



Environmental
Assessment Office

Amendment Application Information Requirements

Orca Sand and Gravel Project Amendment

Proposed by:
Polaris Materials Corporation

October 2017

Pursuant to the Environmental Assessment Act, S.B.C. 2002, c.43



PREFACE TO THE AAIR

The Amendment Application Information Requirements (AAIR) specifies the information that Polaris Materials Corporation (Polaris) and the Orca Amendment (the Proponent) is required to provide in their Application for an amendment in accordance with section 19(1) of the *British Columbia Environmental Assessment Act* (BCEAA) to their existing Environmental Assessment Certificate for the Orca Sand and Gravel Project (EAC # M05-01). The information will also be used to support a proposed amendment to the Orca *Mines Act* Permit.

The Proponent is proposing a minor amendment to its existing EA certificate to develop a small additional aggregate pit [Orca amendment] (the proposed Project), as described below, to enable the Orca Quarry to operate as intended, and to allow its associated benefits to continue. The proposed Project involves the addition of a small pit for a basic 250,000 mta aggregate source located in a previously disturbed site with low environmental values (i.e. a recent clear-cut by Western Forest Products [WFP]). The proposed pit is located approximately three km south from the company's Orca quarry, near Port McNeill, BC on Vancouver Island. The footprint of the proposed pit, associated stockpile in the clear-cut, and haul road is approximately 25 ha, or about ten percent of the size of the footprint assessed during the Orca Sand & Gravel environmental assessment. The proposed amendment is envisaged as a conventional drill/blast/primary crush operation. No other processing is anticipated. Primary crushed product will be trucked along a new haul road, located approximately 600 m away from the Cluxewe River, to the Orca processing facility for secondary crushing.

Aggregate quality analysis demonstrates a high standard construction material suitable for use in asphalt and concrete products for both cold and warm weather climates. Aggregates are the principal constituents of all forms of concrete and asphalt and their wide range of applications makes them fundamental to the construction of homes, highways, schools, hospitals and other infrastructure. The proposed amendment is urgently required to enable the company to offset the effects of increasing sand content at the Orca quarry.

Since the location of the proposed amendment is not currently captured in the EA certificate, it is subject to a provincial EA review under Section 19 of the Act even though the amendment is well below the Reviewable Projects Regulation (BC Reg 370/02) threshold of the Act.

The proponent is also seeking a related minor amendment under its *Mines Act* permit (G-225) under general condition #2 of its *Mines Act* permit for a minor amendment. Specifically, Polaris is seeking a standard "Departure from Approval" as described in condition #2 of its permit and in accordance with Section 10.1.11 of the *Health, Safety and Reclamation Code for Mines in British Columbia*.

Based on the current design, provincial and federal permits are expected to potentially include:

- a routine Explosives Storage and Use Permit from the Mines Inspector (provincial) and possibly a permit under the federal *Explosives Act*;
- a provincial Occupant Licence to Cut to remove any remaining trees in the development area;
- provincial (*Water Sustainability Act*) and possibly federal (*Fisheries Act*) permits for new road crossings; and
- a provincial Road Use Permit for construction, use, and maintenance of the new haul road.

Discussions with the Canadian Environmental Assessment Agency have confirmed that the Canadian Environmental Assessment Act (CEAA 2012) is not applicable and thus a federal environmental assessment is not required.

List of Reviewing Agencies

It is expected that the following Aboriginal Groups, government agencies, municipal and regional agencies, and the public will have the opportunity to review and comment on the proposed Amendment.

Aboriginal Groups:

- Kwakiutl Band
- 'Namgis First Nation

Provincial Agencies:

- EAO
- Ministry of Environment (MOE)
- Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO)
- Ministry of Energy and Mines (MEM)

Federal Agencies:

- Department of Fisheries and Oceans

Municipal and Regional Agencies:

- Regional District of Mount Waddington

To date there has been strong local support and engagement from First Nations and local government.

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TABLE OF CONCORDANCE

A Table of Concordance will be included in the Amendment Application. The Table of Concordance will demonstrate where the requirements in the AAIR are found in the Application, with volume, section, and page references and following the format of **Table 1**. A well-constructed Table of Concordance will assist in a timely evaluation of the amendment application to determine whether the application contains the required information.

Table 1: Example Table of Concordance between AAIR and Amendment Application

AAIR Section & Page No.	AAIR Title	AAIR Section Language	Amendment Application Section Title	Amendment Application Volume Section, Sub-Section, Page Number	Relevant Appendix (if appropriate)

ABBREVIATIONS AND ACRONYMS

AAIR	Amendment Application Information Requirements
ANFO	Ammonium Nitrate Fuel Oil
BC	British Columbia
BCEAA	<i>British Columbia Environmental Assessment Act</i>
CEAA	<i>Canadian Environmental Assessment Act</i>
EA	Environmental Assessment
EAO	Environmental Assessment Office (British Columbia)
FISS	Fisheries Information Summary System
FTE	Full-Time Equivalent
ha	Hectare
km	Kilometre
masl	Metres above sea level
MFLNRO	Ministry of Forests, Lands and Natural Resource Operations (British Columbia)
MOE	Ministry of Environment (British Columbia)
MEM	Ministry of Energy and Mines (British Columbia)
mta	Metric tonnes per annum
NOx	Nitrogen Oxides
NRCan	Natural Resources Canada
PM	Particulate Matter
PY	Person Year
SO ₂	Sulfur Dioxide
TEK	Traditional Ecological Knowledge
TFL	Tree Farm Licence
VC	Valued Component
WFP	Western Forest Products

AMENDMENT APPLICATION SUMMARY

The Amendment Application will include a summary, including the following:

- A summary of the proposed Project including the project scope, project benefits and applicable permits;
- A brief overview of the amendment process;
- A brief overview of consultation approaches with Aboriginal groups, the public and government agencies to date;
- A summary of the key issues raised by Aboriginal groups, the public and government agencies;
- A summary of key adverse effects on Aboriginal Interests and mitigation measures;
- A summary of key effects, proposed mitigation measures and potential residual and cumulative effects on Valued Components; and
- Proponent's conclusions regarding the potential for the amendment to result in any significant adverse residual effects on Valued Components.

Amendment Application Information Requirements

Part A - Introduction

PART A - INTRODUCTION

1.0 OVERVIEW OF PROPOSED PROJECT PROPONENT DESCRIPTION

The Amendment Application will:

- Describe the Proponent, including history, type of company or organization, affiliations;
- Provide contact information for the Proponent; and
- Include a list of parties involved in the preparation of the Amendment Application, their qualifications, and the section(s) for which they were responsible.

1.1 Description of Proposed Project

A brief description of the proposed Project is provided in the Preface to the AAIR. Additional details are provided below.

