



STAR-ORION SOUTH DIAMOND PROJECT
ENVIRONMENTAL IMPACT STATEMENT

SECTION 9.0
CUMULATIVE EFFECTS ASSESSMENT



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9.0 CUMULATIVE EFFECTS ASSESSMENT

The following Sections provide the background information, procedures and results of the cumulative effects assessment (CEA) for the Project.

9.1 APPROACH

A number of different activities in the same geographic area and/or a number of projects occurring over time that are likely to affect a specific area may result in cumulative effects. Cumulative effects are defined in this assessment as effects that result in changes outside the natural limits of variation for the Valued Components (VCs) or changes in ecological populations over the long term.

9.2 METHODS

Detailed methods used to determine cumulative effects are provided in Sections 6.1.6 and 6.1.7. The Environmental Impact Assessment (EIA) for each discipline (Section 6.0) identifies whether the Project will have an effect on a VC, and if so, establishes the impact criteria to assess the effect. Residual effects on VCs that are considered as having the potential to be cumulative with other projects (e.g. a measurable change in the environment resulting from the Project in combination with other projects or activities that have been or will be carried out) and described as having a magnitude that is either moderate or high according to the impact rating criteria outlined in Table 6.1-2 are included within the CEA. Residual effects that were considered to be negligible, neutral, low or positive were not carried forward for discussion into the CEA.

The CEA includes a determination of whether the effect of the Project, in combination with other activities and projects, may cause a significant change in the VC after the Project is implemented or in the reasonably foreseeable future.

9.2.1 Cumulative Effects Assessment Framework

Tasks typically considered within the basic environmental assessment framework include scoping, analysis, mitigation, significance determination and follow-up (CEAA 1999). Following the completion of the effects assessment the following steps were conducted for the CEA:

- residual effects identified in the effects assessment during construction, operations and decommissioning/closure were carried forward as VCs in the CEA;
- temporal and spatial boundaries were defined;
- potential future human activities and reasonably foreseeable projects considered in the CEA were identified and described;
- incremental effects associated with other projects/human activities were identified;



- significance of residual cumulative effects and likelihood after mitigation were discussed; and
- the level of certainty and any limitations in the CEA were described.

9.2.2 Temporal and Spatial Boundaries

Temporal boundaries are selected to encompass Project-related activities for which there are data. This includes exploration through construction and operations to Project closure and decommissioning. The open pit, plant and infrastructure will be constructed over a four year time line (i.e., Years 1 to 4). Production is scheduled to start in late Year 4 and end in Year 24, with closure activities occurring in Years 25 and 26. The life of the plant and associated infrastructure may also be extended beyond 20 years in order to mine and process other inferred and probable reserves in the Star and Orion South kimberlites and/or other kimberlites in the area.

Spatial boundaries for the Project were defined by using the following criteria:

- the physical extent of the proposed Project, including any offsite facilities or activities;
- the extent of potential effects arising from the Project;
- the extent of the aquatic and terrestrial ecosystems, socio-economic indicators, communities and First Nations and Métis interests potentially affected by the Project; and
- the size, nature and location of past, present and reasonably foreseeable projects and activities which could interact with the Project's effects.

The discipline specific regional study areas (RSAs) were used to identify linkages in a specific area for each VC. Potential Project effects on VCs included assessing linkages with other disciplines. For the CEA, incremental effects were identified for each VC in combination with other projects/human activities overlapping the discipline specific RSA.

The CEA Study Area is the same as the RSAs described for most disciplines in their respective sections (Section 6.0). The CEA Study Area, derived from the socio-economic and non-traditional land and resource use RSAs, is comprised of 1,500,090 ha that encompasses the FaIC forest, in addition to the following communities and rural municipalities (Figure 9.2-1):

- two cities (Prince Albert and Melfort);
- six towns (Nipawin, Choiceland, Tisdale, Kinistino, Star City and Birch Hills);
- 13 villages (Smeaton, Weirdale, Love, White Fox, Codette, Meath Park, Ridgedale, Albertville, Beatty, Aylsham, Weldon, Valparaiso and Zenon Park);



- Reserves of four First Nations (James Smith Cree Nation, Muskoday First Nation, Sturgeon Lake First Nation and Red Earth Cree Nation); and
- 12 rural municipalities (Tisdale, Star City, Flett's Springs, Connaught, Willow Creek, Kinistino, Birch Hills, Prince Albert, Nipawin, Torch River, Garden River and Buckland).

The biophysical cumulative effects area is co-incident with the FaIC forest.

9.2.3 Determination of Incremental Effects

Cumulative effects may result from actions that, when viewed individually, are not considered as a source of significant effects, but which are significant when added to other actions (CEQ 1997). Cumulative effects can result from multiple pathways and be manifest on both biophysical and socio-economic resources (Canter 1999). Descriptions of the current environment and the environment with the future/foreseeable human activities added are provided in Section 9.5. The Project residual effects carried forward following the review of specific Project details, including spatial and temporal overlap between disciplines and current land use activities, are then compared with future/foreseeable human activities within the CEA Study Area to identify incremental effects. Note that the socio-economic effects assessment was completed in the manner of a cumulative effects assessment and is described in detail in Section 6.4.1 (Socio-Economic Effects).

9.2.4 Cumulative Effects Assessment Significance Rating

The significance of residual effects (i.e., effects after mitigation) is determined to provide sufficient information to regulators and the public so that net benefits of the Project can be determined. The determination of significance is often more complex for cumulative effects than it is for individual disciplines because of the broader nature of the assessment and increased uncertainty associated with predicting future projects. For cumulative effects, the approach requires determining an effect threshold above which significant cumulative effects may occur that cannot be reversed with mitigation or management. The following are key steps in this process:

- evaluate the significance of residual effects; and
- compare results against thresholds or land use objectives and trends.

For CEA, significance rating criteria were developed to rate potential incremental cumulative effects. The significance rating criteria used are described in Section 6.1.5.

Thresholds or regional objectives are not available for some VCs. Where established thresholds are not available, professional judgement is used to provide a qualitative classification based on a weight of evidence approach. The approach is based on the Magnitude, Spatial Extent, and Duration of expected change in the VC as a result of the project. Two categories are established:



- not significant; and
- significant

Ratings are established based on experience with similar Canadian mining projects. These are modified as appropriate by current community and regulatory perceptions of significance of a particular effect as determined through engagement during the assessment process.

9.2.5 Other Projects and Human Activities Considered in the CEA

The selection of other projects and human activities to be considered in the CEA are initially identified by reviewing available information for the following:

- historical (closed) projects/activities within the CEA study areas;
- existing (currently active) projects within the CEA study areas;
- general land use activities within the CEA study areas; and
- reasonably foreseeable future projects occurring within the CEA study areas.

