams and a diversion channel would be required • Not consistent with constraint mapping 	<ul style="list-style-type: none"> • Extensive effects on landscape and fish habitat • Full rehabilitation may not be attainable • Potential effects on land use 	
Use of Duke Ravine as a reservoir	More costly	<ul style="list-style-type: none"> • Berms would be required to create an upper polishing pond near the processed kimberlite containment facility and a lower pond • Not consistent with constraint mapping 	<ul style="list-style-type: none"> • Extensive effects on landscape and fish habitat • Full rehabilitation may not be attainable • Potential effects on land use 	
Use of the processed kimberlite containment facility as a reservoir and separate management of processing and dewatering water	Cost effective	<ul style="list-style-type: none"> • Recycling of process water through the processed kimberlite containment facility • Consistent with constraint mapping • Greater flexibility 	<ul style="list-style-type: none"> • Avoids direct effects on Duke Ravine • Potential effects on land use 	✓

Summary of Alternative Means continued

Alternative	Factors Considered			Proponent Preferred Option
	Economic Feasibility	Technical Feasibility	Environmental/Socioeconomic Considerations	
Water Supply				
Treating the shallow groundwater	Cost effective	<ul style="list-style-type: none"> • Proven technology • Less treatment required 		✓
Treating the deep groundwater	More costly	<ul style="list-style-type: none"> • Proven technology • More treatment required 	Minimizes use of shallow aquifer	
Surface Water Runoff Management				
Constructed diversion ditch system, including sumps and drainage ditches	Economically feasible	No additional options provided	Minimizes effects on water quality by diverting surface waters and collecting runoff from around the pit, piles and roadways	✓
Sewage Disposal				
Disposal off site	Cost effective	Proven technology	Effects related to truck traffic	
Disposal of black water to onsite lagoon, combine grey and process water	More costly	Proven technology	Not applicable	
Onsite lagoon for all liquid waste	Economically feasible	Proven technology	Not applicable	✓
Road Access				
Connect new access road to Highway 55 near Smeaton	More costly	Requires new crossing over White Fox River	<ul style="list-style-type: none"> • Environmental effects on low lying wetlands • Potential effects on land use 	
Upgrade existing roads and connect to Highway 55 near Shipman	Cost effective	<ul style="list-style-type: none"> • Makes use of existing bridge • Good access to communities located along Highway 55 	Minimal effects	✓
Connect new access road to Garden River Road and Highway 55	More costly	<ul style="list-style-type: none"> • Shortest route to Prince Albert, no stream crossings • Does not provide good access to communities along Highway 55 	<ul style="list-style-type: none"> • Additional disturbance of FaIC Provincial Forest • Potential effects on land use 	

Summary of Alternative Means continued

Alternative	Factors Considered			Proponent Preferred Option
	Economic Feasibility	Technical Feasibility	Environmental/Socioeconomic Considerations	
Building Heating and Cooling Requirements				
Use of natural gas	Cost effective	• Proven technology	Associated carbon release	✓
Use of geothermal	More costly	• Proven technology • Not effective for point heating; may not meet peak winter requirements	Lower carbon release	
Use of natural gas and geothermal	More costly	Proven technology	Lower carbon release	
Construction Camp				
New camp adjacent to existing camp	Cost effective	• Proven technology • Effective	• Land disturbance • Potential effects on land use	✓
New camp located outside FaC Provincial Forest	Higher commuting and contractor costs	• Proven technology • Effective	• Higher traffic and emissions • Potential effects on land use	
No camp	Higher commuting and contractor costs	Not effective	• Higher traffic and emissions • Potential effects on land use	
Gas Line Corridor				
Use of natural gas for all the Project's heating and cooling requirements	Cost effective	• Proven technology • Effective		✓
Use of a geothermal system for all heating and cooling requirements	More costly	• Reliability unknown • May not meet heating loads for certain buildings	• Significant groundwater flow requirement • Added environmental cost to power pumps for the circuit	
Use of a geothermal system for most of the heating and cooling requirements but supplemented with some natural gas for supplemental heating of smaller buildings and point heating	Costly to maintain geothermal system	• Reliability of groundwater source system unknown • Geothermal system may not meet heating loads for certain buildings	• Significant groundwater flow requirement • Added environmental cost to power pumps for the circuit	

Appendix C

Summary of Aboriginal Consultation Opportunities

Stage	Document/Subject of Consultation	Consultation Period
Pre- Environmental Assessment	Notification of the project proposal including the opportunity to discuss comments and concerns, and apply for funding under the Participant Funding Program.	03 December 2008
	Opportunity to comment on the Project and conduct of the comprehensive study.	19 July to 20 August 2010
Environmental Assessment Planning	Consultation Plan (joint consultation with the Province)	No defined timeline
	Draft Project-Specific Guidelines (joint consultation with the Province)	10 August 2009
	Scope of Environmental Assessment	28 April to 31 May 2010
Environmental Assessment Planning and Review	Various meetings including information sessions with select Aboriginal groups.	2008 to present
Environmental Assessment Review: EIS and EIS Summary	Consultation on the draft EIS and revised EIS, including the opportunity to discuss comments and concerns during and after the review period.	18 January 2011 and 23 August 2012
	Aboriginal and public 30-day review of the EIS Summary, including the opportunity to discuss comments and concerns during and after the review period.	14 August to 13 September, 2013
Draft Comprehensive Study Report	Aboriginal 30-day review of the draft Comprehensive Study Report (prior to general public review), including the opportunity to discuss comments and concerns during and after the review period.	14 April to 13 May 2014
Comprehensive Study Report	Aboriginal and public 30-day review of the Comprehensive Study Report, including the opportunity to discuss comments and concerns during or after the review period.	24 June 2014 to 24 July 2014

Appendix D:
Summary of Key Aboriginal Concerns

Reference Number	Subject	Group	Comment/Concern
1	Air Quality	<ul style="list-style-type: none"> • James Smith Cree Nation • Muskoday First Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Concern that the proponent's assessment did not include James Smith Cree Nation reserve as a receptor for air quality. • Concerns about the predicted exceedances of 1-hour nitrogen oxide concentrations at the project fence line.
2	Surface Water Resources - Water Quality	<ul style="list-style-type: none"> • Cumberland House Cree Nation • James Smith Cree Nation • Métis Nation of Saskatchewan Eastern and Western Region II (the Métis) • Muskoday First Nation • Wahpeton Dakota Nation • Red Earth Cree Nation 	<ul style="list-style-type: none"> • Concerns about the water quality effects from the direct discharge of brackish Mannville groundwater into the river and any downstream effects on water quality. • Concerns about the downstream water quality effects from the project discharge into the river. • Concerns about blasting reagents and their effect on water quality, and how this effect would be mitigated. • Concerns about the end pit lake water quality and the length of time required to passively fill the pits from groundwater (i.e. over 300 years for the Star pit and over 1000 years for the Orion South pit to fill).

Summary of Proponent Response	Agency Response
<ul style="list-style-type: none"> • Air quality predictions were updated using new haul trucks; as a result, air quality parameters would not exceed ambient air quality objectives at the project fence line. • Air quality on the reserve is unlikely to be affected by the Project because air quality parameters do not exceed thresholds past the project fence line. • Passive monitoring of nitrogen oxide will be included in the air quality monitoring program. 	<ul style="list-style-type: none"> • The Agency is satisfied that the proponent has considered these issues within the Environmental Impact Statement (EIS). • The Agency concludes that there would be negligible residual effects on air quality from beyond the project fence line. • The Agency concludes that the Project is not likely to cause significant adverse effects on the atmospheric environment after taking into account the implementation of mitigation.
<ul style="list-style-type: none"> • Project discharge would not degrade Saskatchewan River water quality because project discharge would be blended with decant water from the processed kimberlite containment facility prior to discharge. This revised water management strategy was designed in 2013 to further improve the end-of-pipe water quality discharge (refer to section 6.7 Fish and Fish Habitat). Water quality parameters of the river after project discharge would fall within their natural range of variability due to the natural buffering effect of the river. • Baseline water quality parameters that exceeded federal and provincial guidelines for the protection of aquatic health and drinking water would remain above applicable guidelines. • Best practices in explosives management will mitigate effects on water quality from blasting reagents. Residual nitrates and ammonia were considered in the water quality modeling predictions. • The proponent will actively fill the Star pit to improve water quality of the pit lake and accelerate closure. The decision to actively fill the Orion South pit would be determined based on experience with closure of the Star pit. A detailed monitoring and reclamation plan will be developed prior to development and would require further consultation on the plan as per provincial permitting requirements. 	<ul style="list-style-type: none"> • Environment Canada believes the project redesign represents a reasonable approach to improving outfall discharge water quality and reducing its toxicity effects, thereby meeting provincial and federal water quality guidelines and compliance with the Fisheries Act. • The Agency is satisfied that the proponent has considered these issues within the EIS. • The Agency concludes that there would be negligible residual effects on surface water quality and that the Project is not likely to cause significant adverse effects on surface water resources after taking into account the implementation of mitigation.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern	
3	Surface Water Resources - Water Flows	<ul style="list-style-type: none"> • Wahpeton Dakota Nation • Muskoday First Nation 	<ul style="list-style-type: none"> • Concern that tributary flows would not be fully restored post-closure and how mitigation would be enforced if peak effects are predicted to occur 10 to 20 years post closure. All ecosystem function should be restored to pre-disturbance conditions. • Concerns about the proponent's hydrological assessment due to the lack of sufficient baseline data collected. • The proponent should periodically update predictions with real monitoring data and develop a long-term monitoring and mitigation plan for these affected watercourses. 	