The Amendment Application will:

- Describe the purpose of the proposed amendment from the perspective of the Proponent, and identify whether the objectives of the proposed Amendment relate to any broader private or public sector policies, plans, or programs;
- Describe the location of the proposed amendment and the latitude and longitude coordinates of the site and include maps showing both regional context (identifying nearby communities and geographic features) and the specific location of the proposed project;
- Describe the location of the proposed amendment relative to Aboriginal groups' asserted traditional territories, and/or Treaty Nation territories;
- Describe all phases of the proposed amendment, including their duration and proposed scheduling;
- Describe all on-site and off-site components associated with the proposed amendment, with figures, such as:
 - Surface extraction area:
 - Summary of proposed quarry wall designs, design standards, and geological and hydrogeological considerations related to quarry walls; and
 - Description of proposed approaches for water management.
 - Quarry infrastructure and support facilities:

- Overburden stockpile area;
 - Product stockpile area;
 - Plant site (primary crushing);
 - Product transportation route (new haul road);
 - Fuel storage; and
 - Explosives storage (explosives storage will meet NRCAN requirements and applicable regulations).
- Describe the activities associated with the components and phases of the proposed amendment, with figures;
- Discuss the relevant history of the proposed amendment, including exploratory, investigative history, or operational history at the Orca Quarry;
- Describe the production schedule of the new quarry;
- Summarize existing and planned land and marine use that overlaps or may be potentially impacted by the proposed Project components and activities, including, as appropriate:
 - Land ownership [e.g. private land, provincial Crown land, federal land (including Indian Reserves), Aboriginal title];
 - Local government zoning or plans;
 - Tenures (municipal, provincial, federal), licences, permits or other authorizations;
 - Non-tenured current land uses;
 - Current and planned marine use plans;
 - Provincial land use plans (e.g. Land and Resource Management Plans) and provincial land use designations (e.g. Agricultural Land Reserve, Old Growth Management Areas, Forests and Range Practices Act designations) and provincial land use management objectives;
 - Any other development or activities, whether or not directly related to the proposed Project;
 - Maps showing location of other uses referenced above in relation to the proposed Project; and
 - References to the Amendment Application section that assesses land use and potential overlaps/impacts in more detail.
- Describe the project's economic benefits;

- Capital construction cost estimates, including:
 - Breakdown of costs (e.g., land, buildings, equipment) associated with the proposed Project;
 - Estimated operating costs over the life of the proposed Project, including breakdown of costs by category (e.g., labour, supplies and materials, administration); and
 - Estimated costs for decommissioning/closure/abandonment/reclamation.
- Employment estimates including:
 - Direct employment to be created, by job category by project phase, in number of person year (PY) jobs for construction and decommissioning and full-time equivalent (FTE) jobs for operations. Direct employment estimates will be broken down into full-time, part-time and seasonal job categories;
 - Average wages, by major job category, for the construction and operating periods;
 - Breakdown of jobs that will be filled from local, provincial, national or international labour markets;
 - Indirect and induced employment to be generated, by project phase; and
 - Information about an employment strategy, if any.
- Contractor supply services estimates including:
 - List of the major types of businesses/contractors to be used, broken down at the local, provincial, and national level, by project phase;
 - Value of supply of service contracts expected, by project phase; and
 - Information about a local purchasing strategy, if any.
- Annual government revenues, by type (e.g., income tax, licence rent, property tax, mineral tax) and jurisdiction (e.g., local, provincial, federal), for all phases of the proposed Project;
- Any benefits the project may have to the five pillars of assessment (Environmental, Economic, Social, Health and Heritage);
- All Canadian dollar estimates, which will be provided in real dollars, with an explanation of how they are measured (e.g., discount rates); and
- State all assumptions and references for the above information.

The following sections provide details regarding the proposed Proponent and Project:

1.1.1 Proponent Details

Polaris is a BC-based supplier of high quality construction aggregates to major coastal city markets in California, Hawaii and British Columbia. The Company has developed an integrated logistical chain of mineral resources, receiving port terminals and cost effective, contracted shipping that allows it to meet the need for replacement aggregate sources in markets where local resources are depleting and marine imported aggregates offer an increasingly viable alternative.

The Company operates the Orca Sand & Gravel Quarry, located on the northeast coast of Vancouver Island, near the community of Port McNeill, BC (**Figure 1**). The Orca Quarry was permitted in 2005. The approach used by Polaris for permitting, First Nations engagement and environmental assessment has been heralded as a model for the industry. Polaris and the Orca Project have won numerous awards for its leadership including:

- 2006 Mining and Sustainability Award;
- 2007 Prospectors and Developers Association of Canada e3 Award for Environmental and Social Responsibility;
- 2014 BC Export Award; and
- 2016 Stewart/O'Brian Safety Award for zero lost time.

1.1.2 Site History – The Orca Sand & Gravel Quarry

An EA Certificate (M05-01) was issued for the Orca Project on July 14th, 2005 and a *Mines Act* Permit (G-225) on July 28th, 2005. The project commenced production in early 2007 and the first shipment of sand and gravel departed for San Francisco in April 2007. The Orca Quarry is permitted to produce 6.6 million tons of sand and gravel per year and has a dedicated ship loading facility capable of rapidly loading ships and barges, including Panamax vessels with a capacity of up to 80,000 tons. The sand and gravel produced is of very high quality and exceeds all specification requirements for use in the United States, particularly in California, as well as in Canada.

At the Orca Quarry sand and gravel are collected using tractor scrapers and placed into hoppers which empty onto conveyors. From this point, the material travels through mechanical washing and screening processes before being placed into four stockpiles of finished product. Under each stockpile is a reclaim tunnel, with another conveyor, that is used to move the material to the ship loader. Mineral extraction occurs in phases, moving from north to south, with scheduling designed to enable progressive site reclamation.

The Orca Project is a major contributor of prosperity for First Nations and local residents. Polaris is pleased to be contributing to the BC Jobs Plan. The Project has contributed significantly to local employment through wages, contracts and use of local businesses. There has also been significant royalties to First Nation and local partners.