9.2.5.1 Historical Projects and Activities

There are several large commercial timber processing plants that have historically relied on provincial forests within the CEA study area. The draft FaIC Forest Land Use Plan includes a detailed forest management strategy that incorporates historic forestry activities into future harvesting initiatives.

Mineral exploration primarily focussed in the areas associated with known kimberlite deposits has occurred in the past.

There are limited historic oil and gas exploration activities within the CEA Study Area. The Saskatchewan Industry and Resources Oil and Gas Information map identifies eleven (11) abandoned dry wells within the FaIC forest.

A variety of summer and winter recreational activities have historically occurred in the FaIC forest including hiking, camping, hunting, all terrain vehicle use, cross-country skiing and snowmobiling.

Linear access within the FaIC forest has historically been used for a variety of reasons, including hunting and recreational, commercial, industrial or exploration activities. During the 1990s, a road closure program was implemented to limit the number of unmaintained access routes within the FaIC forest. A partnership between the Saskatchewan government, James Smith Cree Nation, and a number of agencies was subsequently formed. Following this, a three year road closure program was developed, with a target of 100 road closures (SMOE 2005). A few designated roads were left open, including the Shipman Trail, which leads to the Project area.



9.2.5.2 Existing Projects

There are no existing large industrial projects within the CEA Study Area.

The socio-economic assessment includes all existing projects, businesses and activities that generate economic activity in the region and affect community well-being, but does not consider their individual effects. The CEA Study Area includes large industrial operations as well as government offices and services (e.g., health care), education facilities, retail trade, and the services industries. The socio-economic effects assessment is provided in Section 6.4.1.

9.2.5.3 General Land Use

A detailed description of the historical and current land use activities within the CEA Study Area is provided in the non-traditional land and resource Sections 5.4-3 and 6.4-3. Table 9.2-1 summarizes the current land use activities within the CEA Study Area.

Table 9.2-1: General Land Use Activities in CEA Study Area

| Project/Activity | Description |
|-------------------------------|---|
| Transportation and Access | Regionally, access to the FaIC forest is possible by a number of municipal paved highways such as Provincial Highway 6, which runs north/south, along the eastern portion of the FaIC forest. Provincial Highway 55, located to the north of the Project area, connects Prince Albert with several towns directly north of the FaIC forest to the town of Nipawin. The Project area, and the rest of the FaIC forest is accessed by several sand roads, typically passable by four wheel drive and high clearance two-wheel drive vehicles all year round. Shipman Trail, which leads directly to the Project site, is accessed via Highway 55, and Division Road is accessed from Highway 6 approximately 10 km north of the Saskatchewan River Crossing. Linear access within the FaIC forest is potentially used for a variety of reasons, including hunting and recreational, commercial, industrial or exploration activities. |
| Mineral Exploration | In addition to Shore and the FaIC-JV, Forest Gate Resources Inc., and Great West Investments & Referrals have mineral exploration dispositions within the FaIC. Shore holds the greatest number of dispositions (43) within the LSA, followed by the FaIC-JV (22), Forest Gate Resources (5) and Great West Investments & Referrals Ltd (1). Other companies within the FaIC forest that hold mineral exploration claims include Ipsco Inc., United Carina Resources Corp., Star Uranium Corporation, Bandera Gold Ltd., Ridgeback Global Resources Ltd., and various others. |
| Oil and Gas Exploration | There have been limited historic activities within the CEA Study Area. 40 km of 2D seismic lines have been or will be hand cut based on approved permits. The lines will be 2.2 m wide and located in the south part of FaIC forest west of Highway 6. There are no other known oil and gas activities in the FaIC forest. |
| Power Generation | Hydroelectric generating stations, including the Francois-Finlay Dam and Nipawin Power Station, are located along the Saskatchewan River 60 km downstream of the Project site and within the socio-economic RSA. |
| Aggregate Resources | Provincial working guidelines direct exploration, extraction, and reclamation of sand, gravel and mineral resources on Crown Resource Land. A surface lease is used to authorize both long-term and large quantities of sand, gravel and mineral resource extraction. Surface leases are limited to a maximum of 65 ha and a term of 5 years. Currently 0.4 ha within the FaIC forest are occupied by gravel pits. |
| Fishing | The only viable waterbody within the CEA Study Area with sports fishing potential is the Saskatchewan River. The Saskatchewan River currently is home to a variety of sportfish, including walleye, sauger, yellow perch, northern pike, cisco, goldeye, mooneye and lake sturgeon. |
| Guide Outfitting | Outfitting is currently prohibited within the boundaries of the FaIC forest. Limited outfitting has occurred on JSCN land within the FaIC. |
| Resident Hunting and Trapping | Hunting is permitted within the FaIC Wildlife Management Unit, which includes the CEA Study Area; however, regulations are specific to the FaIC Forest Reserve. The CEA Study Area overlaps a fur conservation area which is primarily used for trapping in the winter. |



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| Project/Activity | Description |
|----------------------|---|
| Traditional Land Use | Several First Nations and Métis are known to have historically occupied the CEA Study Area. Available information concerning traditional land use is provided in Section 5.4.2. |
| Forest Management | The CEA Study Area contains portions of the FalC, Torch River and Nisbet provincial forests and small portions of the former Weyerhaeuser Prince Albert Forest Management Area and the Weyerhaeuser Pasquia Porcupine FMA. |
| Recreation/Tourism | The parks and outdoor recreation system within the CEA Study Area serves both residents and non-residents. Outdoor recreation within the FalC forest includes trails for hiking, snowshoeing, cross-country skiing, horseback riding, canoeing, camping, bird watching, snowmobiling as well as fishing, trapping and hunting. Within the FalC forest, there are three permitted ski trail systems and two snowmobile trails. Outside of the FalC, beaches, marinas, outfitters and golf courses are located primarily along the southeast and east portions of the Saskatchewan River. |
| Agriculture | Livestock grazing within the forest is authorized under the Forest Resources Management Act and Regulations, and is intended to complement the grazing systems on private and crown land. There are currently five grazing permits within the FalC forest. |
| Residential/Cabins | Cottages, camps, cabins, lodges and campgrounds are located primarily along the southeast and east portions of the Saskatchewan River, outside the FalC forest. |



9.2.5.4 Reasonably Foreseeable Future Projects

Relevant future projects include those which are:

- Certain: The action will proceed or there is a high probability the action will proceed;
- Reasonably Foreseeable: The action may proceed, but there is some uncertainty about this conclusion; and
- Hypothetical: There is considerable uncertainty whether the action will ever proceed. The conjecture is based on currently available information (CEAA 1999).

Research, professional judgement, and engagement are used to identify which future projects should be considered in a CEA. There is no simple rule that can be applied to include or exclude future projects from the CEA. In general, if an environmental assessment has been completed and accepted and a lease, permit, or license has been issued, then it is very likely that the future project will proceed (CEAA 1994). The selection of future actions to consider in a cumulative environmental effects assessment should reflect "the most likely future scenario." Emphasis is given to projects with greater certainty of occurring; however, hypothetical projects might be discussed on a conceptual basis in some cases (CEAA 2007).