Summary of Proponent Response	Agency Response
<ul style="list-style-type: none"> • Residual effects on hydrology are assessed in the EIS, section 6.2.4. Monitoring is described in section 7.4.2. Flow will be monitored in local and regional streams. Flows of two unnamed ravines east of English Creek and a tributary to the White Fox River will also be monitored at their discharge points to account for the uncertainty in groundwater effects. Post closure, base flows to English Creek, 101 Ravine and Duke Ravine will be maintained by flow supplementation throughout the life of the mine, and 20 years post closure or until the site has returned to an appropriate state or until the site can be returned to provincial control. • The proponent commits to monitoring for at least 20 years post closure, until the site is returned to an appropriate state, or until the site can be returned to provincial control. Regulatory permits and associated conditions, and follow-up post closure, will ensure mitigation and monitoring are enforced. • An aquatic effects monitoring plan to monitor water quantity and other valued aquatic components will be developed pre-construction based on similar plans developed for diamond mines in the Northwest Territories. Adaptive management will be applied during the whole project lifecycle and post closure. 	<ul style="list-style-type: none"> • Recognizing that some uncertainty remains with the magnitude of the environmental effects on tributary flows caused by the lowering of groundwater levels, the Agency considers that the effects to key tributaries supporting fish habitat are unlikely after taking into account the implementation of mitigation measures proposed by the proponent should effects be identified during the monitoring of surface water and groundwater levels and the implementation of follow-up by federal regulatory authorities. • The Agency concludes that the Project is not likely to cause significant adverse effects on surface water resources after taking into account the implementation of mitigation. The Agency understands that residual effects on tributary flows would have negligible effects on the overall regional hydrology because Saskatchewan River flows are predicted to remain within the natural range of variability. The Agency notes that the Project's residual effect on tributaries would not likely have adverse ecological consequences as mitigation would be targeted to tributaries with productive fish habitat. Further, the availability of recharge from precipitation and relatively large release of water from storage within the shallow groundwater system would attenuate the effect of drawdown on local and regional tributaries during operations and post closure. Although there would be a complete removal of East Ravine during construction and operations, its flows will be restored when the Star pit lake overflows post closure.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern	
4	Groundwater Resources - Groundwater Levels	<ul style="list-style-type: none"> • James Smith Cree Nation • Métis • Muskoday First Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Concerns about the uncertainties of the proponent's groundwater predictions and requested for more information on the interaction between the surficial and Mannville aquifer, and additional testing of the hydraulic conductivity of the Colorado Shale. • Concerns about project effects on well utility from drawdown and permanent changes to groundwater levels. • Concerns about the Project's long-term effect on springs. 	
5	Groundwater Resources - Groundwater Quality	<ul style="list-style-type: none"> • James Smith Cree Nation • Muskoday First Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Concerns about the effects on groundwater quality from metal leaching and acid rock drainage, and seepage from the coarse kimberlite pile and processed kimberlite containment facility. • Requested that continual monitoring, additional treatment or mitigation, and additional tests be completed with respect to metal leaching and acid rock drainage. 	

	Summary of Proponent Response	Agency Response
	<ul style="list-style-type: none"> • The hydrogeology model was revised based on additional field data collected from a 20-day pump test. The proponent re-evaluated the hydraulic conductivity values for the various geological units to generate over 66 separate scenarios. • The proponent is of the view that due to the local geology, which includes a complex mix of glacial, sedimentary and volcanic lithologies, calibrating the model is difficult despite the large amount of local and regional data. The proponent has committed to providing an updated model to relevant federal and provincial regulators during detailed design and construction when additional information is gathered. • Drawdown effects on existing utility wells on the reserve are in the shallow aquifer and would be outside the area of significant drawdown. There is a large amount of groundwater storage in the shallow aquifer therefore the long-term changes in levels would be low in magnitude. Mitigation of effects on potable groundwater wells includes landowner compensation. Monitoring will continue for at least two decades after the cessation of pumping, and until a clear recovery trend is measured. • Springs are mostly fed from the upper aquifer, which would not be greatly impacted by dewatering. Some springs located closer to the Project would see a decrease in water discharge but changes in water quality to most springs are not expected. Springs would be included in the monitoring plan. 	<ul style="list-style-type: none"> • While modification to the model showed some improvement in calibration, Natural Resources Canada is of the view that the hydrogeology model provided by the proponent still does not calibrate to baseline site conditions. • Recognizing that some uncertainty remains with the magnitude of the environmental effects on local water wells caused by the lowering of groundwater levels, the Agency considers that effects to those wells are unlikely after taking into account the implementation of proposed mitigation measures by the proponent should effects be identified during the monitoring of groundwater levels. • While there were residual effects on groundwater levels, the Agency concludes that the Project is not likely to cause significant adverse effects on groundwater resources after taking into account the implementation of mitigation.
	<ul style="list-style-type: none"> • The overburden pile has low permeability, and therefore it essentially acts as a clay cap that will minimize infiltration and leaching. Seepage and drainage from facilities and piles will be collected in drainage ditches and directed to the processed kimberlite containment facility. • Drainage from the overburden and seepage from the processed kimberlite containment facility will be monitored regularly during operations and post mining. Monitoring would indicate whether treatment of site drainage is necessary. Field leach pad testing will continue during construction and operations, and Joli Fou Formation will be inspected and sampled for acid seepage when it outcrops within the pit. Suspect seepage will be sampled and analysed for acid rock drainage and metal leaching indicators. • The seepage model using laboratory and field monitoring data will be updated to verify predictions in seepage flow dynamics and chemical composition of the processed kimberlite containment facility. 	<ul style="list-style-type: none"> • The Agency is satisfied that the proponent has considered these issues within the EIS, and the monitoring proposed by the proponent as part of its follow-up program. • The Agency concludes that there would be negligible residual effects on groundwater quality post closure, and that the Project is not likely to cause significant adverse effects on groundwater resources after taking into account the implementation of mitigation.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern	
6	Vegetation and Plant Communities - Wetlands and Assessment Methodology	<ul style="list-style-type: none"> • James Smith Cree Nation • Wahpeton Dakota Nation • Muskoday First Nation 	<ul style="list-style-type: none"> • Concerns about the proponent's vegetation assessment, including biodiversity. • Concerns about the regional loss of wetlands caused by the lowered water table during operations and post closure especially when there is large uncertainty over the predicted effects of drawdown. 	
7	Vegetation and Plant Communities - Reclamation	<ul style="list-style-type: none"> • James Smith Cree Nation • Métis • Muskoday First Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Concerns about reclamation success, especially for rare plants and old growth forest. Commented that the reclamation plan does not apply industry standards and best practices, and lacks sufficient detail to determine whether reclamation objectives could be successfully met. • Concerns about the length of time required to reclaim the land to pre-disturbance conditions, including wetland restoration and filling of the pit lakes. Stated that pit reclamation was unacceptable considering it would take over a thousand years to reclaim the Orion South pit through passive filling. Requested further details on the environmental effects of actively filling the pits. • Requested information about reclamation liability and how the reclamation bond would be determined. 	

Summary of Proponent Response	Agency Response
<ul style="list-style-type: none"> • Hydrological effects on wetlands are described in section 6.3, page 6-55 of the EIS. An estimated 7 percent of vegetation or 17 percent of wetlands in the FaIC forest would be affected by drawdown greater than 0.5 meters. These effects are predicted to diminish over time as aquifers re-charge and pit lakes fill with water. • Approximately 142 hectares of affected wetlands will be mitigated by flow supplementation in local streams, as most wetland ecosites within the local study area are located within the upper most reaches of the ravines and ravine bottoms. Flow supplementation would begin at construction and continue post closure for at least 20 years, until the site is returned to an appropriate state, or until the site can be returned to provincial control. At closure, the creation of wetland and lowland areas will offset the areas of affected wetlands to some degree. • A detailed monitoring and reclamation plan will be developed prior to development and would require further consultation on the plan as per provincial permitting requirements. 	<ul style="list-style-type: none"> • Recognizing that some uncertainty remains with the magnitude of the environmental effects on wetlands caused by the lowering of groundwater levels, the Agency considers that effects to wetlands are unlikely after taking into account the implementation of proposed mitigation measures by the proponent should effects be identified during the monitoring of groundwater levels and vegetation. The Agency is satisfied that the proponent has considered these issues within the EIS and with the methodology used for the vegetation assessment. • While there were residual effects on wetlands, the Agency concludes that the Project is not likely to cause significant adverse effects on plant and vegetation communities after taking into account the implementation of mitigation.
<ul style="list-style-type: none"> • Success of rare plant mitigation is variable and requires a unique approach for each rare species. Detailed rare species mitigation will be determined prior to project clearing and mitigation can be targeted at particular species of concern, particularly those with legislated protection. • Progressive reclamation will shorten the length of time to reclaim the landscape. Direct replacement where appropriate and planting shrub and understory species to introduce native species early on reclaimed sites will be done. A research program to gain a better understanding of reclamation will be developed. • The Star pit will be actively filled with Saskatchewan River water to accelerate the closure of the pit lake; active filling of the Orion South pit will be considered depending on the results of Star pit. • It is a provincial requirement to post a bond and that this bond would be for approximately 80 years. A financial assurance of \$85 million is required prior to the Province issuing construction permits. • Soil quality of the area overall is low in productivity. As a result, the proponent will target soil salvage and short-term stockpiling of fair, good and organic rated material, and will directly replace soil where feasible. Reclamation and revegetation trials indicate that revegetation is possible on bare sand. Reclamation and revegetation trials will continue to refine practices during construction and operations. A detailed monitoring and reclamation plan will be developed prior to development and would require further consultation on the plan as per provincial permitting requirements. • The length of time to reclaim wetlands would be offset by the creation of wetlands that would exceed the direct loss wetlands caused by the Project and by flow supplementation post closure. 	<ul style="list-style-type: none"> • The Agency is satisfied that the proponent has considered these issues within the EIS and that the proponent's follow-up program and requirement to comply with provincial reclamation guidelines will adequately monitor success of reclamation and allow for adaptive management. • The Agency concludes that there would be negligible residual effects on plant communities and old growth forest. • While there were residual effects on rare plants, the Agency concludes that the Project is not likely to cause significant adverse effects on plant and vegetation communities after taking into account the implementation of mitigation.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern
8	Terrestrial Wildlife Habitat and Species - Project Effects	<ul style="list-style-type: none"> • James Smith Cree Nation • Métis • Muskoday First Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Concern that sensory disturbances such as blasting, and habitat loss caused by the Project would displace wildlife. • Concern that displaced wildlife would not be able to find other suitable habitat in the area due to existing land disturbances in the FaIC forest. • Concern that wildlife would not acclimate to sensory disturbances caused by the Project. • Concerns about the effects of the access corridor and power line on wildlife, and generally about the protection of non-random pathways of connectivity (ravines and wetlands) and critical habitat. • Concerns about the project effects on wildlife movement and displacement, habitat loss, and mortality from increased traffic. • Concerns about the health risks to wildlife posed by the open pits at closure and retention ponds.
9	Terrestrial Wildlife Habitat and Species - Project Mitigation	<ul style="list-style-type: none"> • James Smith Cree Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Concern about the validity of the proponent's mitigation to make suggestions on provincial wildlife management strategies because it is outside the proponent's influence and governed by the provincial government. • Requested that wildlife be reassessed if there were no commitments on provincial wildlife management strategies. • Concerns about the uncertainty in reclaiming the landscape back to pre-disturbance function for wildlife, and that the mitigation such as habitat offsets elsewhere in the FaIC forest, should be considered. • Requested that access management planning be implemented for the main access road and Division road to minimize impacts on wildlife. • Requested that regulators consider developing an access management plan for the FaIC forest to ensure wildlife habitat and populations, and biodiversity are maintained.
10	Terrestrial Wildlife Habitat and Species - Assessment Methodology	<ul style="list-style-type: none"> • James Smith Cree Nation • Muskoday First Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Concern that certain wildlife species were not assessed in the EIS (e.g. wolves, amphibians, and bats). • Concerns about the proponent's methodology in assessing wildlife effects which included historical data not being representative of the FaIC forest. • Concerns about the Province's ability to manage residual effects on wildlife caused by the Project.