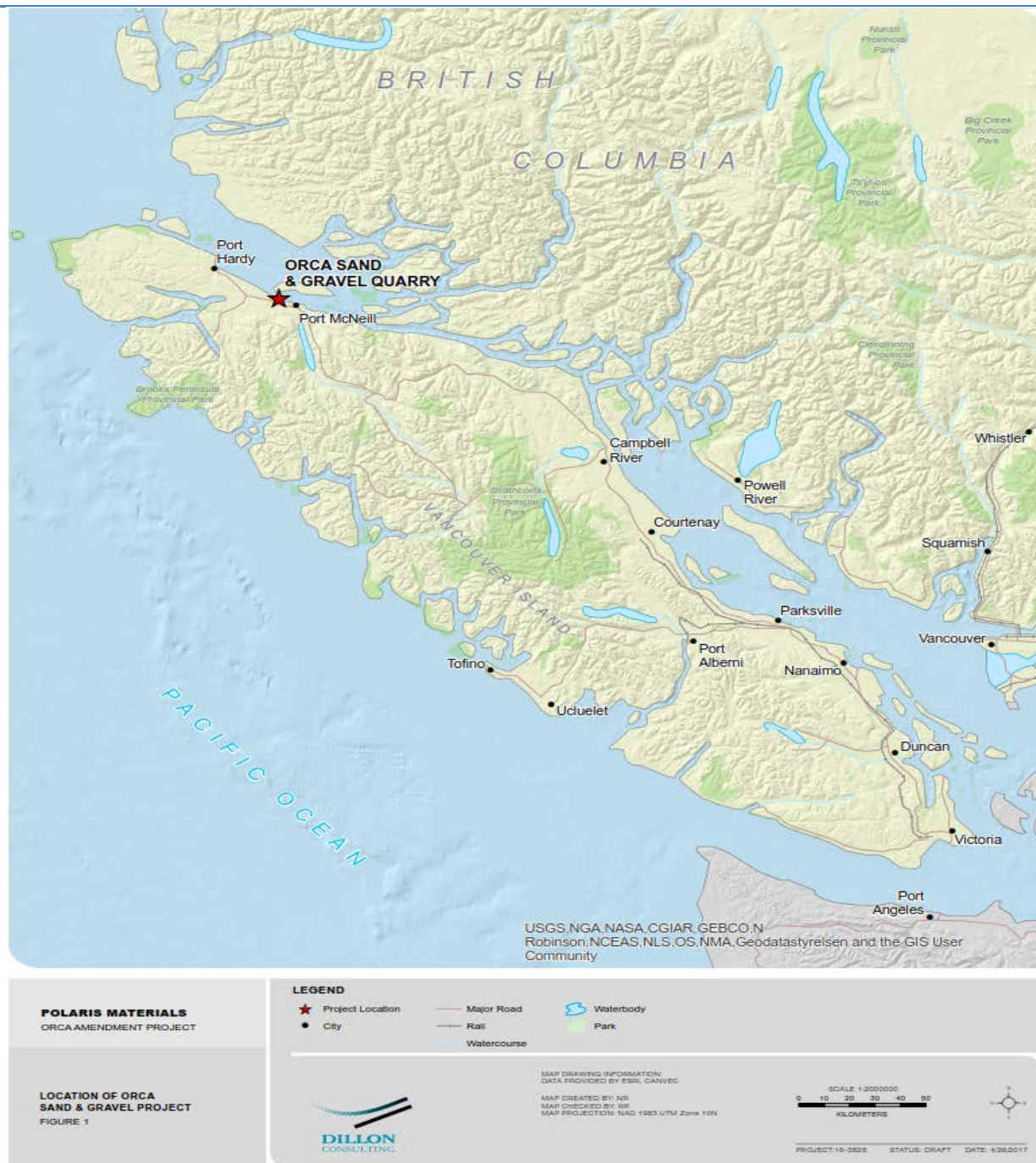


Figure 1: Location of the Orca Sand & Gravel Project

1.1.3 Amendment Description

The proposed quarry will be located within Licence of Occupation (LOO) V926148 which covers an area of approximately 706 ha of Crown Land. The proposed quarry would be located approximately six km south of Port McNeill and approximately three km southwest from the company's Orca quarry, and is accessible from both Highway #19 and a network of logging roads maintained by Weyerhaeuser and Western Forest

Products (**Figure 2**).

The proposed Project involves the addition of a small pit for a basic 250,000 metric tonnes per annum (mta) aggregate source located in a previously disturbed site with low environmental values (i.e., a recent clear-cut by WFP – **Photo 1**). Additional logging is also proposed by WFP in the project area. The footprint of the proposed pit, associated stockpile in the clear-cut, and haul road is approximately 25 ha, or about ten percent of the size of the footprint assessed during the Orca Sand & Gravel environmental assessment. (**Figures 2 and 3**).



Photo 1: Clear-cutting around the proposed extraction area.

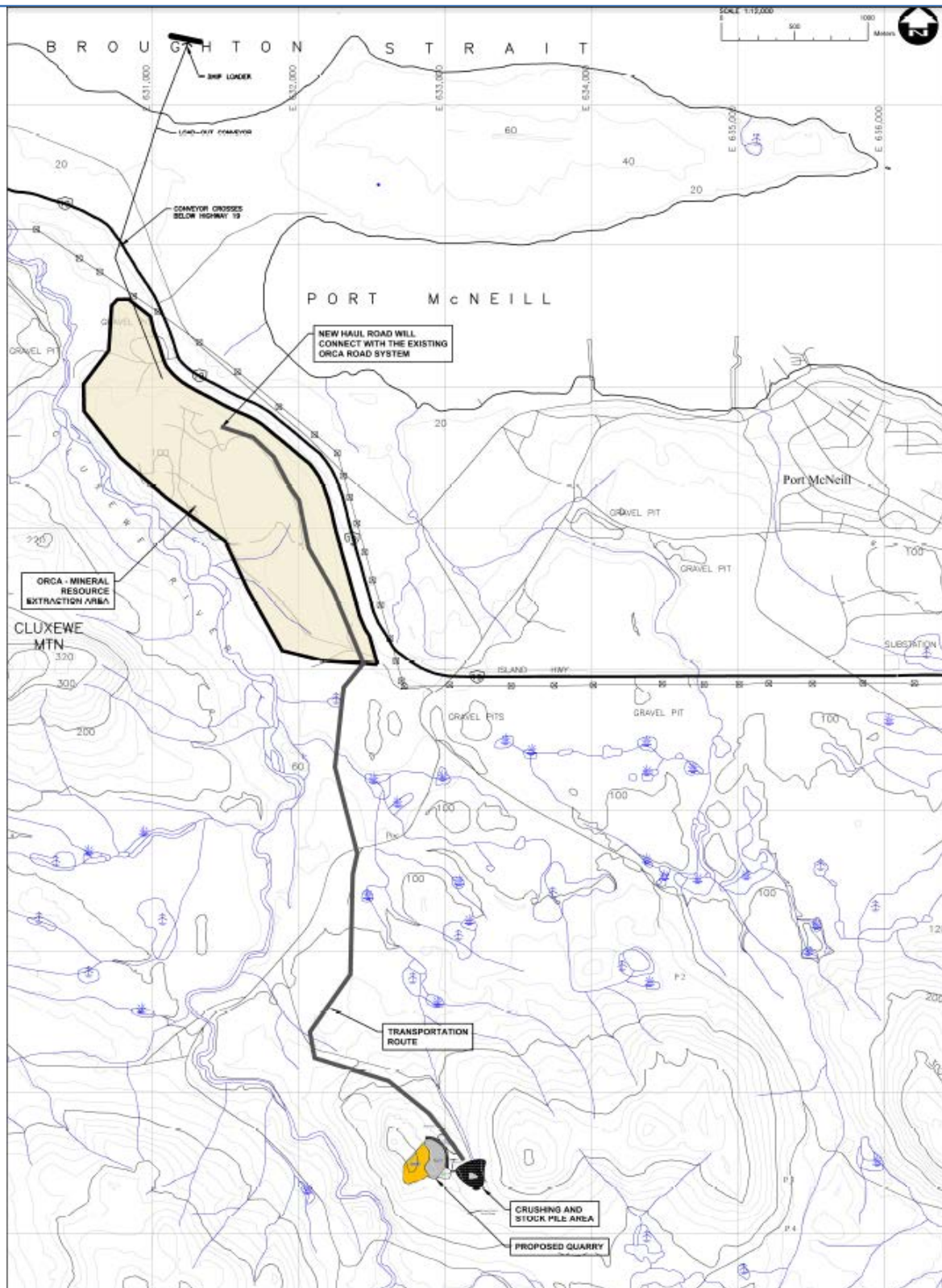


Figure 2: Location of the Amendment Area Relative to the Orca Sand & Gravel Project and Port McNeill