There is often a degree of uncertainty related to which environmental effects from future projects and activities should be included in the assessment. The *Canadian Environmental Assessment Act* states that projects and activities that "will be carried out" must be considered. At a minimum, projects and activities that have been approved will be included in the assessment. The decision to include a project in the CEA is based on the 'weight of evidence' that a future project will proceed. 'Weight of evidence' decisions usually consider:

- The quality of the evidence: Are the indications that a future project will proceed strong or weak?
- The quantity of the evidence: Is there one indication that a future project will proceed, or several indications?

Future projects that may result from a project's 'growth inducing ability', are not considered as part of the CEA. This Section provides the rationalization for selecting the projects included in the Project Inclusion List for the CEA.

The socio-economic baseline also considers future employment and demographic conditions in the region because the Project may compete with approved and reasonably foreseeable projects for regional labour and services. By examining Project effects in the context of other regional development that is expected to occur in the near future, the assessment of socio-economic effects is inherently a cumulative effects assessment. The socio-economic effects assessment is provided in Section 6.4.1. Table 5.4.1-6 in the socio-economic baseline summarizes the major projects in the planning and design phase that

were included in the socio-economic effects assessment. This major project list is known to include some projects that may not actually proceed as described or are unlikely to be developed at all. For example, recent information suggests that development of the Shell / Iogen Corporation ethanol plant is unlikely (Newstalk 650 Radio 2010). The projects are primarily focussed within the communities of Prince Albert, Tisdale and Nipawin and would not be expected to cumulatively affect the environment in combination with the Project other than from the socio-economic perspective. Other potential linkages with these projects are limited to overlapping use of transportation routes, specific details for which are unavailable.

9.2.6 Effects Analysis

The analysis of cumulative effects follows these steps:

- evaluate linkages between the residual effects on biophysical and socio-economic disciplines and the residual effects on the VC that is being assessed (Figure 9.2-2);
- describe potential Project effects on VCs that include assessing linkages with other disciplines;
- determine whether incremental effects are predicted to occur on a VC in combination with other projects/human activities;
- provide mitigation, monitoring and management strategies to reduce/limit potential cumulative effects;
- determine significance of residual cumulative effects and likelihood after mitigation; and
- provide a discussion regarding level of certainty.

9.3 PROJECT RESIDUAL EFFECTS ON VALUED COMPONENTS

9.3.1 Projects Considered for Cumulative Effects

Following a review of the available information and the scope of the CEA for the Project the major “foreseeable” projects/human activities that appear to overlap spatially and/or temporally with the Project include:

- exploration drilling by Shore;
- expansion of the Star pit to include other kimberlite;
- extension of the Orion South pit to include inferred resources and the Orion Centre Deposit;
- SaskPower power line to service the Project;
- logging/management of the provincial forest; and
- Other uses of the rerouted and upgraded access road to the site.

These projects are described below.



Exploration Drilling by Shore

The projected future drilling program by Shore is currently envisioned to consist of an average of 100 exploration drill holes on the Orion Centre, Orion North and Taurus kimberlites (Figure 9.3-1). Drill pads are assumed to be 30 by 50 m and access roads to these drill pads are assumed to be 7 m wide; drill spacing is planned on a 100 m grid.

The disturbed area occupied by current exploration activities is approximately 70 ha. It is assumed that exploration activities would continue in the foreseeable future. Disturbance associated with exploration activities will be minimized wherever possible. All exploration works will follow conditions outlined in applicable permits. This exploration drilling would be for resource definition and is assumed to be on 100 m centres (on average). With extrapolation, this will equate to 15 ha of new disturbance for drill pads annually. It is not possible to estimate the exact pattern for the drill holes, but the least amount of disturbance would be if holes were placed every 100 m along a square grid which would require approximately 1,000 m long access road down one length of the block and spurs between drill holes, or 11 ha of roads. Based on these assumptions total new disturbance would be 26 ha. The 134 kimberlite, which daylights into the Star pit, may also be explored.

Extension of the Open Pits

At this point, Shore is not proposing to mine any other kimberlites in the region. The 134 Kimberlite, which daylights into the Star pit may be potentially mined, if economic. Mining at Orion South would expose kimberlite currently considered as inferred resources or other mineralized material, and expose kimberlite from the Orion Centre deposit. As such, it is reasonable to assume that this additional kimberlite, should it prove economic, would be mined, subject to appropriate regulatory approvals.

Future mining is assumed to proceed in a manner similar to that of the proposed Project using open pit mining methods. Progressive backfilling is also assumed so that overburden and Fine PK is placed into the previous pits.

SaskPower Power Line to Service the Project

SaskPower is evaluating supply options to provide the required electrical power to the site (Figure 2.5-4), and has prepared a Preliminary Project Description which is attached as Appendix 2-A (SaskPower 2010). The options considered by SaskPower provide for the construction of a new line ranging in length from 15.6 km to 18.5 km and connecting to an existing power line in the forest, southeast of the site across the Saskatchewan River. Final alignment will be determined by SaskPower through a separate application process for the power line. The SaskPower application will be subject to a parallel environmental assessment pursuant to the applicable environmental regulations. As such, the power line is assessed in a more general fashion in the EIS as an ancillary development in order to capture the full extent of the Project and is carried forward in this CEA.



Logging/Management of the Provincial Forest

Timber harvesting is permitted within the FaIC forest, and the total harvest allocation is distributed between 18 forest product permit holders and one term supply license holder. Forest product permits are issued on an annual basis, and operators are required to adhere to the stipulations contained in the Area Operating Plans (AOPs) for the island forests. In lieu of a forest management plan being in place for the island forests, these AOPs provide guidelines for permit holders to operate in accordance with the Forest Resources Management Act and Regulations (Saskatchewan Research Council 2008).

The FaIC Integrated Forest Land Use Plan sets out forest management strategies specific to the FaIC forest, including: harvest volumes, forest management, forest renewal, fire salvage, forest protection, environmental monitoring, access management, stream crossing, road closure, and all-terrain vehicles. Sustainable timber harvest in the FaIC forest is set at 84,100 cubic meters per year.

Planned forestry activity is likely to occur within the region and will potentially act in combination with the Project to impact vegetation and wetlands. Table 9.3-1 indicates that an additional 1,165 ha of harvest was expected to occur in 2010, and a further 2,202 ha will be harvested in 2014, assumed to correspond with Year 2 or 3 of construction. No harvest is planned for the LSA.

Future forest harvest may also affect known rare plant locations, areas of high rare plant potential, and areas of high potential for historically used species. However, vegetation types, including forest harvested areas, were rated for their potential to support rare or historically used species with data which was collected while forestry activities had already occurred on the landscape. In this way, the rankings established for rare plant and historical use plant potential already factor in forest harvest activities.