	Summary of Proponent Response	Agency Response
	<ul style="list-style-type: none"> • Project effects on wildlife movement, habitat loss and mortality were assessed in the EIS, section 6.3. • Predicted continuous project noise would be relatively low beyond the fence line to not adversely affect wildlife behaviour. Some wildlife would habituate to the noise including sonic booms. • There are minimal existing land disturbances in the FaIC forest and therefore the displacement effects on wildlife would be minimal. • Other mitigations such as setback distances from active nests and buffers in riparian areas would minimize project disturbance of wildlife. • Wildlife will be monitored to confirm the accuracy of the predictions and effectiveness of mitigation. • The effects of the access corridor on wildlife were assessed in the EIS. The corridor is unlikely to create a significant barrier effect, particularly once vegetation begins to regenerate to a level providing forage and hiding cover. • From the habitat constraints mapping, the proponent avoided the majority of wetlands and ravines (critical habitat for waterfowl, fish, and furbearers) by relocating and redesigning project facilities. Waterfowl habitat is generally poor quality in the project area, and suitable ungulate habitat was modelled to be of better quality outside the project area. • Fencing around the sewage lagoon will prevent wildlife access. Other project facilities, such as the settling ponds, that attract wildlife are not considered harmful to wildlife. 	<ul style="list-style-type: none"> • The Agency is satisfied that the proponent has considered these issues within the EIS. • The Agency considers the effects assessment to have moderate certainty due to the lack of consideration to predator (wolf)-prey dynamics within the FaIC forest. • While there were residual effects on wildlife and their habitat, the Agency concludes that the Project is not likely to cause significant adverse effects on terrestrial wildlife habitat and species after taking into account the implementation of mitigation.
	<ul style="list-style-type: none"> • Suggestions were directed to the Province to consider in the overall management plan for ungulates to offset minor project effects on wildlife within the FaIC should they be required. • Reclamation commitments are described in Reference Comment #7. • Access to any public access road in the FaIC forest is provincially managed and would require a response from the provincial government. 	<ul style="list-style-type: none"> • The Agency does not consider proponent suggestions on provincial wildlife management strategies to be direct mitigations for the Project on wildlife. • While there were residual effects on wildlife and their habitat, the Agency concludes that the Project is not likely to cause significant adverse effects on terrestrial wildlife habitat and species after taking into account the implementation of mitigation. • The Agency has forwarded the request for a FaIC access management plan to the Province for consideration.
	<ul style="list-style-type: none"> • The Project would not affect wolf pack territory size as the project footprint is substantially smaller than its territorial range and thus any population change caused by the Project is predicted to be minimal and localised. No amphibian species would be displaced because the project design is intended to maximise avoidance of wetland habitat used by amphibians. Bats were not selected as a valued component and therefore no baseline data were collected. • Error range in wildlife modelling was provided in the revised EIS including current baseline survey and historical data deemed relevant to the FaIC forest. 	<ul style="list-style-type: none"> • The Agency is satisfied that the proponent has considered these issues within the EIS and within the methodology used to assess effects on wildlife. • While there were residual effects on wildlife and their habitat, the Agency concludes that the Project is not likely to cause significant adverse effects on terrestrial wildlife habitat and species after taking into account the implementation of mitigation. • The Agency has forwarded the concern on provincial wildlife management within the FaIC forest for consideration.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern
11	Fish and Fish Habitat - Project Effects	<ul style="list-style-type: none"> • Cumberland House Cree Nation • James Smith Cree Nation • Métis • Wahpeton Dakota Nation • Muskoday First Nation • Red Earth Cree Nation 	<ul style="list-style-type: none"> • Concerns about the loss of fish habitat in the small streams and Saskatchewan River, including post-closure drawdown effects that could last several decades. • Concern that important aquatic species were not included in the assessment (e.g. virile crayfish, brook trout and lake chub). • Concerns about the project discharge effects on aquatic biota, including downstream effects.
12	Fish and Fish Habitat - Consultation and Offset Plan	<ul style="list-style-type: none"> • James Smith Cree Nation • Muskoday First Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Requested consultation with the proponent on the Offset Plan, and involvement in the implementation and monitoring of the plan to ensure traditional knowledge is taken into consideration. • Requested for consultation with Fisheries and Oceans Canada over the Offsetting Plan including the calculated loss of fish habitat productivity. • Requested that a Lake Sturgeon recovery plan be required prior to project approval to ensure proper measures are taken to preserve the population.

	Summary of Proponent Response	Agency Response
	<ul style="list-style-type: none"> • Fish habitat losses will be compensated by the Offsetting Plan and flow supplementation, taking into account far future effects associated with drawdown. Regulatory permits and associated conditions, along with follow-up post closure, will ensure that mitigation and monitoring are enforced. Adaptive management will be applied during the whole project lifecycle and post closure. • Virile crayfish was frequently encountered in the minnow traps but were not considered in the assessment because suitable habitat for the species occurs throughout the Saskatchewan River system. Brook trout was not observed in the baseline studies or identified as a valued component in traditional land use studies. Lake chub can be adequately represented by white sucker as they have the same forage base; further white sucker were more common throughout the study area than lake chub. • The water management strategy was redesigned in 2013 to include a Mixing Facility to blend the Mannville groundwater with process water from the Processed Kimberlite Containment Facility. The project redesign will improve the water quality of the discharge, thereby reducing the likelihood of toxicity effects and will not be deleterious as defined under the <i>Fisheries Act</i>, and will meeting provincial and federal water quality guidelines. 	<ul style="list-style-type: none"> • Environment Canada stated that the proponent's revised water management strategy was a reasonable approach to meeting the requirements of the Fisheries Act. • Recognizing that some uncertainty remains with the magnitude of the environmental effects on fish and fish habitat caused by the lowering of groundwater levels, the Agency considers that effects to fish and fish habitat are unlikely after taking into account the implementation of proposed mitigation measures by the proponent should effects be identified during the monitoring of groundwater levels and the implementation of follow-up by federal authorities. The Agency is satisfied that the proponent has considered these issues within the EIS. • The Agency concludes that there would be negligible residual effects on fish and fish habitat, and that the Project is not likely to cause significant adverse effects on fish and fish habitat after taking into account the implementation of mitigation.
	<ul style="list-style-type: none"> • The EIS addressed project effects on lake sturgeon populations from project-induced effects on surface water resources, habitat loss, and fish health and mortality. • The proponent remains open to discussing the Offsetting Plan. 	<ul style="list-style-type: none"> • As recovery planning for the Lake Sturgeon population falls under provincial jurisdiction, the Agency referred the First Nation's concern to the provincial Water Security Agency. • Fisheries and Oceans Canada remains open to discussing the Offsetting Plan with Aboriginal groups. • The Agency concludes that there would be negligible residual effects on fish and fish habitat, and that the Project is not likely to cause significant adverse effects on fish and fish habitat after taking into account the implementation of mitigation.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern
13	Traditional Land Use - Assessment Methodology	<ul style="list-style-type: none"> • James Smith Cree Nation • Métis • Muskoday First Nation 	<ul style="list-style-type: none"> • Requested clarification on the area of restricted access for traditional land use. • The proponent failed to recognize the cultural significance and intrinsic value of the FaIC forest and project area to Aboriginal groups • Concern that the proponent's assessment methodology on traditional land use was not adequate and lacked integration of traditional knowledge.
14	Traditional Land Use - Project Effects	<ul style="list-style-type: none"> • James Smith Cree Nation • Métis • Muskoday First Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Indicated that project effects on traditional land use would be likely significant due to the lack of adequate mitigation and significant cultural effects from the loss of the project area and broader FaIC forest. • Concerns about the cultural impacts from the direct and indirect loss of their traditional lands, including cultural effects from the lost opportunity for current and future use of the FaIC, and lost spiritual and cultural connections to the land and Saskatchewan River. Concerns about project effects on the availability and displacement of resources, including wildlife and traditional plants. • Requested that the proponent substantiate the conclusion that traditional land use would not be affected by the Project because there are available traditional use areas elsewhere in the FaIC forest that are of comparable quality and equally accessible. • Commented that the trapping harvesting statistics are not indicators of trapping importance to Aboriginal groups.