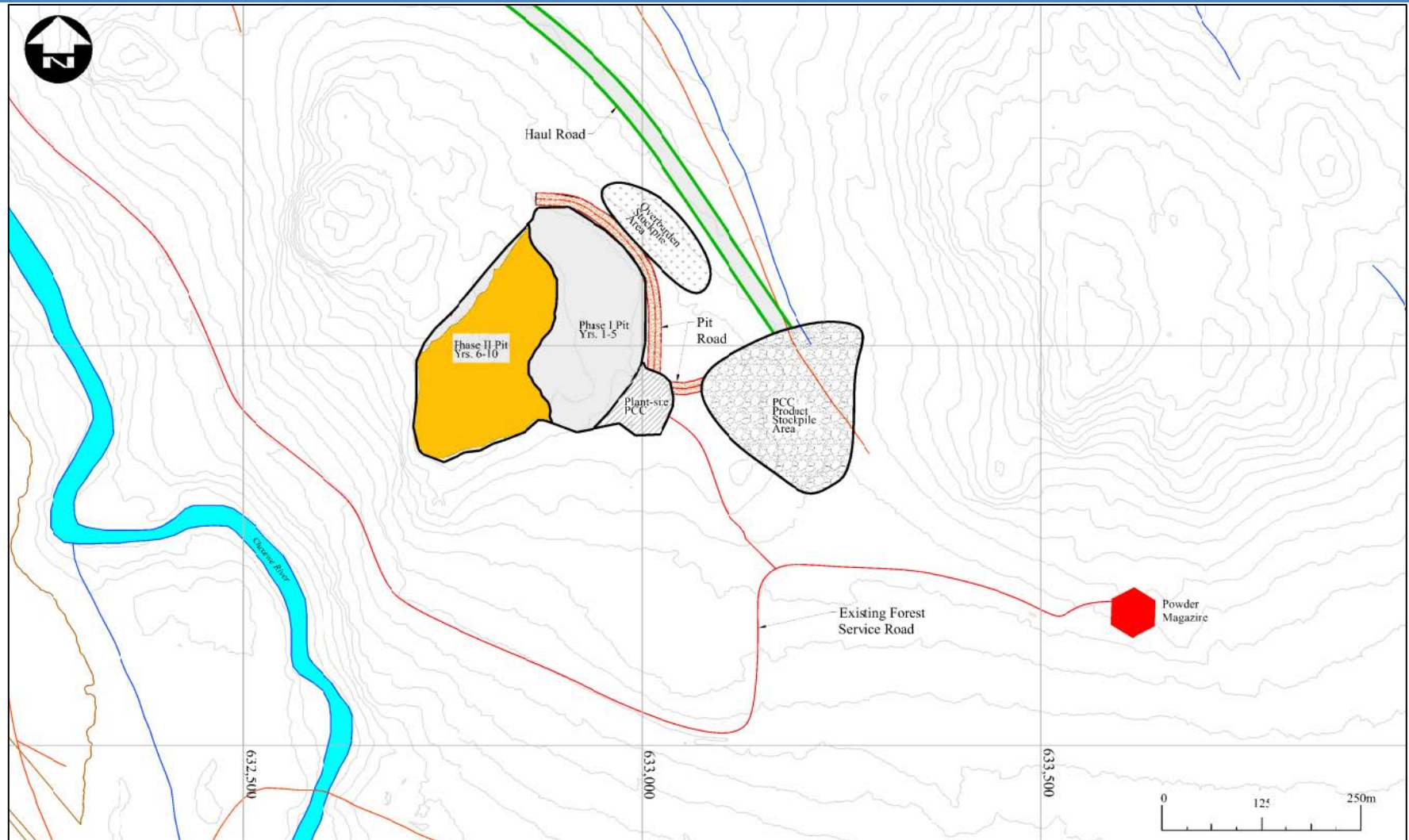


Figure 3: Preliminary Layout of the Proposed Quarry

1.1.3.1 RESOURCE

Initial analyses of the bedrock materials (Basalts) have demonstrated the material to be of a suitable quality to permit the production of various aggregate products to such as asphalt and concrete products. The geochemistry of the materials has been tested for their potential to develop acid rock drainage (ARD) and metal leaching potential. The materials have also undergone whole rock element analysis, both of which indicate that the proposed pit materials are benign to the environment and compatible with the current Orca plant product.

The deposit consists of a blend of three definable deposition environments within the Basalt, namely amygdaloidal, massive and fine grained.

1.1.3.2 PRODUCTION

Production is anticipated to utilize only physical processes, with onsite drilling, blasting, primary crushing (dry crush – no requirement for process water) and screening to a top-size of six inches. This material will be then transported year-round by truck on a dedicated road to the Orca plant for further crushing, sizing and washing, with no chemicals used in the process plant.

The site will operate for 60 ten-hour shifts (i.e., 60 days) per year at a plant production rate of 500 tonnes per hour. Activities will consist of overburden stripping, drilling and blasting. A 992-face loader equipped with a rock bucket will load blasted rock on 50 tonne rock trucks for transport to the portable crushing and screening plant. Overburden material will be stockpiled for use for site reclamation activities.

Aggregate will be extracted by blasting with ammonium nitrate fuel oil (ANFO). Blasting activities will be undertaken by a licenced local contractor and there will require approximately 60,000 kg of ANFO over the 60 day extraction period (1 tonne per shift). Blasting activities will require the storage of up to 5 tonnes of bagged ANFO and separate storage for primers and nonel (shock tube) detonators. A powder magazine will be required to store detonators and other associated blasting equipment. Over the 60 day production period it is expected that blasting will only be required every 2 days (i.e., a total of 30 blasts per year).

Development of the quarry is expected to progress from a pioneering operation top down from elevation 280m to 247 for Phase I (Years 1-5) and from 302 m to 269 m for Phase II (Years 6-10). After initial development of the upper benches a highwall will be developed for the continuation of Phase I and II. Overall design of pit slopes and bench dimensions will meet requirements of the *Health, Safety and Reclamation Code for Mines in British Columbia (2008)*.

The product stockpile area (**Figure 3**) will include separate areas for waste materials and for product for trucking to Orca.

1.1.3.3 INFRASTRUCTURE

Crushed material will be trucked from the stockpile year round to the Orca quarry using a dedicated haul road approximately five km in length (**Figure 3**). Initially it was thought that the existing forestry road network near the Cluxewe River would be suitable, with some upgrades, for transportation requirements. Under this initial scenario hauling schedules would be adjusted to minimize conflicts with logging traffic such that the company's hauling would occur at night and on the weekends. However, the primary user of the road, WFP, was concerned about shared access, due to safety considerations. Furthermore, these forestry roads near the Cluxewe River would require significant upgrades including widening and changes to watercourse crossings. The company is proposing to construct a new road located approximately 600 m away from the Cluxewe River to minimize potential for environmental impacts, and alleviate safety concerns regarding road use by WFP and potential conflicts with logging trucks. The dedicated haul road has an added public safety advantage of preventing potential impacts to recreational traffic which currently use the forestry road network (e.g. on the weekends). Trucking of material will occur, as required, to meet customer requirements.