Figure 9.3-2 shows past, present (2010) and proposed forest harvesting in the FaIC forest area. Table 9.3-1 lists proposed forest harvesting to 2014 (the planning horizon information available).



Table 9.3-1: Planned Forest Harvest

| Vegetation Type | Forestry affected areas in the RSA at Baseline (ha) | Forestry affected areas in the RSA in the Project Case (ha) | Additional Forestry affected areas in 2010 (ha) | Additional Forestry affected areas in 2014 (ha) | Total Forestry affected area in 2014 (ha) | Total Forestry affected area in 2014 (%) |
|--------------------------------|--|--|--|--|--|---|
| Forest Harvest (<30 years old) | 20 243 | 19 740 | 1165 | 2 202 | 23 107 | 17 |
| Regeneration (>30 years old) | 7 888 | 7 545 | n/a | n/a | 7 545 | 6 |



Other Uses of the Rerouted and Upgraded Access Road to the Site

Existing linear features within the CEA Study Area (primarily the FaIC forest) consist of roads of varying length. The proposed access corridor encompassing a roadway, communication lines and a natural gas pipeline passing through the FaIC forest (i.e., the RSA) is proposed for construction in association with the Project development. It would extend from Highway 55 near Shipman south to the current bridge at the Whitefox River and continue to the Project site. The road will replace an existing road (Shipman Trail) to the site, which will be straightened and improved to a paved surface. The portions of the existing road that will be abandoned will be reclaimed.

The Project will require year-round access during construction and operations. An increase in accessibility along the rerouted and upgraded access road, and year round access may have positive or negative effects for various land and recreational users. Cumulative effects are expected to be primarily associated with traffic conflicts.

Reasonably Foreseeable Projects Summary

Table 9.3-2 provides a summary of the reasonably foreseeable projects in the CEA Study Area.

Table 9.3-2: Reasonably Foreseeable Projects in the CEA Study Area

| Project/Activity | Start Date | Duration | Area |
|--|-------------------|--|---|
| Exploration Drilling by Shore | Year 10 | Unknown | Within mineral lease area |
| Extension of the open Pits to Include the Orion Centre Deposit and Other Kimberlites | Unknown | Unknown | Orion South and Centre Deposit |
| SaskPower power Line to Service the Project | Year 1 | On-going | Alignment options being evaluated (Figure 2.5-3). |
| Logging/Management of the FaIC Forest | 2011 | Known annual cuts allocated up to 2014 | FaIC forest |
| Other Uses of the Rerouted and Upgraded Access Road to the Site | On-going | Foreseeable future | Rerouted and upgraded access road |



9.3.1.1 Hypothetical Future Projects

In addition to the reasonably foreseeable projects and activities described above the available information for two hypothetical projects are summarized below. These projects are defined as hypothetical because there is considerable uncertainty whether they will proceed and publicly available details are very limited. These projects are described here for information purposes.

Pehonan Hydroelectric Project

The James Smith Cree Nation, Peter Kiewit Sons Co. and Brookfield Renewable Power Inc. announced in the media (May 13, 2010, e.g. Pennenergy website) that they intend to construct a hydroelectric dam (the Pehonan project) on the Saskatchewan River, and have announced that studies are underway to determine the feasibility of the project. However, no description of the project has been submitted to the SMOE for consideration, and there was no formal notice of this project prior to submission of this EIS. As a result, while there is not sufficient information to undertake a quantitative assessment, a discussion of this potential project is included in the CEA. Available information indicates that the proposed dam would be located on the Saskatchewan River potentially upstream of the Project; however an exact location has not been selected.

Information at the time of the media announcement was that it was to be a “run-of-river” facility, which suggests that the impoundment behind the dam would be of limited extent. Dams tend to regulate the flow of water, and in this case would not be expected to reduce the low flow volumes in the river. More likely, the regulation may increase low flow conditions and reduce the high flow conditions. Upstream river water quality would not be expected to be different as a result, with the possible exception of a decrease in sediment loads due to settling behind the dam. The impoundment of water would be contained within the river banks of the Saskatchewan River.

Mining of Orion North or Taurus

After the reasonably foreseeable mining of Orion Centre, the next kimberlite to be mined is less certain and may be either Orion North or Taurus (see Figure 9.3-1). For the purposes of this discussion, it is considered hypothetical that mining could occur at Orion North and then Taurus. The economic extent of these two kimberlites is presently unknown.

9.3.2 Cumulative Effects Assessment Valued Components

The VCs identified in the environmental effects assessment, which were selected for evaluation as required under the Project Specific Guidelines, are summarized in Table 9.3.-3. The residual effects on each VC are described in the corresponding effects assessment sections (Section 6.0). The rationale for the selection of the VCs listed below is provided in the following Sections.



Section 8.0 provides a summary of the Project-related residual effects. Those residual effects that were considered to be negligible, neutral, low or positive within the study area established for the EIA (i.e. environment specific LSAs) were not carried forward for discussion into the CEA unless a specific concern or issue was identified during engagement with stakeholders, regulators, or Aboriginal groups. The rationale for those residual effects rated as having a low magnitude were carefully reviewed taking into consideration the following:

- predicated mitigation success; and
- spatial and temporal overlap with potential future/foreseeable human activity.



Table 9.3-3: Summary of VCs Identified in Effects Assessment and Addressed in Cumulative Effects Assessment

| Environmental Component | Valued Components | Magnitude Rating | Residual Effects Rating |
|--|---|------------------|-------------------------------|
| Noise (construction only) | Noise Levels | Moderate | Not significant |
| Hydrology | Surface water hydrology – tributary streams | High | Significant (in LSA, not RSA) |
| | Surface water hydrology – Saskatchewan River | | Not significant |
| Terrain Distribution and Topography | Topography | High (LSA) | Not significant |
| | Soil Distribution/Cover | Moderate (LSA) | Not significant |
| | Moisture Status | Moderate (LSA) | Not significant |
| | Overall Soil Quality | Moderate (LSA) | Not significant |
| Surface water quality | Sedimentation (construction only) | Low – Moderate | Not significant |
| | Sediment quality | Low – Moderate | Not significant |
| Fisheries and Aquatic Resources | 101 Ravine loss of fish habitat | High (LSA) | Significant (LSA) |
| | West Ravine loss of fish habitat | High (LSA) | Significant (LSA) |
| | West Ravine decrease in mean annual discharge | High (LSA) | Significant (LSA) |
| | East Ravine loss of fish habitat | High (LSA) | Significant (LSA) |
| | East Ravine decrease in mean annual discharge | High (LSA) | Significant (LSA) |
| | Duke Ravine loss of fish habitat | High (LSA) | Significant (LSA) |
| Vegetation and Plant Communities (Construction only) | Duke Ravine decrease in mean annual discharge | High (LSA) | Significant (LSA) |
| | Loss of upland vegetation | Moderate (LSA) | Not significant |
| | Loss of wetland vegetation | Moderate (LSA) | Not significant |
| | Loss of uncommon vegetation | High (LSA) | Significant (LSA) |
| | Loss of old growth forest | High (LSA) | Significant |