Summary of Proponent Response	Agency Response
<ul style="list-style-type: none"> • A map and area calculations of the mine enclosure throughout the project life cycle and the maximum enclosed area from the project fence line were provided to the groups. • The EIS was updated to include information from traditional land use studies that were conducted by the groups that were not available when the initial EIS was released for review. • The proponent jointly worked with James Smith Cree Nation to develop an assessment methodology on their traditional land use. 	<ul style="list-style-type: none"> • The Agency met with James Smith Cree Nation to discuss their concerns about the loss of traditional lands caused by the mine footprint and enclosure. • The Agency has considered both the direct and indirect loss of traditional lands in its residual effects analysis on cultural heritage. • Traditional knowledge was integrated into the assessment to the extent possible (e.g. cultural value and preference for traditional use areas).
<ul style="list-style-type: none"> • Displacement effects on traditional users would not be significant as there are alternate traditional use areas within the FalC forest. These conclusions are founded on the project effects assessment on wildlife and vegetation, and surface lease information about resource availability. • The quality of other harvesting areas in the FalC forest was not considered as data are not available. • Project effects on culture were addressed in the traditional land use assessment, which included socio-cultural aspects of each traditional land use. • Trapping was regarded in the assessment as a valued component for some Aboriginal groups regardless of trapping statistics. 	<ul style="list-style-type: none"> • The Agency recognizes that alternate traditional use areas within the FalC forest may not have as high cultural importance but these areas would have some degree of cultural relevance given the importance of the entire forest for traditional practices. • The Agency concludes that there would be residual adverse effects on traditional land use from the loss of traditional lands and direct and indirect effects to cultural heritage. • The Agency concludes that the Project is not likely cause significant effects to traditional land use and that Aboriginal groups would be able to continue traditional practices in a modified context within other areas of the FalC forest, taking into account mitigation and proponent commitments.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern
15	Traditional Land Use - Mitigation	<ul style="list-style-type: none"> • James Smith Cree Nation • Métis • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Requested that access management plan for the FaIC forest be developed to mitigate effects on traditional land use from changes in access. • Concerned about the length of time required for the site to be reclaimed for traditional land use, and whether reclaimed areas would support traditional activities. • Questioned how project effects on culture will be mitigated by socio-cultural benefits. • Concerns about the social impacts of the Project on vulnerable Aboriginal communities and requested that the proponent develop targeted mitigation for affected communities that would maximize socio-economic benefits to offset adverse project impacts. • Commented that project effects on traditional land use would be significant without the proponent's commitment for mitigate and monitor project effects, including reaching a successful impact benefit agreement with affected Aboriginal groups. • Commented that the proponent failed to incorporate the FaIC Integrated Land Use Plan, which identifies protected and environmentally sensitive areas, and requires that forested (traditional) lands removed by the Project be replaced with functional comparable and accessible lands through additions to the FaIC forest. • Cultural sites at risk from regional drawdown effects on wetlands need to be identified and protected.
16	Human Health - Project Effects	<ul style="list-style-type: none"> • James Smith Cree Nation • Métis • Wahpeton Dakota Nation • Red Earth Cree Nation 	<ul style="list-style-type: none"> • Concern that the proponent did not include important noise receptors in their assessment such as temporary camps, traditional users, and cabins in the FaIC Forest, and permanent residences on the James Smith Cree Nation reserve. • Concern that the proponent did not evaluate project noise and vibration effects caused by blasting, and that helicopters were not used in the noise assessment model. • Requested that suitable noise mitigation be developed in consultation with the First Nation. • Concerns about human health effects from consuming contaminated fish. • Concerns about the effect of project discharge on drinking water quality downstream and project effects on drinking water quality from local wells on the James Smith Cree Nation reserve.

Summary of Proponent Response	Agency Response
<ul style="list-style-type: none"> • The proponent recognizes that the development of a satisfactory impact benefit agreement can be considered appropriate mitigation for project effects on traditional land use. The proponent stated that it will provide reasonable funding for direct expenses related to engagement activities, as determined by future engagement. • The proponent is proactively working with Aboriginal groups in the region to create a process whereby jobs, training and contracting opportunities can be identified through an impact benefit agreement. • The proponent also will strive to have a representative workforce where 20 percent of the workforce would be Aboriginal. The proponent also commits to Aboriginal training and education to support project employment and business participation. Economic benefits would accrue to all communities in the region, including Aboriginal people through employment and contracting activities, regardless of the state of any discussions between the proponent and Aboriginal groups. • The environmental and economic feasibility of mitigating project effects on Bingo Hill was evaluated. The proponent concluded that removal of Bingo Hill and socio-cultural benefits to mitigate the direct and permanent loss of Bingo Hill would be the preferred option. The proponent remains open to any suggestions that may arise through future discussion with James Smith Cree Nation. • Reclamation would replace the land to a regenerating condition which would attract ungulates to use young and open stands, and promote berry plant growth. The length of time depends on end land use. Vegetation communities targeted by revegetation and reclamation are expected to develop into pre-disturbance ecosites. Reclamation plans include commitments to replace traditional use plants and incorporate traditional knowledge into closure planning. • Star pit will be actively filled with Saskatchewan River water to accelerate reclamation. The decision and method to actively fill Orion South pit will be determined based on experience with closure of the Star Pit. • If unanticipated archaeological materials or features are encountered as a result of construction or reclamation activities, all work in the immediate area will cease and the Heritage Resources Branch and Aboriginal groups will be contacted. 	<ul style="list-style-type: none"> • Mitigation for effects on cultural heritage cannot be made independently and would require proponent engagement with affected Aboriginal groups to understand what mitigations are culturally acceptable and feasible. The Agency notes that the proponent commits to further discussions with Aboriginal groups on these mitigations and that this commitment is strengthened by memorandums of understanding to develop impact benefit agreements with affected Aboriginal groups. The Agency can reasonably expect that the proponent will uphold these commitments. • The FalC Integrated Land Use Plan is a draft document and has not received approval to proceed to the implementation stage. • The Agency concludes that the Project is not likely cause significant effects to traditional land use and that Aboriginal groups would be able to continue traditional practices in a modified context within other areas of the FalC forest, taking into account mitigation and proponent commitments.
<ul style="list-style-type: none"> • Noise levels will be below recommended guidelines beyond the project fence line so that there would be no project noise effects on receptors such as temporary camps and cabins, and residences on the reserve. • Blasting would take place inside the pit, at a depth of up to 300 metres below grade. The pit walls would act as an effective noise barrier. At a distance, blasting would be heard as a low rumble or popping sound that would occur in a fraction of a second. Helicopters were not included in the noise assessment model because only small helicopters would be infrequently used and flown during the day. • Traditional user response, such as stress levels and annoyance, to project noise (including helicopter and blasting) would vary between individuals and circumstance and therefore cannot be quantitatively or qualitatively assessed. The proponent will develop a complaint resolution process, including community consultation on a noise management plan to address this issue. • A country foods baseline study and human health risk assessment will be implemented. Project effects on country foods related to contamination of soil or plants were predicted to be negligible since there is a limited pathway and extent of deposition of fugitive dust. • Project discharge would not adversely affect water quality of the river (refer to section 6, Surface Water Resources). The EIS further notes that drinking water sourced from the Saskatchewan River is treated before consumption. Drinking water quality sourced from groundwater would not likely be affected as groundwater contaminants such as seepage, would be collected and contained within the project area, and would not be released in the receiving environment (refer to section 6, Groundwater Resources). 	<ul style="list-style-type: none"> • The Agency is satisfied that the proponent has considered this issue within the EIS. • The Agency concludes negligible residual effects on human health from project-induced changes in drinking water, country foods, and noise, and that the Project is not likely to cause significant adverse effects on human health.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern
17	Accidents and Malfunctions	<ul style="list-style-type: none"> • Métis • Muskoday First Nation 	<ul style="list-style-type: none"> • Concerns about how spills would be contained and how the affected area would be remediated. • Concerns about the stability of the pit walls and the potential for the Star pit wall to collapse. • Commented that the EIS did not fully identify hazards and associated mitigations to reduce the probability of its occurrence.
18	Cumulative Effects	<ul style="list-style-type: none"> • Cumberland House Cree Nation • James Smith Cree Nation • Wahpeton Dakota Nation • Muskoday First Nation 	<ul style="list-style-type: none"> • Requests that if information about Pehonan Hydroelectric Project becomes available over the course of the review, it be included in the cumulative effects assessment. • Requests that the SaskPower transmission line be included in the scope of the environmental assessment. • Comments that provincial approval for exploration activities requires Crown consultation. • Requests that the Nipawan Dam, and Prince Albert Pulp and Paper Mill be included in the cumulative effects assessment. • Stated that the analysis of effects of existing disturbances within the FalC forest on traditional land use was weak to non-existent. • Past activities such as exploration, natural disturbances, and road closure programs have already affected traditional land use in the FalC forest and have not been described or are weakly analyzed. • Concerns about existing downstream effects on water quality from hydroelectric projects upstream.
19	Socio-Economic	<ul style="list-style-type: none"> • Wahpeton Dakota Nation • James Smith Cree Nation • Muskoday First Nation 	<ul style="list-style-type: none"> • Concerns about traffic safety and access management in the FalC Forest. • Requests that the proponent consult with Aboriginal groups on potential training, employment and business opportunities and contracts. • Requests that Aboriginal groups be provided with equal access to employment opportunities. • Aboriginal groups were not consulted during the excavation of artifacts for the archaeological surveys and excavation.