The road will be constructed primarily using cut and fill methods, with material from the new pit (primarily from bulk sampling activities) being used as final road cover.

During the 60 days of operation per year site power to be provided by diesel generators.

1.1.3.4 ENVIRONMENTAL SETTING

1.1.3.4.1 Physical

Topography and Physiography

The site is located within the Coast Mountains and Islands physiographic region of British Columbia. This region, which includes Vancouver Island, consists largely of glacial landforms and erosion surface remnants. Property elevations range from 220 to 300 metres. Drainage features associated with the site are primarily limited to the Cluxewe River and its tributaries and small wetlands.

Climate

The Port McNeill area experiences cool moist weather, which is typical of northern Vancouver Island. Temperatures are generally mild throughout the year, and drop below freezing during winter, but only for short periods of time. The heavier rainfall period occurs from October to February. Environment Canada weather stations are maintained in Port McNeill, Alert Bay, and Port Hardy. Data collected at these stations include: temperature, precipitation, evaporation, wind speed and wind direction.

Geology

The Amendment Project area is underlain exclusively by Upper Triassic Age Karmutsen Formation basic Tholeiitic submarine basalts which are conformably overlain by Quatsino limestones to the north and are in fault contact with Upper Cretaceous Nanaimo group sandstones. The Nanaimo sediments are in turn

overlain by Quaternary sand and gravel deposits being mined at the Orca Sand and Gravel Quarry. The bedrock has been extensively modified by glaciers during the Pleistocene period. In general, most of the surficial material shown on the maps is related to the most recent glacial episode, the Fraser Glaciation, which occurred 9,000 to 25,000 years ago.

1.1.3.4.2 Terrestrial

The Project Area is situated within the Coastal Western Hemlock biogeoclimatic zone (CWHvm) – submontane variant (CWHvm1), the most common biogeoclimatic unit in the Vancouver Forest Region and found at low to middle elevations roughly between sea level and 900 metres above sea level (masl). The fluvial terraces of the Cluxewe River, west of the project area include Western hemlock, Amabilis fir, and Sitka spruce on the upper terraces and mostly red alders on medium to low terraces, where the disturbances are more recent.

The site is located within WFPs Tree Farm Licence (TFL) 39, and as such the majority of cut blocks of merchantable timber identified within the development area have been logged (**Photo 2**).



Photo 2: Representative photo of clear-cutting within the project area.

1.1.3.4.3 Aquatic

The Amendment area lies within the Cluxewe River Watershed, the same watershed assessed during the Orca EA. The Cluxewe River is 27.1 km long and drains northward into Broughton Strait. The watershed has an area of approximately 95 km² and has a long narrow north trending shape. The Cluxewe River supports significant runs of pink salmon, as well as small runs of Coho and chum salmon. Chinook and sockeye

salmon are also present but in very low numbers. Summer and winter run steelhead are also present in significant, but declining numbers. Fish are known to move well into the headwaters of the Cluxewe system.

Small tributaries and streams drain directly into the Cluxewe River often supporting fish populations. Cutthroat trout and Coho salmon have been collected in the stream at the Keogh Main road crossing during a previous study, however upper reaches are not fish-bearing according to the WFP database.

1.1.3.5 SOCIO-ECONOMIC SETTING

Traditionally, logging has provided the economic base of Port McNeill, but the Orca Sand & Gravel Quarry, as well as tourism and fishing are becoming larger employers to the community. These resources are supported by a diversity of other businesses such as restaurants, grocery and general stores. Within the community, there is an existing skilled resource-based industrial workforce.

The town of Port McNeill has government-supported recreational facilities such as a swimming pool and sports arena, and the community operates a volunteer fire department and a marina. Port McNeill is serviced by a ten-bed hospital equipped for emergency and provides trauma treatment prior to transfer to a higher medical facility.

1.1.3.6 FIRST NATIONS

The site is located on Crown Land, within the asserted traditional territory of the Kwakiutl Band and adjacent to the asserted traditional territory of the 'Namgis First Nations, where Orca Sand & Gravel has agreements for the operations of the Orca Quarry.

The Kwakiutl Band's traditional territory is bounded to the north by Nigei Island, to the west by Tyllai Creek, to the south by the Kilpala River, and to the east at Trinity Bay. The Band has the following reserves: Fort Rupert No.1, Kippase No.2, Shell Island No.3, Thomas Point No.5, Thomas Point 5A, Keogh No.6, Klickseewy No.7, Malcolm Island No.8, Walden No.9, and Wazulis No.14. The Kwakiutl Band has a community of approximately 300 residing in Fort Rupert.

The 'Namgis First Nation is located on Cormorant Island in the Johnstone Strait, south of Port McNeill. Reserve lands account for approximately 30% of Cormorant Island's land mass. Centred around Alert Bay and the Nimpkish Valley, the 'Namgis traditional territory extends both west and south from Port McNeill, covering 283,107 hectares. Within the territory are 6 provincial and marine parks and 4 ecological reserves.

Polaris has, and will continue to take, a proactive approach to consultations, consistent with their approach to developing the Orca deposit, and are currently in active information sharing with both the Kwakiutl Band and 'Namgis First Nations. Polaris has discussed the Orca EA amendment with the 'Namgis and the Kwakiutl since early 2016 and to date there has been strong local support and engagement by both groups. Polaris currently has an equity partnership with the 'Namgis and representatives participate on the Board of Directors. Polaris has Impact and Benefits Agreements (IBA) with both First Nations. These IBAs also stipulate a target employment level for each First Nation of 25% or a total of 50% of total Orca Sand & Gravel Employment. Currently total First Nations employment is at 47.6%. In addition to quarterly Board Meetings with the 'Namgis as an equity partner, quarterly IBA reviews are held with the Kwakiutl and quarterly Joint Human Resources Committee Meetings are held with the 'Namgis. Relations with both First Nations are excellent and constructive.

Polaris intends to meaningfully consult with both the Kwakiutl Band and 'Namgis First Nations regarding the proposed amendment and to uphold the commitments in the partnership agreements with both groups.

1.2 Applicable Authorizations

The Amendment Application will list in table format (see example below) all applicable licenses, permits and/or approvals that are already received or required for the proposed amendment, and the associated responsible regulatory body.

Table 2: Authorization Table

Name of Authorization	Statute and Authorizing Agency	Description Need for Authorization

1.3 Project Design and/or Alternative Means of Carrying out the Project

The Amendment Application will include:

- An assessment of the alternative means of carrying out activities proposed as part of the Amendment that are technically and economically feasible including, but not limited to, the alternatives identified in the AAIR; and
- The rationale and criteria used to select the proposed means of undertaking the proposed project.

1.4 Alternatives to the Proposed Amendment

The Amendment Application will include:

- An assessment of the alternatives to the proposed Project that were technically and economically feasible including, but not limited to, the alternatives identified in the AAIR.