STAR-ORION SOUTH DIAMOND PROJECT
ENVIRONMENTAL IMPACT STATEMENT

| Environmental Component | Valued Components | Magnitude Rating | Residual Effects Rating |
|--|---|--------------------|---|
| | | | (LSA) |
| | Riparian habitat | High (LSA) | Significant (LSA) |
| | Species at risk | Moderate (LSA) | Not significant |
| Wildlife | Moose loss/alteration of habitat (construction and operation) | Low-moderate (LSA) | Not significant |
| | Moose sensory disturbance (construction) | Low-moderate (LSA) | Not significant |
| | Moose movement disruption (construction) | Low-moderate (LSA) | Not significant |
| | Black Bear loss/alteration of habitat (construction) | Low-moderate (LSA) | Not significant |
| Biodiversity | Native species diversity | Moderate | Not significant |
| Socio-economicsa (construction and operation) | Provincial economy | High | Positive |
| | Government revenues | High | Positive |
| | Regional employment | High | Positive |
| | Transportation – road traffic | Moderate | Not significant |
| | Transportation – rail | Moderate | Positive |
| | Housing | Minor - Moderate | Positive |
| Socio-economics (closure) | Provincial economy | High | Significant |
| | Government revenues | High | Significant |
| | Regional employment | Moderate | Not significant |
| | Transportation – decreased road traffic | Moderate | Not significant |
| Traditional Knowledge and Traditional Land Use | Traditional land use – Métis First Nations | Low | Not significant |
| Non-Traditional Land Use | Land use plans and policies | | Neutral |
| | Physical disturbance Access Industrial and commercial land uses Outdoor recreation | | Not significant Positive Not significant Not significant |
| Visual and Aesthetic Resources | Change in landscape | | Not significant |



| Environmental Component | Valued Components | Magnitude Rating | Residual Effects Rating |
|-----------------------------|---------------------------------------|------------------|-------------------------|
| Human Health and Well-Being | Traffic safety | Moderate | Not significant |
| | Worker health | Moderate | Not significant |
| Heritage Resources | Archaeological and historic resources | | Not significant |

Notes: ^a The socio-economic effects assessment was completed in the manner of a cumulative effects assessment and is described in detail in Section 6.4.1, Socio-Economic Effects.

9.4 DETERMINATION OF CUMULATIVE EFFECTS

9.4.1 Climate and Air Quality

The CEA includes all of the existing, approved and planned projects and activities associated with atmospheric emissions which could negatively impact air quality in the FaIC region. Projects are typically some form of commercial or industrial development that is planned, constructed, and operated – a refinery development or resource access road, for example. Activities may either be part of a project or may arise over time because of ongoing human presence in an area (CEAA 1999).

A study of inventory data of existing and planned facilities and operations in the area east of Prince Albert has shown that no significant emission sources exist or are anticipated in the 30 km radius from the centre of the Project area. Usually a 30 km distance is sufficient to disperse emitted contaminants to concentrations at the background levels. The modelled area, total suspended particulate isopleths (blue lines) and rural / forestry surroundings showing lack of industrial emission sources are displayed in Figure 6.2.2-11.

The nearest proposed industrial facility is the Nipawin Ethanol Plant located 40 km east of the Project. Some activities such as highway traffic and commercial timber harvesting do not contribute to the Project cumulative impacts because of their low emissions, short dispersion range and distant location. Therefore, cumulative effects of the Project are not expected.

No linkages with potential interactions for climate and air quality are carried forward for inclusion in the determination of incremental effects because available information indicates there are no significant emission sources within a 30 km radius from the centre of the Project area.



9.4.2 Noise

Due to natural attenuation of sound in the atmosphere, noise effects will be localized and mitigated within a short distance of the source. No other industrial operations or major sources of noise exist within the Project area. No cumulative increase to existing background noise is expected as a result of the Project. Therefore, the Project will not contribute to cumulative effects and a cumulative effects assessment is not warranted.

No linkages with potential interactions for noise are carried forward for inclusion in the determination of incremental effects because no significant increase to existing background noise is expected as a result of the Project.

9.4.3 Hydrology

The residual effects of the Project on surface water hydrology at the RSA level (Saskatchewan River) have been determined to be not measurable and not significant as a result. Cumulatively, the net change in flow from all local catchments draining to the Saskatchewan River is near zero, and the effects on the Saskatchewan River are deemed not significant as a result. Effects in the RSA are not measurable, and are not significant. As the effects of this Project cannot be detected as a part of cumulative effects of other projects, this Project does not add measurably to the effects of the other projects.

No linkages with potential interactions for hydrology are carried forward for inclusion in the determination of incremental effects because Project effects in the CEA Study Area are not measurable, and are rated as not significant. As the effects of this Project cannot be detected as a part of cumulative effects of other projects, this Project does not add measurably to the effects of the other projects.

9.4.4 Geology and Hydrogeology

Cumulative effects pertain to changes resulting from combined current and future developments. Any projects involving disturbance to the groundwater systems are speculative at this time, and accordingly, no cumulative effects are contemplated.

No linkages with potential interactions for geology and hydrogeology are carried forward for inclusion in the determination of incremental effects because no planned projects with potential effects on the regional geology and hydrogeology were identified.

9.4.5 Surface Water Quality

To produce a cumulative effect, the residual effects of the Project must act in combination with the residual effects of one or more other human actions. Any residual effects on the Saskatchewan River will be limited to a few metres below the outfall structure. Beyond that point, no residual effects are forecast and therefore there will be no cumulative effects.



Cumulative effects to water quality may accrue from development of deposits other than Star and Orion South. At the time of writing of this report, no timeframes had been developed for additional development beyond Star and Orion South and thus a temporal scope for the water quality CEA cannot be provided. For any future projects developed by Shore, the most likely outcome would be a continuation of the currently projected water quality effects beyond the projected end of mine life of the Project because the current processing plant would continue to be used.

Extension of the temporal extent of effects on water quality from additional development of kimberlites was carried forward for inclusion in the determination of incremental effects.

9.4.6 Terrain and Soils

Previous projects in the RSA were identified as part of the baseline establishment for soils and terrain (Tables 6.2.2-15 and Table 6.2.2-16). Prior disturbances consist of access, open site, other disturbance, reclaimed site, borrow pit, gravel pit, industrial, tower site, town site, and a well site. The total area of these disturbances is 1,406.4 ha, which is 1.06% of the RSA area. Of this area, 166.6 ha (0.13% of the RSA) will be used by the Project. The Project disturbance will be 4,259 ha, or 3.18% of the RSA.