	Summary of Proponent Response	Agency Response
	<ul style="list-style-type: none"> The proponent asserted that a Hazardous Materials Response Plan will include response plans for hazardous goods spills and compliance monitoring. This plan will be updated to include site-specific details prior to construction. The proponent will also consult with the public and Aboriginal groups on the development of the management plans. In response to these concerns, the proponent stated that two engineering reports were produced to garner a better understanding of pit design and that it will design all slopes at a minimum safe angle as determined by industry best practices and provincial guidelines. The proponent also stated that it is committed to backfilling the Star pit to strengthen the wall, and that stockpiles will be monitored for any geotechnical issues. Adaptive management strategies will also be employed to include new mitigation measures in response to any new information on hazards. 	<ul style="list-style-type: none"> The Agency is satisfied that the proponent has considered this issue within the EIS. The Agency is satisfied that the Project has been designed to prevent accidents and malfunctions, and that contingency and response plans would be in place should an accident occur. The Agency concludes that accidents or malfunctions that could result in significant residual effects are unlikely to occur.
	<ul style="list-style-type: none"> The cumulative effects assessment considers future projects that are reasonably foreseeable. A project proposal for Pehonan Hydroelectric Project has not yet been developed. Past concerns about exploration and access within the FaIC forest should be directed to the Province. Hydroelectric projects upstream of the Project are not included in the assessment. The SaskPower transmission line was included in the cumulative effects assessment because it is a separate project proposal by a different proponent and therefore could not be within the scope of the Project's environmental effects assessment. Any regional planning initiatives would require the cooperation of provincial regulators, including wildlife and access management. Mechanisms to have regional concerns addressed could go through the Diamond Development Advisory Committee. No other surface leases exist in the FaIC forest other than for agricultural, forestry, and exploration activities. Agricultural leases do not have restrictions on traditional land use, and forestry harvest (current and potential) amount to one to two percent of the FaIC forest. Both agricultural and regenerating forest could still facilitate traditional land use. The proponent estimates that exploration activities occupy approximately 678 hectares or 0.5 percent of the FaIC forest, taking into account a 500 metre buffer around facilities. 	<ul style="list-style-type: none"> Consultation matters related to exploration activities is governed and regulated by the provincial government. The Agency has forwarded concerns to the Province. The Agency concludes that the Project, in combination with past, current and future foreseeable projects, is not likely to result in significant adverse cumulative effects. The Agency notes that regional planning, which is managed by the Province, would provide a long term perspective and actions on how the FaIC forest can continue to support traditional practices.
	<ul style="list-style-type: none"> The EIS describes project effects on traffic and road safety in section 6.4. Archaeological surveys have and will be done in consultation with Aboriginal groups. The proponent is proactively working with Aboriginal groups in the region to create a process whereby jobs, training and contracting opportunities can be identified through an impact benefit agreement. The proponent also will strive to have a representative workforce where 20 percent of the workforce would be Aboriginal. Economic benefits would accrue to all communities in the region, including Aboriginal people through employment and contracting activities, regardless of the state of any discussions between the proponent and Aboriginal groups. 	<ul style="list-style-type: none"> The Agency considers traffic, safety, employment, training and contracting outside of the scope of the environmental assessment; concerns have been forwarded to the Province for consideration in provincial licensing for the Project. Excavation related to archeological sites is governed and regulated by the provincial government. The Agency has forwarded concerns to the Province.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern
20	Follow-up	<ul style="list-style-type: none"> • James Smith Cree Nation • Métis • Muskoday First Nation • Wahpeton Dakota Nation 	<ul style="list-style-type: none"> • Baseline studies and future monitoring program should be conducted in consultation with First Nations to ensure traditional knowledge is incorporated. • Requests for more detail on environmental monitoring and adaptive management plans including groundwater drawdown, reclamation and traditional use. • Requested that consultation with Aboriginal groups include the provision of funding to support their participation in the studies. • Requested that a vegetation monitoring program be developed to assess effects of invasive and non-native plants, dust deposition, and drawdown effects on vegetation communities. • Requested that the proponent conduct additional wildlife surveys, in collaboration with the First Nation, to update their habitat models. • Requested that the proponent use secondary sources such as past and current diamond mines to validate its country foods assessment and improve its monitoring program • Commented that monitoring and adaptive management are not mitigations or forms of averting risk. The proponent should provide more accurate predictive models in order to adequately mitigate effects. • Commented that the Province does not have the resource capacity to enforce its regulations and that Aboriginal groups should be involved in environmental monitoring.
21	EA Process	<ul style="list-style-type: none"> • James Smith Cree Nation • Muskoday First Nation • Wahpeton Dakota Nation • Métis 	<ul style="list-style-type: none"> • Requests that regulatory approval be contingent on the completion of a satisfactory impact benefit agreement. • Requests that the Project be referred to a panel environmental assessment due to the significance of conclusions in the EIS.

Summary of Proponent Response	Agency Response
<ul style="list-style-type: none"> • Monitoring programs on vegetation, soil, and wildlife will be conducted. A more detailed follow-up plan will be developed prior to construction once detailed engineering is completed. • The proponent is open to discussing community-based programs and mitigation with Aboriginal groups. • A detailed reclamation plan will be developed prior to project development and would require further consultation on the plan as per provincial permitting requirements. 	<ul style="list-style-type: none"> • The Agency is satisfied that the proponent has considered this issue within the EIS. • Recognizing that some uncertainty remains with the magnitude of the environmental effects on potable wells, tributary flows, wetlands, and fish and fish habitat caused by the lowering of groundwater levels, the Agency considers that these effects are unlikely after taking into account the implementation of proposed mitigation measures by the proponent should effects be identified during the monitoring of environmental components and the implementation of follow-up by federal authorities.
<ul style="list-style-type: none"> • Not applicable. 	<ul style="list-style-type: none"> • The Minister's environmental assessment decision does not require impact-benefit agreements to be in place. • The Agency is of the view that potential project environmental effects and project impacts on rights can be addressed through a comprehensive study type environmental assessment. Both a comprehensive study and panel process deliver high quality environmental assessments leading to a determination on the significance of adverse environmental effects of a project, and employ the same level of commitment in addressing public and Aboriginal concerns. Both processes consider identical factors under the former Act and provide funding to assist public and Aboriginal participation in the environmental assessment.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern	
22	Impacts on Rights	<ul style="list-style-type: none"> • Cumberland House Cree Nation James Smith Cree Nation • Muskoday First Nation 	<ul style="list-style-type: none"> • Requested that the Crown describe how it will determine project impacts on rights, including culture, and how it will accommodate these impacts. • Requested information on how the Project would affect treaty land claim interests within and surrounding the project area. Requested a full economic package to forego the treaty land entitlement selection if the subject lands are found in favour of the proponent. 	

	Summary of Proponent Response	Agency Response
	<ul style="list-style-type: none"> • Not applicable. 	<ul style="list-style-type: none"> • The Agency met with the James Smith Cree Nation to discuss the proponent's and Agency's assessment of effects on traditional land use, and corresponding Agency's assessment of the Project's impact on rights. • The Agency has based its impact on rights assessment on the following: reports, comments, and other submissions by Aboriginal groups; discussions with Aboriginal groups; the proponent's EIS; environmental effects that may impact potential or established Aboriginal or Treaty rights and their associated mitigation measures; and additional accommodation measures and commitments of the proponent included in agreements with affected Aboriginal groups. • The Agency considers that while the Project has the potential to cause adverse impacts on potential or established Aboriginal or treaty rights, through a loss or change to the preferred way for exercising these rights, these potential impacts will be accommodated through the proposed mitigation and proponent commitments. • Treaty land entitlement claims are independent of the Project's environmental assessment. Treaty land entitlement claims have been referred to Aboriginal Affairs and Northern Development Canada and the Province.

Summary of Key Aboriginal Concerns continued

Reference Number	Subject	Group	Comment/Concern	
23	Consultation	<ul style="list-style-type: none"> • Cumberland House Cree Nation • James Smith Cree Nation • Métis • Muskoday First Nation • Wahpeton Dakota Nation • Red Earth Cree Nation • Sturgeon Lake First Nation • Peter Ballantyne Cree Nation 	<ul style="list-style-type: none"> • Requests that consultation funding be available for the environmental assessment and regulatory process. • Comments that funding provided by the Crown for consultation has not been adequate. • Requests that Aboriginal groups be consulted on all Crown decisions. • Comments that proponent consultation has not been adequate. • Comments that funding from the proponent to negotiate an impact benefits agreement has not been provided or is inadequate. 	

Summary of Proponent Response	Agency Response
<ul style="list-style-type: none"> • The proponent provided capacity funding for a select number of Aboriginal groups to collect traditional land use and traditional knowledge information required for the environmental assessment. • The proponent will provide reasonable funding for direct expenses related to engagement activities, as determined by future engagement. 	<ul style="list-style-type: none"> • The Agency provided funding to participate in the environmental assessment to a number of Aboriginal groups who could be potentially affected by the Project. • Request for capacity funding during the regulatory phase will be referred to the appropriate federal regulatory authorities. • The Agency considers the Minister's environmental assessment decision with respect to the Project as Crown conduct and therefore is consulting with Aboriginal groups whose potential or established rights could be impacted by the Project. • The Agency considered the proponent's engagement with Aboriginal groups as part of the environmental assessment. • Other federal or provincial decisions that are considered Crown conduct will involve consultation with potentially impacted Aboriginal groups, as necessary.

Appendix E

Summary of Adverse Residual Effects

VEC/Phase/Activity	Adverse Residual Effects	Residual Effect Attribute Ratings ⁵			
		Magnitude	Extent	Duration	
ATMOSPHERIC ENVIRONMENT					
Air Quality, Greenhouse Gas Emissions, Noise					
Construction, Operations	• Predicted air quality parameters would be below recommended guidelines at the project fence line.	N/A	N/A	N/A	
Construction, Operations	• Project greenhouse emissions would account for 0.15 percent of provincial and 0.0122 percent of national annual emissions reported in 2008.	Negligible (less than 1 percent change)	Beyond regional	Medium-term	
SURFACE WATER RESOURCES					
Water Quality					
Construction, Operation, Closure	• Predicted water quality parameters in local tributaries and Saskatchewan River would substantially fall within pre-mining background ranges of variability.	N/A	N/A	N/A	
Water Flows					
Operations	• Negligible (less than 1 percent increase) in Saskatchewan River flows from the increase in tributary discharge, and amount of river water withdrawn and returned to the river for mine processing/discharge.	Negligible (less than 1 percent change)	Regional	Medium-term	
Closure	• Negligible change in Saskatchewan River flows from reduced baseflow of the river and change in tributary discharge from drawdown, and amount of river water withdrawn to actively fill Star pit.	Negligible (less than 1 percent change)	Regional	Medium-term	
Operations & Closure	<ul style="list-style-type: none"> • Negligible effects for local and regional tributaries with productive fish habitat that will receive flow supplementation during operations and post closure • Some local tributaries not receiving supplemented flow during operations and post closure would experience flow reductions of up to 52 percent. • East Ravine flows would be eliminated during operations but would be re-established at closure when Star pit lake overflows. 	Low to High	Regional	Long-term	

⁵ Refer to Section 6.1 Approach to Environmental Effects Assessment for definitions of residual effects attributes.