2.0 PROVINCIAL ENVIRONMENTAL ASSESSMENT AMENDMENT PROCESS

The Amendment Application will include:

- A statement that the proposed amendment requires an amendment to the existing EA certificate subject to Section 19 of the Act;
- A statement that the Amendment Application has been developed pursuant to the AAIR approved by EAO and complies with any other relevant direction provided by EAO;
- A list of the government agencies and Aboriginal Groups that participated in the Amendment process; a summary of their participation; and, a list of the key issues raised by each party and the status of issue resolution. (The Proponent will cross-reference, as appropriate, other sections of the Amendment Application that deal further with consultation and issues raised); and
- A summary of public participation in the Amendment process, a list of the key issues raised, and the status of issue resolution (with cross-references, as appropriate, to other sections of the Amendment Application that deal further with consultation and issues raised).



Environmental
Assessment Office

Amendment Application Information Requirements

Assessment of Environmental Effects



PART B - ASSESSMENT OF ENVIRONMENTAL EFFECTS

3.0 ASSESSMENT METHODOLOGY

This section of the Amendment Application will describe the methods used to assess the potential adverse effects of the Project. In brief, in terms of the EA process, Polaris intends to re-examine the Orca Valued Components (VCs) for those that could *potentially* experience significant adverse effects due to the proposed amendment. Polaris also intends to re-examine all the candidate VCs screened during Orca to validate exclusion from the amendment or include as appropriate. In addition, consideration will be given to whether any new VCs should be included that would apply to the amendment area but not the Orca project area as originally assessed.

The effects assessment will:

- identify the VCs that are linked to the Orca Certificate for which significant adverse effects could potentially be caused by this amendment and assess the incremental change, as appropriate;
- identify, through consideration of the environmental setting of the amendment area and consultation with First Nations, whether any new VCs should be assessed specific to the amendment area;
- utilize the same effects assessment methodology as in the Orca EA, with the addition of cumulative effects assessment should there be any residual effects, to determine whether the proposed amendment is likely to result in any relevant significant adverse effect;
- be based on previous experience and practice and will include quantitative and qualitative analyses as well as expert professional judgment; and
- propose appropriate mitigative measures and monitoring to verify results where appropriate.

The assessment methodology will also consider the EAO's Guideline for the Selection of Valued Components and Assessment of Potential Effects (September 2013), as appropriate.

3.1 Issues Scoping and Selection of Valued Components

The initially identified VCs that have the potential to be significantly adversely affected due to the proposed amendment include:

- Air quality;
- Noise; and
- Cluxewe River salmonids.

The Amendment Application will include a VC screening table that summarizes all VCs (new and/or from the original Orca EA) that were considered, whether they were selected for the effects assessment or excluded, and the rationale for inclusion or exclusion. In addition, Polaris will seek information from the

potentially affected First Nations, as well as from other available traditional use information sources, as to their traditional use of the amendment area, if any, to assist in identification of potential new candidate VCs. For example, if a First Nation identifies that its members hunt, fish, or gather a particular species in the amendment vicinity, it will be considered for inclusion as a VC and will be described in the VC screening table. Similarly, if First Nations identify specific traditional uses in the amendment vicinity, and associated concerns over the experience of the traditional user and/or their ability to practice an asserted Aboriginal right or treaty right (e.g. visual quality, noise), those relevant VCs as they relate to these uses will be considered for inclusion in the effects assessment and described in the VC screening table in the Amendment Application.

A sample of what this VC screening table will look like is provided below (Table 3). The draft VC screening table will be provided to First Nations and the EAO for feedback in advance of submittal of the Amendment Application. Similar to the Orca EA, the rationale for the inclusion or exclusion of a specific VC in the detailed effects assessment will be based on a range of factors, such as:

- Input from First Nations, regulators and/or stakeholders
- Presence or absence of the candidate VC in the project area or vicinity
- Ecological role of the candidate VC
- Sensitivity of the candidate VC to disturbance
- Potential for interactions between the amendment activities and the candidate VC

Table 3: Example VC Screening Table

Candidate VC	Original Orca EA (January 2005)		Orca EA Amendment (2017)	
	Carried Through for Effects Assessment (Yes/No)	Rationale	Carried Through for Effects Assessment (Yes/No)	Rationale

Prior to selecting specific VCs for detailed evaluation, the Orca EA screened all potential VCs to ensure that all potential issues were addressed appropriately. The screening of VCs allowed the EA team to focus efforts on those issues that were potentially directly or indirectly impacted by the Orca project, factoring in input from regulators, First Nations, and stakeholders. As described above, as part of the amendment process the list of potential VCs will be re-screened to ensure the selection process is still valid and takes into consideration potential impacts from amendment related activities that could potentially result in a

significant adverse effect.

The Amendment Application will summarize the process and methodologies used to identify and select the VCs for assessment. The Amendment Application will also include the rationale for the final determination of whether considered VCs were included in or excluded from the effects assessment, in the form of a VC screening table, as previously described.

3.2 Assessment Boundaries

3.2.1 *Spatial, Temporal, Administrative and Technical Boundaries*

The Amendment Application will describe the methods used in identifying spatial, temporal, administrative and technical boundaries. Information on spatial, temporal, administrative and technical boundaries for specific VCs will be included in the appropriate VC sections of this document and will encompass all relevant project phases, components and activities. The Amendment Application will include the rationale for any differences in boundaries from those presented in the final AAIR.

3.3 Existing Conditions

For each VC, the Amendment Application will include: A description of the existing (or baseline) conditions within the study area in sufficient detail to enable potential project-VC interactions to be identified, understood, and assessed:

- A description of the quality and reliability of the existing (or baseline) data and its applicability for the purpose used, including any gaps, insufficiencies and uncertainties, particularly for the purpose of monitoring activities;
- Reference to natural and/or human-caused trends that may alter the environmental, economic, social, heritage and health setting, irrespective of the changes that may occur as a result of the proposed Project or other project and/or activities in the area;
- An explanation of if and how other past and present projects and activities in the study area have affected or are affecting each VC;
- Documentation of the methods and data sources used to compile information on existing (or baseline) conditions, including any standards or guidelines followed;
- Where additional project and VC-specific field studies are conducted, the scope and methods to be used will follow published documents pertaining to data collection and analysis methods, where these are available. Where methods used for the assessment deviate from applicable published guidance, the rationale for the variance will be provided in the Amendment Application; and
- Description of what Traditional Ecological Knowledge (TEK), including Aboriginal Traditional Knowledge, was used in the VC assessment.

The Amendment Application will contain the existing (or baseline) technical reports in the Appendices and will summarize key findings contained in these technical reports directly in the Amendment Application, in a manner that allows the reader to understand each VC's effects assessment.

3.4 Potential Effects

The Amendment Application will summarize the overall process and methodologies used to identify and assess the potential effects of the proposed Project on the identified VCs.

For each VC section, the Amendment Application will:

- Identify the potential interactions of the proposed amendment and the considered and selected VCs;
- Identify and describe the potential adverse effects resulting from the proposed amendment; and
- Demonstrate how feedback from Aboriginal Groups, the public, stakeholders and government agencies on VC selection and assessment was incorporated, as appropriate.

The Amendment Application will identify any project activity-VC interactions that were excluded from further assessment, including the methods and criteria used to justify the exclusion and input received from EAO, government agencies, Aboriginal groups and the public regarding the exclusion.

To support the identification of potential effects on VCs that may result from all phases of proposed amendment activities, a potential project effects matrix will be developed (see **Table 3** for an example). The matrix will identify the potential interactions between the various physical works and activities and the selected VCs.