Exploration activities, potential expansion of the pits, and future forestry activity all have the potential to affect soil and terrain. In addition, the hypothetical Pehonan Dam and mining of other kimberlites would also have an effect on soil and terrain VCs. These cumulative effects may add to the Project disturbance. These linkages justify inclusion of potential interactions for terrain and soil in the CEA.

9.4.7 Fisheries and Aquatic Resources

Project planning was conducted to ensure that potential negative effects on the aquatic environment beyond the LSA due to development were eliminated or mitigated, however, as discussed above, some residual effects were identified. The objective of this Section is to evaluate whether residual effects of the Project have the potential to interact with environmental effects caused by other projects or activities.

9.4.7.1 Streams

Seven of the nine streams located within the Project LSA (Wapiti Ravine, FalC Ravine, West Perimeter Ravine, East Ravine, Duke Ravine, West Ravine, and 101 Ravine) are contained within the Project footprint and are only subject to local influences. Projects located outside of the LSA do not intersect hydrologically with streams in the LSA as they are not in the same watersheds. Therefore there are no potential cumulative effects.



9.4.7.2 Saskatchewan River

The Saskatchewan River is part of a major river system that spans three provinces. Assessing cumulative effects on the Saskatchewan River watershed is complicated because of the large number of cities and industries extracting water and depositing substances into the river, as well as developments altering the natural flow of the river such as hydroelectric projects. Major developments have impacted the river upstream and downstream of the Project including the Francois-Finlay Hydroelectric dam located approximately 60 km downstream of the Project LSA, and the former Prince Albert pulp and paper mill and the City of Prince Albert wastewater discharge located approximately 60 km upstream of the Project LSA.

The hypothetical Pehonan Dam could affect water levels in the Saskatchewan River both upstream and downstream of the hydroelectric dam but details are not available to quantitatively assess cumulative effects.

Project-related impacts were rated as not significant in the Saskatchewan River. Increases in mean annual flow are predicted to be very small in magnitude, falling in the range of 0.2 to 0.3%. This increase in flow is not likely to have any measurable effects on the aquatic environment. Disruption or loss of fish habitat will be localized to the water discharge outfall structure, and will be offset by a Fish Habitat Compensation Agreement. Within a few metres of the outfall structure, water quality guidelines for the protection of freshwater aquatic life will be met or the changes will be within natural variability and therefore water quality impacts will not be significant. Since Project-related impacts are not predicated to be measurable, this Project would not add to the effects of other projects occurring in the Saskatchewan River and cumulative effects are not predicted to occur.

There are no linkages beyond the Project downstream in the Saskatchewan River and thus no cumulative effects to aquatic resources resulting from the Project are predicted.

9.4.8 Vegetation and Plant Communities

Reasonably foreseeable projects in the region include on-going exploration activities, further mining of kimberlite bodies, and forest harvest activities. Forest harvest is the most easily quantified future activity at present and is discussed below. Exploration and mining cannot easily be quantified at this time, but if they do occur are likely to clear additional areas within the LSA and RSA and may raise the impact magnitudes beyond their currently assessed level. Other characteristics of potential impacts (e.g., frequency, duration, reversibility, etc.) would likely remain similar to those described in Table 6.3.2-11.

Linkages with potential interactions for vegetation carried forward for inclusion in the determination of incremental effects include:

- an incremental increase in the loss of vegetation and wetlands due to planned logging;

- the potential incremental loss of rare plant species and historically used species due to planned logging;
- an incremental temporary (prior to reclamation) increase in the loss of vegetation due to exploration drilling;
- the potential incremental loss of rare plant species and historically used species due to exploration drilling;
- an incremental increase in the loss of vegetation and wetlands due to development of additional kimberlites by Shore; and
- the potential incremental loss of rare plant species and historically used species due to the development of additional kimberlites by Shore.

9.4.9 Wildlife and Habitat

The Project wildlife impacts were assessed in comparison to baseline conditions, and for residual impacts, following mitigation. The contribution of the residual impacts of the Project to regional cumulative effects was then assessed. A summary of this impact assessment is provided in Table 6.3.3-20.

Cumulative effects were only assessed where:

- the Project-specific residual effect has a measurable or demonstrable effect on wildlife; and
- the Project-specific residual effect does or is likely to act in a cumulative fashion with the effects of other past, present, or likely future projects and activities.

Adverse effects on habitat availability may be expanded spatially and temporally by exploration drilling, development of additional kimberlites and logging in the RSA.

9.4.10 Environmental Health

Effects on environmental health from the Project will be largely local in extent and limited to water quality in the Water Management Reservoir. This water will be discharged to the Saskatchewan River through a diffuser. Quantitative modelling indicates Saskatchewan objectives and CCME protection of freshwater aquatic life guidelines will be met or will be within natural background variation within a few metres downstream of the outfall.

No linkages with potential interactions for environmental health were carried forward for inclusion in the determination of incremental effects.

9.4.11 Biodiversity

The CEA on biodiversity differs from the Project effects assessment in that a comparison to baseline is not used to assess cumulative effects. Instead the assessment is based on the



sum total of changes within the CEA case (i.e., the total amount of alteration in the RSA as compared to an original or pristine condition when there would have been no anthropogenic influences).

The cumulative effects assessment considers two important statistics to assess effect ratings and significance:

- the total regional change from pristine conditions, is used to determine if there are cumulative effects, in comparison to established thresholds, guidelines, or as discussed qualitatively; and
- the relative project contribution to these effects assesses significance of the effect for the Project.

The assessment of cumulative effects and significance is based on the residual Project contribution to the effect, using results from the conceptual reclamation case (Residual Case). As with the Project effects assessment, the cumulative effects assessment then considers whether an effect on biodiversity (species) is likely. If the effect is not likely, the assessed cumulative effect is low and not significant.

Biodiversity CEA is based on quantitative spatial data within the RSA. While some future regional activities have been proposed, none are at a state that a future residual spatial impact can be determined. Thus, the CEA case for biodiversity is the same as the Project Case.

The following biodiversity measures were rated as negligible to low and not carried forward to the CEA:

- LVC1: Landscape composition;
- LVC2: Landscape intactness;
- LVC3: Landscape spatial structure;
- HVC1: Habitat composition;
- HVC2: Habitat structure;
- HVC3: Habitat intactness;
- SVC1: Species at risk;
- SVC2: Species richness; and
- SVC3: Regulatory/culturally important species.

Cumulative Effects on SVC4: Native Species Diversity

Impact assessment on SVC4 determined that the residual increase in habitats at high risk for invasion by non-native species in the RSA was moderate, and thus an assessment of

cumulative effects was warranted. The assessment of SVC4 focussed on areas at risk for invasion by non-native species (Table 9.4.-1). The cumulative area at high risk is predicted to have increased 104% from the pristine RSA area, which had no disturbed areas. The risk from non-native plants will be mitigated by the implementation of a weed management plan. The cumulative effect rating is therefore moderate but the relative Project contribution is low. The effect is considered not to be significant.