Residual Effect Attribute Ratings ⁵			Certainty/ Likelihood	Significance Determination
Frequency	Reversibility			
				<p>Not significant – Negligible</p> <p>Rationale: Negligible adverse residual effects are unlikely to produce significant effects.</p>
N/A	N/A	Moderate Certainty		
Continuous	Reversible	High Certainty & Likelihood		
				<p>Not Significant – Minor to Moderate</p> <p>Rationale: Local tributary flows contribute a negligible amount to the Saskatchewan River's annual discharge and thus any changes in tributary flows would not alter the regional hydrology of the river. Tributaries affected by drawdown but not receiving flow supplementation provide little fish habitat value. The availability of recharge from precipitation and relatively large release of water from storage within the shallow groundwater system would attenuate the effect of drawdown on local and regional tributaries during operations and post closure.</p> <p>There would be a complete removal of East Ravine during construction and operations, however its flows will be restored when the Star pit lake overflows post closure.</p>
N/A	N/A	High Certainty		
Continuous	Reversible	High Certainty & Likelihood		
Continuous	Reversible	High Certainty & Likelihood		
Continuous	Reversible	Low Certainty/ High Likelihood		

Summary of Adverse Residual Effects continued

VEC/Phase/Activity	Adverse Residual Effects	Residual Effect Attribute Ratings*			
		Magnitude	Extent	Duration	
GROUNDWATER RESOURCES					
Groundwater Levels					
Operations & Closure	<ul style="list-style-type: none"> • Shallow groundwater levels would be lowered from operational pit dewatering, and inflow of groundwater into the pits at closure. • Residual effects on potable groundwater wells are not likely due to mitigation; springs near the project area could see a decrease in water discharge. 	Low	Regional	Long-term	
Groundwater Quality					
Closure	<ul style="list-style-type: none"> • No likely residual effects on groundwater quality from seepage and drainage after taking into account mitigation. • Upward movement of brackish Mannville groundwater through the open pits. Star pit water could also flow out of the pit lake towards the lower elevation of the Saskatchewan River valley through one or more deeper intertill aquifers. 	Negligible (less than 1 percent change)	Regional	Long-term	
VEGETATION AND PLANT COMMUNITIES					
Plant Communities: Upland Vegetation Types					
Construction, Operations, & Closure	<ul style="list-style-type: none"> • Direct loss of natural vegetation types from project clearing, not including regenerating forest, would be negligible (less than 1 percent when compared to the baseline area of each respective vegetation type in the FaIC forest). 	Negligible	Local	Long-term	
Plant Communities: Wetland Vegetation Types					
Construction, Operations, & Closure	<ul style="list-style-type: none"> • Direct loss of wetland vegetation types would be negligible (less than 1 percent when compared to the baseline area of each respective vegetation type in the FaIC forest). • Indirect loss of vegetation from drawdown could affect 7 percent of wetlands in the FaIC forest during operations and post closure. 	Moderate	Regional	Long-term	
Rare Plants and Old Growth Forest					
Construction & Operations	<ul style="list-style-type: none"> • Rare plants would be removed from the mine footprint (13 percent of species; 10 percent of occurrences) and transplanted but transplantation success is deemed low. Swamp fly honeysuckle has potential to be completely removed from the FaIC forest should transplantation be unsuccessful. • Less than one percent of old growth forest would be cleared by the mine footprint. 	Low	Local	Short-term	

* Refer to Section 6.1 Approach to Environmental Effects Assessment for definitions of residual effects attributes.

Residual Effect Attribute Ratings*		Certainty/ Likelihood	Significance Determination
Frequency	Reversibility		
			Not Significant – Minor
Continuous	Reversible	Low Certainty/ High Likelihood	<p>Rationale: The shallow aquifer would be minimally affected during operations due to the attenuation of the underlying shale and till (confining layer) preventing permeability, availability of recharge from precipitation, and large amount of groundwater storage in the aquifer. The proponent also commits to mitigating effects on potable groundwater wells. The volume of brackish water that could move up through the open pits would be negligible due to the limited potential for the thin, discontinuous aquifers to move water, low hydraulic gradient from the pit lake to the spring locations in the river valley, and the covering of aquifers by back filled materials in the Star pit.</p>
Continuous	Reversible	High Certainty/ Low Likelihood	
			Not Significant – Minor
Continuous	Reversible	High Certainty & Likelihood	<p>Rationale: Effects on the loss of natural vegetation types from project clearing would be negligible. The majority of wetlands affected by drawdown will be restored naturally when aquifers reach equilibrium. Approximately 214 hectares of wetland would be created from site reclamation. Actively filling Star pit would accelerate equilibrium of aquifers, and therefore wetland recovery. Additional mitigation strategies will be developed once long-term changes can be predicted with greater confidence through monitoring. There are other provincial occurrences of swamp fly honeysuckle in the province and therefore extirpation would be unlikely should transplantation be unsuccessful. Transplantation for rare plants would reduce the effect to some degree. Residual effects on old growth forest would be negligible.</p>
Continuous	Reversible	Low Certainty/ High Likelihood	
Not Frequent	Reversible	Moderate Certainty/ High Likelihood	

Summary of Adverse Residual Effects continued

VEC/Phase/Activity	Adverse Residual Effects	Residual Effect Attribute Ratings*			
		Magnitude	Extent	Duration	
TERRESTRIAL WILDLIFE HABITAT AND SPECIES					
Wildlife Species and their Habitat: Ungulates and Black Bears					
Construction, Operations & Closure	<ul style="list-style-type: none"> • Ungulate habitat could decline by 2.8 percent during construction and operations, and 0.5 percent after closure due to the loss of upland habitat from the creation of pit lakes. • Ungulate populations could be reduced by up to 9.1 percent for moose, 12.4 percent for elk, and 10.7 percent for white-tailed deer within the FaIC forest, assuming the conservative estimate of a 100 percent indirect habitat loss within a kilometre from the Project. • Black bear habitat within the FaIC forest could be reduced by 2.6 percent during operations and 0.4 percent post closure due to the loss of upland habitat from the creation of pit lakes. • Negligible effects from disturbances to wildlife movement and mortality. 	Moderate	Regional	Long-term	
Wildlife Species and their Habitat: Beaver					
Construction, Operations & Closure	<ul style="list-style-type: none"> • Beaver habitat within the FaIC forest could be reduced by 2.9 percent during construction and operations, and 2.3 percent after closure due to the loss of riparian habitat from the Star pit lake. • Negligible effects from disturbances to wildlife movement and mortality. 	Moderate	Local	Long-term	
Wildlife Species and their Habitat: Waterfowl					
Construction, Operations & Closure	<ul style="list-style-type: none"> • Waterfowl habitat within the FaIC forest could decrease by less than 1 percent from the direct loss of wetlands caused by the project footprint. Waterfowl habitat could also be indirectly affected from the drawdown of approximately 7 percent or 3 917 hectares of total wetlands in the FaIC forest caused by operational pit dewatering and inflow of groundwater for pit filling at closure. • Negligible effects from disturbances to wildlife movement and mortality. 	Moderate	Regional	Long-term	
Wildlife Species and their Habitat: Songbirds					
Construction, Operations & Closure	<ul style="list-style-type: none"> • Interior forest and wetland-dependent songbirds could be adversely affected by the Project from habitat fragmentation, and wetland habitat loss. Sensory disturbances could also adversely affect songbirds. • Negligible effects from disturbances to wildlife movement and mortality. 	Low	Regional	Long-term	
Species at Risk and their Habitat					
Construction & Operations	<ul style="list-style-type: none"> • Negligible effects on Rusty Blackbird and Horned Grebe from habitat loss. No likely residual effects for the other listed species at risk. • Negligible effects from disturbances to wildlife movement and mortality. 	Negligible	Local	Long-term	

* Refer to Section 6.1 Approach to Environmental Effects Assessment for definitions of residual effects attributes.

Residual Effect Attribute Ratings*		Certainty/ Likelihood	Significance Determination	
Frequency	Reversibility			
			<p>Not Significant – Moderate</p> <p>Rationale: Residual effects on ungulates and black bears would be provincially managed within the FaIC wildlife management zone. The province is responsible for ensuring that wildlife populations are maintained at sustainable levels. Residual effects on beaver are localized, where most of the affected habitat would be at the upstream ends of seasonally flowing creeks whereas beaver activity would most likely occur downstream where sufficient water could accumulate and be impounded. Due to the poor quality breeding habitat for waterfowl within the FaIC forest, residual effects on waterfowl are unlikely to occur. The Project is unlikely to affect habitat availability or use of these species at risk within the project area or FaIC forest. Potential local habitat for these species at risk may be created from reclamation. Negligible and local adverse residual effects are unlikely to produce significant effects.</p>	
	Continuous	Reversible		Moderate Certainty/ High Likelihood
	Continuous	Reversible		Moderate Certainty/ High Likelihood
	Continuous	Reversible		Low Certainty/ High Likelihood
	Continuous	Reversible		Moderate Certainty/ Low Likelihood
	Continuous	Reversible		High Certainty/ Low Likelihood

Summary of Adverse Residual Effects continued

VEC/Phase/Activity	Adverse Residual Effects	Residual Effect Attribute Ratings*			
		Magnitude	Extent	Duration	
FISH AND FISH HABITAT					
Construction, Operations & Closure	<ul style="list-style-type: none"> Residual effects on fish and fish habitat from change to water quality are negligible taking into account mitigation. Project discharge water quality is unlikely to have residual effects on fish health and mortality taking into account mitigation. Residual effects on fish and fish habitat from project-induced changes in surface water flows are negligible because fish-bearing streams will be supplemented with flow during operations and closure. Residual effects from direct fish habitat loss would be negligible taking into account the Offset Plan. 	Negligible	Regional	Long-term	
CURRENT USE OF RESOURCES FOR TRADITIONAL PURPOSES					
Traditional Land Use (All Uses)					
Construction & Operations	<ul style="list-style-type: none"> Traditional lands that have high intrinsic cultural value would be lost from the mine footprint and enclosure. Alternate traditional use areas within the FaIC forest would support biophysical resources relied on for traditional land use. Alternate areas in the FaIC forest would be accessible for traditional land use and would minimally affect travel cost to these alternate areas. Direct and indirect loss of traditional lands and transformation of the habitat would span over multiple generations, and within a socio-cultural context, the changes to the cultural value of the area and preferred opportunities for traditional practice would be long-term at a community level and possibly permanent for certain individuals. Alternate traditional use areas within the FaIC forest may not have as high cultural importance or quality. 	Refer to residual effects on cultural heritage below			
Traditional Trapping and Fishing					
Construction, Operations & Closure	<ul style="list-style-type: none"> Residual effects from direct loss of and changes in access to current and future fishing opportunities are unlikely. Residual effects from changes in resource availability for traditional fishing are unlikely. Residual effects from direct loss of and changes in access to traplines will be financially compensated. 	N/A	N/A	N/A	
Cultural Heritage					
Construction, Operations & Closure	<ul style="list-style-type: none"> Access to camping and cultural sites would be restricted within the mine enclosure. Camping and cultural sites near the access road right-of-way would be disturbed by noise, dust and/or aesthetics. Bingo Hill site would be removed. 	Moderate	Regional	Long-term or Permanent depending on socio-cultural context	

* Refer to Section 6.1 Approach to Environmental Effects Assessment for definitions of residual effects attributes.