Table 4: Potential Project Environmental Effects on Orca VCs

Project Components and Physical Activities	Potential Environmental Effects			
	Effect 1	Effect 2	Effect 3	Effect 4
Site Preparation and Construction				
Component or Activity 1				
Component or Activity 2				
Operation				
Component or Activity 1				
Component or Activity 2				
Decommissioning and Reclamation				
Component or Activity 1				
Component or Activity 2				

3.5 Mitigation Measures

For each VC section, the Amendment Application will:

- Describe the approach to identify and analyze mitigation measures, including any management and compensation plans proposed by the Proponent, which will be implemented to address potential effects;
- Describe the mitigation measures incorporated into the project, including site and route selection, project scheduling, project design (e.g. equipment selection, placement, emissions abatement measures), and construction and operation procedures and practices;
- Describe any standard mitigation assumed or proposed to be implemented, including consideration of best management practices, environmental management plans, environmental protection plans, contingency plans, emergency response plans, and other general practices;
- Clearly indicate how the mitigation measures will mitigate the potential adverse effects on the VC;
- Provide the rationale for the proposed mitigation measures, including why further avoidance or reduction measures for adverse effects may not be considered feasible, and the need for and scope of any proposed compensation or offset;
- Evaluate the anticipated success of each mitigation measure and describe rationale and analysis for these evaluations. If there is little relevant/applicable experience with a proposed mitigation measure and there may be some question as to its effectiveness, describe the

potential risks and uncertainties associated with use of the mitigation;

- Include the time required for mitigation to become effective, to enable understanding of the duration of residual effects and the temporal characteristics of reversibility; and
- Summarize the mitigation measures for potential Project effects by project phase and identify any mitigation measures that are in management or compensation plans.

3.6 Characterization of Residual Effects

In summary, the process and methodology proposed to characterize adverse effects is to utilize the same effects assessment methods as undertaken in the Orca EA, with the addition of cumulative effects assessment should any residual effects be predicted, to determine whether the proposed change is likely to result in any relevant significant adverse effect, as appropriate.

The Orca EA used the following criteria:

Magnitude: This criterion is intended to capture information related to the portion of the population potentially affected. It considers the percentage of a population and number of generations potentially affected by the impact, as well as a comparison of the impact with natural variation. It applies equally to all VCs.

Geographic Extent: Classes of geographic extent were chosen to approximately correspond to localized impacts ($<0.1 \text{ km}^2$) and impacts within the extraction area (1 km^2), the concession area (10 km^2), in the immediate vicinity of the project ($10 - 100 \text{ km}^2$), and the region ($>100 \text{ km}^2$). For Socio-Economic effects, the geographic extent is classified as local (within 5 km of the project), regional (North Island), national, and international.

Duration: Duration classes were chosen to reflect impacts of short duration (< 1 month), duration of construction (1 to 12 months), operation (1 to 30 years) and operations through post closure (>30 years).

Frequency: Frequency of impact reflects impacts occurring less than once a month, up to once a week, up to twice a week and continuous impacts.

Reversibility: The reversibility criteria examines whether the impact is reversible with the implementation of mitigative measures. Impacts are classed as either reversible (R) or irreversible (I).

Residual Effects: Classifications in these criteria included whether there are residual environmental effects that need to be addressed, even when mitigative measures have been implemented. Residual effects can be classified as either negative (-), or positive (+). No residual effects were classified as (N) no effect.

Confidence: This criteria examines how good the data and understanding of the specific VC is. It assesses the level of confidence that proposed mitigative measures will reduce/eliminate effects.

The Amendment Application will describe, in a table format, the residual effects using the residual effects criteria context, magnitude, extent, duration, reversibility, and frequency, as defined in EAO's Guideline for the Selection of Valued Components and Assessment of Potential Effects. Where feasible and relevant, these criteria will be described quantitatively in the Amendment Application for each VC. When residual effects cannot be characterized quantitatively, the Amendment Application will characterize these effects qualitatively. Definitions will be provided when qualitative terms are used.

The use of any qualitative terms (e.g. high, moderate, low, etc.) will be accompanied by distinct definitions for each of these rankings. An explanation will be included for the conclusion reached for each criterion used to characterize a residual effect.

If residual effects on a VC are determined and the VC is also considered a “pathway” for other potential effects on other VCs, the Amendment Application will identify the linkages between the VCs and the discipline-specific studies to which the information has been forwarded for further evaluation.

3.7 Likelihood

The Amendment Application will assess the likelihood for all residual adverse effects using appropriate quantitative or qualitative terms and sufficient description to understand how the conclusions were reached. Definitions of any qualitative terms, such as ‘low’, ‘moderate’, or ‘high’ probability will be provided.

3.8 Proponent’s Determination of Significance

The Amendment Application will present the process and methodology used to define and evaluate the significance of any residual effects, including how the term “significance” has been used in relation to each VC using quantitative and qualitative thresholds.

A determination of whether the proposed amendment is expected to result in significant residual adverse effects will be provided for each VC.

3.9 Confidence and Risk

The Amendment Application will summarize the process and methodology used to evaluate the levels of confidence associated with residual effects predictions and in particular, how any identified uncertainty may affect either the likelihood or the significance of any predicted residual effect. The Amendment Application’s consideration of confidence will factor in the post-Orca EA monitoring outcomes with respect to the accuracy of the original effects assessment predictions. The Amendment Application will also describe any measures to reduce uncertainty through monitoring, adaptive management or other follow-up programs.

The Amendment Application will summarize the process and methodology used to determine if additional risk analysis is required. If additional risk analysis is required, the Amendment Application will summarize the process and methodology used for this analysis and the conclusions, including the range of likely, plausible and possible outcomes with respect to likelihood and significance.

3.10 Cumulative Effects Assessment

The Amendment Application will assess cumulative effects on VCs for which residual Project effects are predicted.

3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities

The following development categories will be considered in the Amendment Application:

- Projects or activities that have already been built or conducted for which the environmental effects overlap with those of the proposed Project (i.e. certain);
- Projects that are either proposed (public disclosure) or have been approved to be built, but are not yet built, for which the environmental effects overlap the proposed Project (i.e. reasonably foreseeable);
- A preliminary list of past, present and reasonably foreseeable projects and activities that will, at a minimum, be included in the cumulative effects assessment, if required, are as follows:
 - Western Forest Products forestry activities (e.g., log sort area); and
 - Other (that may impact selected VCs [e.g., Port McNeill Enterprises – Concrete supplier to the west of Port McNeill]).
- A cut-off date of May 30th, 2017 is proposed for incorporating any new future developments in the cumulative effects assessment in the Amendment Application.

The Amendment Application will describe the methodology for identifying potential interactions between residual project effects and the effects of other developments, including a description of the following:

- The spatial boundaries for the cumulative effects assessment for each VC, including maps;
- The spatial and temporal boundaries of other developments; and
- The potential for interaction (spatial and temporal) and linkages (overlap) of VCs with other developments.

The Amendment Application will include:

- A table of all past, present and reasonably foreseeable developments that will be included in the cumulative effects assessment, should one be required for a particular VC;

- A general description of the information sources used to identify reasonably foreseeable developments and activities; and
- A map showing the location of the projects and activities.