Table 9.4-1: Cumulative Effects on Areas at Risk from Non-native Species

| Project Area (ha) | Pristine Area at Risk (ha) | Residual CEA Case Area at Risk (ha) | Cumulative Changed Area at Risk (ha) | Cumulative Percent Altered | Relative Project Contribution |
|-------------------|----------------------------|-------------------------------------|--------------------------------------|----------------------------|-------------------------------|
| High | 5,143 | 10,463 | +5,320 | +103.5 | 33.2 |
| Medium | 48,744 | 47,044 | -1,700 | -3.5 | 2.3 |
| Low | 78,882 | 75,262 | -3,620 | -4.6 | 3.2 |

Linkages with potential interactions for biodiversity carried forward for inclusion in the determination of incremental effects include SVC4. Native Species Diversity.

9.4.12 Social and Economic Effects

This Section discusses the extent to which certain Project-related socio-economic effects overlap temporally with other projects or initiatives taking place in the region in a corresponding timeframe as the Project. As outlined in Section 6.4.1.4 socio-economic effects assessment is inherently cumulative, because it is based on projections of social and economic conditions which are not usually project-specific. Instead, the VCs respond to cause-effect relationships that result from a broad combination of coincident influences, of which the Project changes are only one.

As shown in the major projects list in Table 5.4.1-6, there are a number of capital projects in addition to this Project in various stages of development within the SRSA. To the extent that certain of these projects may occur in some parallel timeframe with this Project, there may be competition for local labour and increased need to bring labour in to the region to meet multiple project needs. Two of the listed projects (an ethanol plant and the proposed Pehonan Dam on the Saskatchewan River) account for 88% of the possible future project construction spending in the CEA Study Area and thus would have the largest influence on Shore's ability to access local labour in the event of project concurrence. However, at the time of writing, neither of these projects has yet submitted a firm project proposal to provincial or federal authorities, accordingly, it is unlikely that work on either of these projects will proceed until after the construction work on the Project has commenced or been completed.



To the extent that there is some concurrence of construction schedules with other major projects in the area, there may be cumulative socio-economic effects associated with the need to bring in additional labour from outside the SRSA. This would lead to further economic growth and employment and income benefits. It could also lead to growth in local housing markets, an increased concern about housing demand outstripping supply, the need for new home and residential land development, and the increased potential for the presence of transient populations in communities near the mine site. In addition this growth could lead to increased general traffic on the roads within the SRSA and the potential for increased traffic-related noise and safety concerns. Increased employment and income that may come with multiple capital intensive projects being constructed at the same time could increase potential well-being of the regional population but could also exacerbate the potential for increased adverse social effects in the short-term. It could also lead to concerns about the capacity of general services and local municipal infrastructure to meet the needs of a growing population but would generate additional revenues to address these demands.

Since most of these issues are beyond Shore's direct control, they would need to be monitored and addressed where required in collaboration with key local government, community and other industry stakeholders as outlined in Section 5.14.6.5 – Shared Responsibility.

The socio economic assessment uses a larger, less specific major projects list for the CEA than does the bio-physical assessment. Potential linkages acting in combination with economic and social residual effects were taken into consideration, to the extent available information allows, in the Project specific effects assessment Section 6.4.1.

9.4.13 Traditional Knowledge and Traditional Land Use

Aboriginal communities indicated that their Traditional Land Use (TLU) within the LSA and RSA included hunting, vegetation harvest, timber harvest, fishing, and cultural use. Planned forestry activity is likely to occur within the region and will potentially act in combination with the Project to impact vegetation and wetlands. A total of 1,165 ha of harvest was to occur in 2010 in the FaIC forest, and a projected 2,202 ha by 2014 (the extent of the planning horizon). Future forest harvest may also affect known rare plant locations, however, vegetation types were rated for their potential to support rare or historically used species with data which was collected while forestry activities had already occurred on the landscape. In this way, the rankings established for rare and historical use plant potential already was factored into forest harvest activities.

The anticipated cumulative effects on wildlife are positive, neutral or not significant for assessed parameters.



There are no anticipated cumulative effects on fishing as the only recreational fishing in the Project area occurs in the Saskatchewan River and will not change as a result of the Project. Employees and contractors will not live on site (except during the construction period) and thus any population increases will be spread among nearby communities. It is not possible to predict how many of the additional people from outside the Project employment catchment area will recreationally fish but the number is likely to be negligible to small and thus the incremental effects on recreational fishing in the Saskatchewan River are likely to be minor. A normal practice of government when recreational fishing increases toward or beyond the carrying capacity of the environment is to place restrictions on the activity and it is reasonable to assume SMOE would act in a similar manner, if this were to occur here.

As indicated in the vegetation CEA (9.4.8), cumulative effects of logging through physical disturbance and changes to access will be not significant.

A moderate concentration of traditional land use around the LSA and to the south of the Saskatchewan River was identified in Section 5.4.2, and as such, projects or activities outside of the LSA may not have a noticeable impact on TLU in the RSA. However, TLU will likely be displaced from the LSA into surrounding areas, as access to the mine site will be restricted due to safety and security concerns.

In summary, cumulative effects on traditional land use as it is currently understood will be not significant.

Any human activity or project on land that is used for traditional activities by Aboriginal peoples have the potential to also interact with the Project. However, no substantial linkages were identified with potential interactions for TLU and Traditional Knowledge (TK) that needed to be carried forward for inclusion in the determination of incremental effects.

9.4.14 Non-traditional Land Use

The hypothetical Pehonan Dam, ongoing commercial timber harvesting in the RSA, and future mining were identified as possibly contributing to cumulative effects. The cumulative effects for physical disturbances, changes to access, and non-consumptive recreational use were all determined to be not significant:

- Disturbance: Cumulative disturbance is determined to be a low, negative, regional, long-term and continuous effect stated with moderate confidence given the low number of planned developments in combination with the uncertainty of foreseeable other development schedules, development locations and footprints;
- Access: Cumulative access development is considered low in magnitude, regional, long-term, and continuous. This is stated with moderate confidence given the uncertainty of foreseeable other development schedules and extents; and



- Non-consumptive land use: The cumulative effect of improved access on outdoor recreation opportunities will be positive overall, low in magnitude, long-term, regional and continuous. Additionally, the cumulative effect of visual and noise disturbances and safety issues is considered to be low in magnitude, regional, long-term and continuous.