Residual Effect Attribute Ratings*		Certainty/ Likelihood	Significance Determination
Frequency	Reversibility		
Continuous	Reversible	High Certainty/ High Likelihood	Not significant - Negligible Rationale: The Project is not likely to cause residual effects on fish and fish habitat after taking into account mitigation.
Refer to residual effects on cultural heritage below			Not significant – Moderate Rationale: Alternate traditional use areas within the FaIC forest may not have as high cultural importance or quality but these areas would have some degree of cultural relevance given the importance of the entire forest for traditional practices. Aboriginal groups would be able to continue traditional practices in a modified context in the FaIC forest after taking into account mitigation and proponent commitments.
N/A	N/A	High Certainty	
Continuous	Reversible when the site can be reclaimed; Irreversible for landscape features and cultural sites that would be permanently lost	Moderate Certainty & High Likelihood	

Summary of Adverse Residual Effects continued

VEC/Phase/Activity	Adverse Residual Effects	Residual Effect Attribute Ratings*			
		Magnitude	Extent	Duration	
HUMAN HEALTH					
Noise					
Construction & Operations	• Predicted noise levels would be at or below the threshold of 45 A-weighted decibels at the project fence line.	N/A	N/A	N/A	
Air Quality					
Construction & Operations	• Predicted air quality parameters would be below recommended guidelines at the project fence line.	N/A	N/A	N/A	
Country Foods					
Construction & Operations	• Residual effect on health due to country foods consumption from dust deposition on soil and plants is negligible.	Negligible	Local	Long-term	
Drinking Water					
Construction, Operations & Closure	• Negligible effects on drinking water availability for potable wells after taking into account mitigation. Project effect on groundwater quality is unlikely after taking into account mitigation. • No likely effects on Saskatchewan River flows that would affect drinking water availability. Drinking water taken from the Saskatchewan River is treated before consumption.	Negligible	Regional	Long-term	
EFFECTS ON THE ENVIRONMENT ON THE PROJECT					
Construction & Operations	The following natural processes or events could have potential effects on the Project: • Forest fires • Climate change • Extreme weather events, including floods	N/A	N/A	N/A	
ACCIDENTS AND MALFUNCTIONS					
Construction & Operations	Accidents and malfunctions that could result in very large consequences for the Project or the environment include: • Infrastructure failure such as slope failure of the pit walls • Explosives magazine fire • Hazardous goods spills	Low to High	Local	Variable	
CAPACITY OF RENEWABLE RESOURCES					
Construction, Operations & Closure	Residual effects on renewable resources could result in a reduced capacity to provide: • Drinking water • Support forestry activities • Support sustainable traditional and non-traditional uses such as fishing, hunting, trapping, and gathering	Each of these renewable resources was assessed in previous sections of this report.			

* Refer to Section 6.1 Approach to Environmental Effects Assessment for definitions of residual effects attributes.

Residual Effect Attribute Ratings*			Certainty/ Likelihood	Significance Determination
Frequency	Reversibility			
				Not significant - Negligible
N/A	N/A		Moderate Certainty	Rationale: Project is not likely to cause residual effects on human health after taking into account mitigation. Air quality and noise levels were below or at threshold levels at the project fence line. Negligible effects on country foods due to limited exposure pathways. Effects on drinking water from potable wells will be mitigated by the proponent; effects on drinking water quality is unlikely given that water is treated from the Saskatchewan River and that project containments will be contained on site. No project effects on Saskatchewan River flows are anticipated and therefore project effects on drinking water availability from the river is unlikely.
N/A	N/A		Moderate Certainty	
Continuous	Reversible		Moderate Certainty/ Low Likelihood	
Continuous	Reversible		Moderate Certainty/ Low Likelihood	
N/A	N/A		High Certainty	The proponent has adequately designed the Project to account for the effects of the environment on the Project.
Low	Reversible in most cases		High Certainty Low Likelihood	Accidents or malfunctions that could result in significant residual effects are unlikely to occur. Effects from accidents and malfunctions, should they occur, would likely be localized.
Each of these renewable resources was assessed in previous sections of this report.				Not Significant Rationale: The assessment for each renewable resources concluded that adverse residual effects would not likely be significant, after taking into account implementation of mitigation.

Appendix F: **Summary of Key Mitigation Measures**

The following is a list of measures that the Canadian Environmental Assessment Agency considers necessary to mitigate the environmental effects of the Project. Additional mitigation measures may also be identified in authorizations issued by the federal or provincial government.

Physical Environment

1. Transport and store soil in a manner that preserves topsoil quality.
2. Revegetate slopes as soon as practicable.
3. Apply engineered slope stability and erosion control measures to all slopes (pits, berms, dykes, and containment facilities).
4. Implement a comprehensive slope maintenance program employing the best available technology and an annual monitoring program.
5. Implement sedimentation and erosion control measures for erosion-prone areas of all waterbodies and watercourses including Duke Ravine and inspect them as necessary to ensure slope stability.
6. Store processed kimberlite, overburden, and waste rock in the Star pit when mining begins in the Orion-South pit.
7. Progressively reclaim the overburden pile. Bury any shale not suitable for reclamation by a minimum of two metres within the pile.
8. Reclaim the processed kimberlite containment facility and other retention facilities as marsh habitat.
9. Fill the Star pit by the passive inflow of groundwater and active filling from the Saskatchewan River intake.
10. Fill the Orion-South pit based on experience from actively filling the Star pit.
11. Contour the site at closure to blend into the surrounding topography, maintain drainage, re-establish natural drainage patterns through project design and construction avoidance, incorporate salvaged organic material to an average depth of 15 cm, and leave the processed kimberlite piles and the overburden and rock storage pile as changed features of the landscape.
12. Design all site facilities to have a maximum slope of 3:1. Re-contour for stability as required.
13. Implement compaction reducing deep ripping.
14. At closure, roll-back the perimeter berms onto the toe slope of the processed kimberlite containment facility. Mix the remaining exposed fine processed kimberlite with a top dressing of at least 100 centimetres of sand or other overburden material or mix it with a suitable soil amendment (composted biosolids or other material) based on the results of ongoing research.
15. Create and implement a closure plan to restore the site to a condition that is similar to the conditions that existed prior to disturbance considering mitigation #12. In cooperation with affected communities, determine indicators of successful closure.

Air Quality and Greenhouse Gas Emissions

16. Implement a vehicle emissions reduction program, which will include:
 - a. carpooling,
 - b. the elimination of vehicle idling,
 - c. a fleet maintenance program,
 - d. the use of low-sulfur fuels, and
 - e. reduced speed limits.
17. Ensure vehicles are inspected to maintain optimal operational conditions.
18. Suppress fugitive dust by:
 - a. applying water or other agents to road surfaces,
 - b. paving roads,
 - c. using delayed blasting techniques, and
 - d. applying a vegetation cover to stripped areas and long-term stockpiles.
19. Implement energy saving plans, purchase energy-efficient equipment, and reforest land.
20. Contain processed kimberlite on the mine site in a wet state.

Surface Water Resources (in addition to mitigation measures above)

21. Construct clean water ditches to divert non-contact surface runoff water around the site to 101 Ravine to the south and Caution Creek to the north or install temporary sedimentation ponds and release water into nearby watercourses.
22. Collect seepage in perimeter ditches and pump it to the processed kimberlite containment facility.
23. Employ a diffuser for water released into any water course or water body.
24. Supplement low flows in English Creek, Duke Ravine, 101 Ravine, and other streams when required to maintain or exceed 115 percent of base flow from the East Ravine diversion or the Saskatchewan River.
25. Shut down the Saskatchewan River water intake pump during low-flow conditions.
26. Recycle water at the plant site.
27. Vary water withdrawal from the Saskatchewan River to maintain predicted seasonal base flows.
28. Blend the pit discharge water with decant water from the processed kimberlite containment facility prior to discharge into the Saskatchewan River.

Groundwater Resources

29. Address any drawdown in water levels detected in private wells or monitoring wells by providing above ground water storage, lowering the mine dewatering pump setting, or replacing the dewatering pumps with more efficient high-lift pumps.
30. Provide alternate water supplies, drill new water supply wells, and compensate local well owners for losses when declines related to the Project are severe.

Vegetation & Plant Communities

31. Remove all merchantable timber prior to construction.
32. Stockpile all slash and non-merchantable timber for future reclamation and temporary security berms.
33. Progressively reclaim vegetation during the life of the mine, including reclamation of unused portions of the access road after straightening and paving the road.
34. Progressively replace a variety of ecosites so that the diversity of vegetation communities reflect original vegetation upon mine closure.
35. Reclaim 5084 hectares of disturbed land as upland vegetation, wetland vegetation, and open water.
36. Create riparian habitat around the perimeters of the Star and Orion-South pit lakes, within and near drainage channels on the overburden and rock storage area and within the processed kimberlite containment facility at closure.
37. Avoid, transplant, and collect seeds of rare plants prior to clearing.
38. Create and implement a weed management plan.

Terrestrial Wildlife Habitat & Species (in addition to mitigation measures above)

39. Avoid terrestrial habitat loss or alteration through the following project design features:
 - Situate project components in previously disturbed and less sensitive areas;
 - Maintain habitat connectivity, minimize the project's footprint, progressively reclaim disturbed areas, and progressive clearing;
 - Use existing roads and utility corridors;
 - Avoid wetlands and riparian zones; and
 - Use a 100 metre setback from sensitive wildlife areas, such as wetlands, streams, and ravines.