9.4.14.1 Disturbance

In order to assess cumulative disturbance effects, Project disturbance is placed in context with other existing or approved and planned project and infrastructural disturbances in the RSA. The Project footprint's disturbance was determined to be low in magnitude at the level of the RSA. When placed in the context of planned land and resource use this will result in an additional reduction of available land base for non-traditional land uses (hunting, forestry, outdoor recreation and related activities). This is determined to be a low, negative, regional, long-term and continuous effect stated with moderate confidence given the low number of planned developments in combination with the uncertainty of foreseeable other development schedules, development locations and footprints.

9.4.14.2 Access

The planned and existing industrial developments and continued land and resource use within the RSA will contribute cumulatively to access development. Planned development in the form of access could include the addition of seismic cutlines and utility and pipeline corridors and right-of-ways which could open up areas for recreation and consumptive uses (all terrain vehicle use, snowmobiling, non-motorized recreation, hunting, fishing and related activities). Similarly, additional access could facilitate the increase of industrial uses such as forestry and industrial and commercial land uses within the RSA.

9.4.14.3 Non-Consumptive Recreational Use

The creation of additional and improved access in the RSA will provide greater access for non-consumptive recreational use. However, it is not known how many non-consumptive recreation enthusiasts will perceive and subsequently act on an increase in access in the RSA resulting from linear developments.

Visual and noise disturbances and safety issues created by the Project could interact with other activities in the region to negatively affect outdoor recreational users and their associated activities. However, given the low number of planned developments and activities in the region, combined with uncertain schedules, locations and footprints, the cumulative effect is considered to be low in magnitude, regional and long-term but continuous.

Linkages with potential interactions for non-traditional land use carried forward for inclusion in the determination of incremental effects include:



- increased land disturbance due to exploration drilling; and
- increased land disturbance due to forestry activities.

9.4.15 Visual and Aesthetic Resources

No linkages were identified with potential interactions for visual and aesthetic resources that needed to be carried forward for inclusion in the determination of incremental effects.

9.4.16 Human Health

Linkages with potential interactions for human health carried forward for inclusion in the determination of incremental effects include an incremental increase in injuries because of an increase in traffic associated with the logging of the provincial forest, mineral exploration activity and recreational activity that may share routes with the Project-related traffic on rural roads.

9.4.17 Heritage Resources

No cumulative effects on heritage resources are expected given standard mitigation and management practices, which require surveys and identification of heritage resources prior to new land disturbance and avoidance or other mitigative measures for those deemed significant.

9.4.18 Summary of Project Residual Effects Overlapping Spatially and Temporally with Future/Foreseeable Human Activities

The residual Project effects and overlapping human activities carried forward for assessment in the determination of incremental effects below are provided in Table 9.4.-2.



Table 9.4-2: Cumulative Effects Summary

| VC/Regional Cumulative Effect | Linkage | Regional Significance |
|---|--|-----------------------|
| Climate and Air Quality | | |
| Cumulative effects low | No assessment required | No |
| Noise | | |
| Cumulative effects negligible | No assessment required | No |
| Hydrology | | |
| Cumulative effects negligible | No assessment required | No |
| Hydrogeology | | |
| Cumulative effects low | No assessment required | No |
| Surface Water Quality | | |
| Increased length of water discharge from the site | Additional kimberlites mined by Shore | No |
| Terrain, Soils and Geology | | |
| Moderate alteration of landscape from baseline condition | Logging, mining exploration and expansion | No |
| Fisheries and Aquatic Resources | | |
| No residual effects beyond the outfall structure | No assessment required | No |
| Vegetation and Plant Communities | | |
| Moderate incremental increase in loss of vegetation and wetlands Moderate incremental loss of rare plant species and historically used species | Logging, mining exploration and expansion | No |
| Wildlife and Habitat | | |
| Moderate change in habitat availability | Logging, mining exploration and expansion, increased traffic in area | No |
| Environmental Health | | |
| Low cumulative effects | No assessment required | No |
| Biodiversity | | |
| Moderate magnitude effects are possible to native species diversity | Logging, mining exploration and expansion | No |
| Social and Economics | | |
| Mostly positive; some increase in pressure on services | Discussed in Socio-Economic Effects assessment (Section 5.10). Summary provided in Section 5.18.5. | Positive |
| Traditional Knowledge and Traditional Land Use | | |
| No cumulative effects | No assessment required | No ¹ |
| Non-traditional Land Use | | |
| Both increase and reduction in recreational activities Increase in land disturbance | Increased traffic along upgraded access road associated with recreational use Logging, mining exploration and expansion | No |



| VC/Regional Cumulative Effect | Linkage | Regional Significance |
|--|--|-----------------------|
| Visual and Aesthetic Resources | | |
| Cumulative effects low | No assessment required | No |
| Human Health | | |
| Incremental increase in injuries negligible to low | Increased traffic along access road | No |
| Heritage Resources | | |
| Negligible residual effects | Surveys are required before new disturbance; significant artefacts are curated | No |
| | | |

Note: ¹Based on the information acquired to date.

9.5 MITIGATION, MONITORING AND MANAGEMENT STRATEGIES

Cumulative incremental effects associated with human activities and projects that overlap spatially and temporally in combination with the Project are predicted to be primarily limited to the following:

land disturbance associated with planned forestry activities, exploration activities and potential expansion of mining activities;

- extension of the limited water quality effects on the Saskatchewan River from mining of additional kimberlites and continued discharge of treated water from the site;
- potential increase in traffic injuries from increased use of the public portion of the access road (Shipman Trail); and
- continued government revenues from the Project as well as employment and contract benefits.

Mitigation measures associated with increased accessibility of the upgraded/paved Shipman Road will be associated with educating the public using the road for recreational purposes that the route is frequently used by logging and traffic. Signage will be posted that provides guidance regarding measures to avoid conflicts (i.e., turn around locations and speed limits).

Discharge of water and the Saskatchewan River receiving environment will be closely monitored both with water chemistry sampling and aquatic effects sampling, and action will be taken if concentrations of discharged substances is significantly greater than predicted by modelling, or, if aquatic effects monitoring indicates chronic effects that can reasonably be ascribed to the Project treated water discharge.



Land disturbance will be minimized to the extent possible during all mining, logging and exploration activities as required by the permitting agencies. Detailed closure, reclamation and revegetation/reforestation plans will be implemented where necessary taking into consideration local land use plans.

The Project may continue to provide government revenues and employment and contract benefits beyond the timeframe originally proposed if all future developments are completed.

9.6 LEVEL OF CERTAINTY

Other human activities are currently being conducted in the area and would be expected to continue into the future to some degree. The future foreseeable projects described in the CEA have several unavoidable inherent uncertainties due to the following:

- detailed project descriptions are not available;
- approval date and/or specific temporal and spatial boundaries are unknown; and
- economic drivers change.

9.7 LIMITATIONS

The CEA was prepared following a detailed review of the information publicly available at the time of report preparation. Some of the information included in this report was based, in part, on the publicly available information provided by others.

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