40. Conduct clearing or grading outside sensitive wildlife periods (March 15 to April 15 – green-up, May 15 to June 15 – calving and September 1 to October 15 – rut) or bird breeding season (consult Environment Canada on breeding periods).
41. Prohibit project personnel from disturbing, harassing, or feeding wildlife.
42. Use nest and breeding site detection techniques, avoidance measures, and blasting mitigations acceptable to Environment Canada for birds listed under the *Migratory Birds Convention Act* and *Species At Risk Act*.
43. Use low pressure sodium lights and install fitting hoods to reduce upward lighting.
44. Install wildlife-proof fences around the sewage lagoon.
45. Reduce the potential for adverse effects related to roadways and traffic including:
 - Cautionary signage and properly maintained;
 - Mown right of ways; and
 - Prompt removal of any carrion.
46. Prohibit hunting around the active mining sites by personnel and contractors.
47. Implement a wildlife awareness education program to orient personnel on wildlife issues, required best operating practices, worker responsibilities, and reporting requirements.

Fish & Fish Habitat

48. Offset fish habitat loss through the implementation of a Fisheries and Oceans Canada approved Offsetting Plan.
 49. Rescue fish and relocate them to the Saskatchewan River prior to construction activities in the East Ravine.
 50. Upgrade the White Fox Bridge in compliance with the *Fisheries Act* (Fisheries and Oceans Canada 2013).
 51. Install culverts to allow for fish passage in compliance with the *Fisheries Act* (Fisheries and Oceans Canada 2013) and standards set by the Saskatchewan Ministry of Environment.
 52. Time in-stream construction to avoid vulnerable fish life stages by adhering to restricted activity timing windows in accordance with the *Fisheries Act* (Fisheries and Oceans Canada 2013).
 53. Comply with the blasting guidelines in compliance with the *Fisheries Act* (Fisheries and Oceans Canada 2013).
- Traditional Land Use (in additional to mitigation measures described in all other valued components)***
54. Provide notification of project developments as determined between the affected party and the proponent.
 55. Develop a notification procedure to facilitate traditional activities within the mine enclosure.
 56. Comply with the objectives of the land use policies, plans, and regulations related to all three zones within the draft Fort à la Corne Integrated Forest Land Use Plan and follow the access management guidelines as set out in this plan.
 57. Re-align Lars Road around the overburden and rock storage pile and replace the Lars Road fire tower.
 58. Maintain navigation on the Saskatchewan River at the process and groundwater discharge structure. Mitigate potential effects to navigation by:
 - marking the location of the outfall structure,
 - removing any debris that accumulates as soon as practicable, and
 - completely removing the structure and any associated equipment at closure.
 59. Incorporate traditional land use and traditional knowledge into closure plans so that traditional uses can continue after closure.
 60. Provide awareness training to project workers about the nature of heritage resources and management of any heritage resources that may be encountered.
 61. Sponsor cultural and community activities and programs, and replacement initiatives in consultation with Aboriginal groups.

Human Health

62. Develop a comprehensive Safety, Health and Environmental Management System that will encompass emergency response planning, spill response planning, explosives management planning, and health and safety operational procedures. Develop these management plans in cooperation with relevant authorities at all government levels.
63. Educate and train employees on successful execution of the plans.
64. Complete a Human Health Risk Analysis prior to the construction of the Project.
65. Conduct all construction work during day time hours.
66. Design project facilities and equipment to reduce noise.
67. Ensure engines meet acoustical industrial standards and vehicles are inspected often enough to maintain optimal operational conditions.
68. Enclose the processing plant (walls and roof).
69. Conduct a noise survey at the property line and at the location of critical receptors when the Project attains full production capacity to confirm compliance with permissible sound levels during daytime and nighttime hours. The results of this survey will determine if any additional work is required such as noise mitigation plans, community consultation, and complaint resolution.

Accidents & Malfunctions

70. Maintain on-site medical care and equipment to deal with worker injuries and illness.
71. Develop a worker transfer agreement with the Prince Albert Parkland Regional Health Authority in case of the event of worker injury or illness that is beyond the on-site capacity.
72. Create an Emergency Response Plan that will be implemented, reviewed, and updated on a regular basis in cooperation with local emergency response officials and will include:
 - Spill prevention techniques for refueling vehicles and stationary power equipment and
 - A Spill Response Plan including plans for the treatment of contaminated soils and water.
73. Implement an explosives management plan that will be reviewed by appropriate authorities and include at a minimum:
 - methods for the safe storage of explosives,
 - a requirement that blasting occur during daylight hours,
 - a public information component, and
 - optimization with the goal of reducing the amount of blasting required and blasting residue.

Appendix G

List of Species of Conservation Concern that May Occur within the Project Area

Species of Special Conservation Concern		Status	
Common Name	Scientific Name	Species At Risk Act Registry (SARA 2011)	National Status (COSEWIC 2012)
Canada Warbler	<i>Wilsonia Canadensis</i>	Schedule 1, Threatened	Threatened
Chimney Swift	<i>Chaetura pelagica</i>	Schedule 1, Threatened	Threatened
Common Nighthawk	<i>Chordeiles minor</i>	Schedule 1, Threatened	Threatened
Horned Grebe	<i>Podiceps auritus</i>	No Schedule	Special Concern
Loggerhead Shrike*	<i>Lanius ludovicianus excubitorides</i>	Schedule 1, Threatened	Threatened
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Schedule 1, Threatened	Threatened
Piping Plover, <i>melodus</i> subspecies*	<i>Charadrius melodus</i>	Schedule 1, Endangered	Endangered
Rusty Blackbird	<i>Euphagus carolinus</i>	Schedule 1, Special Concern	Special Concern
Short-eared Owl	<i>Asio flammeus</i>	Schedule 1, Special Concern	Special Concern
Sprague's Pipit*	<i>Anthus spragueii</i>	Schedule 1, Threatened	Threatened
Whip-poor-will	<i>Caprimulgus ociferus</i>	Schedule 1, Threatened	Threatened
Whooping Crane*	<i>Crus americanus</i>	Schedule 1, Endangered	Endangered
Yellow Rail	<i>Coturnicops noveboracensis</i>	Schedule 1, Special Concern	Special Concern
Northern Leopard Frog	<i>Rana pipiens</i>	Schedule 1, Special Concern	Special Concern

* Species not included in the environmental assessment as there were no historical occurrence records in the Saskatchewan Conservation Data Center database for the local study area.

Appendix H Follow-Up

A follow-up program identifies the accuracy of predicted environmental effects through monitoring and whether mitigation measures or monitoring methodologies need to be modified or adapted as the Project proceeds in order to continue to effectively address unanticipated adverse environmental effects. The proponent's follow-up program will be modified as required to reflect adaptive management and lessons learned, changes in mine configuration, and changes in regulatory requirements.

Below are components of the proponent's follow-up program for which federal authorities have related regulatory responsibilities or technical expertise.

Valued Ecosystem Component	Objectives and Monitoring Commitment	Project Phase	Reporting to ⁶
Atmospheric Environment	<ul style="list-style-type: none"> Greenhouse gas monitoring and reporting, including nitrogen oxide emissions 	Operations	<ul style="list-style-type: none"> Supported by Environment Canada
Surface Water Resources	<ul style="list-style-type: none"> Hydrology monitoring to verify predicted drawdown effects to local and regional tributaries, and the Saskatchewan River Water quality monitoring under principles and study designs suggested in the Metal Mining Effluent Regulations, coordinated into an aquatic effects monitoring plan. Includes sampling sediment, effluent, and surface water for metals, total petroleum hydrocarbons, nutrients, and dissolved solids. Aquatic Effects Monitoring Plan will be designed according to all applicable regulations, guidance contained in CCME Protocols Manual for Water Quality Sampling in Canada, and follow plans similar to those of diamond mines in the Northwest Territories Erosion and sedimentation monitoring 	Pre-Construction, throughout the life of the mine, at least two decades after pumping ceases or until a clear recovery trend is established or until the site can be returned to provincial control.	<ul style="list-style-type: none"> Fisheries and Oceans Canada Supported by Environment Canada
Groundwater Resources	<ul style="list-style-type: none"> Groundwater monitoring to confirm predicted effects on groundwater-surface water interactions affecting surface water quantity and quality of local and regional tributary flows, and the Saskatchewan River. Includes updating and recalibrating groundwater models to the new data. 	Pre-construction, throughout the life of the mine, at least two decades after pumping ceases or until a clear recovery trend is established or until the site can be returned to provincial control.	<ul style="list-style-type: none"> Fisheries and Oceans Canada
Terrestrial Wildlife Habitat and Species	<ul style="list-style-type: none"> Wildlife monitoring, including surveys to assess the presence of and project effects to migratory birds and species at risk 	Pre-construction, Construction, Operations	<ul style="list-style-type: none"> Supported by Environment Canada

⁶ Environment Canada and Health Canada do not have regulatory responsibilities to review and approve monitoring plans and reports. However, these federal authorities may review and offer advice upon request.

Valued Ecosystem Component	Objectives and Monitoring Commitment	Project Phase	Reporting to ⁶
Fish and Fish Habitat	<ul style="list-style-type: none"> • See above monitoring programs under “Surface Water Resources” • Fisheries and aquatic resource monitoring, coordinated with water quality monitoring into an aquatic effects monitoring plan • Fish population and benthic community surveys • Monitoring of habitat improvements committed to in the Offset Plan to confirm integrity and effectiveness of the plan 	Construction, throughout the life of the mine, at least two decades after pumping ceases or until a clear recovery trend is established or until the site can be returned to provincial control.	• Fisheries and Oceans Canada
Human Health	<ul style="list-style-type: none"> • After conducting a human health risk assessment and a baseline country foods assessment, country foods monitoring will be implemented and linked to the results of the aquatic effects monitoring plan to monitor the potential accumulation of metals in fish. Mercury, arsenic and molybdenum will be included in the monitoring plan • Noise monitoring program, including complaint resolution procedures, and monitoring at the project fence line and critical receptors • Potable well water monitoring on levels and quality 	Pre-construction, Construction, Operations, Post closure (only for potable well water monitoring)	• Supported by Health Canada
Accidents and Malfunctions	<ul style="list-style-type: none"> • Implementation of the spill contingency plan and emergency response plan will be monitored 	Construction, Operations	• Supported by Environment Canada