3.10.2 Conducting a Cumulative Effects Assessment

The Amendment Application will summarize the process and methodology used to conduct the cumulative effects assessment, including the identification of potential cumulative effects, identification of additional mitigation measures, and evaluation of any (residual) cumulative effects using the same methodology described above in sections 3.6 to 3.9 of this AAIR template.

3.11 Follow-up Strategy

Where a residual adverse effect and/or cumulative effect has been identified for a specific VC, the Amendment Application will include a description of a follow-up strategy, where appropriate, that:

- Identifies the measures to evaluate the accuracy of the original effects prediction;
- Identifies the measures to evaluate the effectiveness of proposed mitigation measures; and
- Proposes an appropriate strategy to apply in the event that original predictions of effects and mitigation effectiveness are not as expected. This includes reference to further mitigation, involvement of key stakeholders, Aboriginal groups, government agencies and any other measures deemed necessary to manage the issue.

4.0 ENVIRONMENTAL EFFECTS ASSESSMENT

The Amendment Application will include an assessment of VCs identified for inclusion in the VC screening table. The assessment will be conducted in accordance with the methodology specified in section [3.0 Assessment Methodology](#) of the AAIR, using the organizational structure demonstrated in this section.

The VCs that will definitely be assessed and their key indicators are summarized below. If any other VCs are identified for inclusion in the effects assessment, they and their key indicators will be identified in this section of the Amendment Application.

Valued Component	Key Indicators
Air Quality	Changes to air quality – changes to emissions of criteria air contaminants identified in Orca EA (dust [PM10 particles], NOx, SO2)
Noise	Changes in atmospheric noise – changes in noise levels during the operations of new extraction and processing area (only daytime operations – 60 days)

Valued Component	Key Indicators
	and trucking.
Cluxewe River Salmonids	<p>Fish habitat quality (including tributaries)</p> <p>Fish distribution (presence/absence; relative abundance – including tributaries)</p>

4.1 Air Quality

4.1.1 Introduction and Background

The Amendment Application will evaluate potential impacts of amendment related activities to air quality. Air quality was originally selected for assessment in the Orca EA primarily due to concerns regarding the generation of dust from site construction and operation. The Orca impact assessment found that there were no potential residual effects to the air quality. It was concluded that significant air quality impacts could be avoided with the implementation of appropriate mitigative measures.

4.1.2 Context and Boundaries

The Amendment Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template. Spatial boundaries to be used in the Amendment Application will be driven by local air sheds and location of any nearby receptors (such as dwellings or known traditional use areas) as well as the locations of other emissions sources in the area.

4.1.3 Existing Conditions

The Amendment Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) of this AIR template. The Amendment Application will also summarize as appropriate the regulatory or government context for the management of air quality and any supporting technical reports related to air quality will be provided.

An emissions inventory was completed as part of the original Orca EA. At the time of the inventory the only significant sources of air pollutants in the Project area were from paved (Highway 19) and unpaved (generally logging haul roads) roads, including dust and emissions. The addition of the new quarry area and associated activities (i.e., blasting, crushing, and trucking) will require an update / re-evaluation of the previous inventory.

The location of potential receptors for air quality effects (e.g. known active Aboriginal traditional use sites, dwellings, recreation sites) will be described, as appropriate.

The detailed assessment will focus on the amendment site, since there will be no increase in processing or

other site activities at the Orca Quarry due to the opening of the supplementary quarry. The assessment will evaluate selected indicator compounds such as NO_x, SO₂, and PM₁₀.

Emissions associated with the amendment site as well as the Orca Quarry will be estimated based on vehicle types, vehicle numbers, haul routes, quarry development over time, excavation and blasting areas, frequencies of blasting, etc. An AERMOD dispersion model will be developed and run for the project (including developing project specific AERMOD dataset from prognostic data). Baseline air quality will be characterized using available local air quality monitoring data and modeling of emissions for Orca. The assessment will estimate combined air quality (baseline plus predicted amendment impacts). The assessment would utilize existing meteorological data obtained from existing climate stations in Port McNeill, Port Hardy, and Alert Bay.

4.1.4 Potential Effects

The Amendment Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AAIR template. The Application will also identify measures to avoid, manage or otherwise mitigate potential adverse effects to ambient noise levels. A summary of potential air quality VC interactions with amendment components or activities is provided below in Table 4.

Table 5: Summary of Potential Air Quality VC Interactions with Amendment Components or Activities

Activity	Atmospheric Environment
Site Preparation and Construction	
Vegetation clearing and removal of overburden/soils	X
New haul road	X
Operations	
Quarry development (drilling and blasting of aggregate)	X
Resource extraction and processing	X
Trucking to Orca Quarry	X
Fuel and explosives storage and handling	
Decommissioning, Closure, and Reclamation	
Removal of crushing facilities and infrastructure	X
Site remediation / reclamation	X

The Amendment Application will also describe the effects in relation to any nearby receptors that may potentially be affected by air quality changes caused by the amendment.

4.1.5 Mitigation Measures

The Amendment Application will identify measures to avoid, manage or otherwise mitigate potential

adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Amendment Application must be identified.

4.1.6 Residual Effects and their Significance

Where an adverse residual effect is identified, the Amendment Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AAIR template.

Where an adverse residual effect is identified, the Amendment Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AAIR template.

4.1.7 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Amendment Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AAIR template;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AAIR template;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AAIR template; and
- Where an adverse residual cumulative effect is identified, the Amendment Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AAIR template.

4.1.8 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Amendment Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AAIR template.

4.2 Noise

4.2.1 Introduction and Background

The Amendment Application will re-assess potential impacts of amendment related activities to noise.

Noise was originally selected for assessment in the Orca EA primarily due to concerns regarding the construction and operation of the marine ship loading facility and the generation of underwater noise. Potential impacts of underwater noise were related to marine mammals (e.g., Orca) and salmonids.

Noise concerns were also of concern to the Kwakiutl, who own and operate the nearby campground at the estuary of the Cluxewe River. The assessment concluded that during construction and operations there will be localized increases in ambient noise, however no residual effects were anticipated with the implementation of appropriate mitigative measures.

As noted previously proposed amendment activities will not result in any changes or alterations to the marine component of the Orca Quarry.

4.2.2 Context and Boundaries

The Amendment Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with 3.2 Assessment Boundaries of the AAIR Template. Potential effects on the acoustic environment will be assessed within the Project footprint and surrounding area. The extent of the assessment will depend on an inventory of potential sensitive receptors for both the Orca Quarry and the amendment area. Receptors may include Port McNeill and the Cluxewe Resort (located at the mouth of the Cluxewe River).

4.2.3 Existing Conditions

The Amendment Application will summarize existing conditions in a manner consistent with Section 3.3 Existing Conditions. The Amendment Application will also summarize as appropriate the regulatory or government context for the management of noise and any supporting technical reports related to noise will be provided.

A detailed noise assessment was undertaken as part of the Orca EA. In order to determine the potential cumulative noise impact associated with the operation of the existing Orca quarry and the proposed amendment site, the following tasks will be completed:

- Determination of a reasonable worst-case noise emission scenario based on the existing and proposed operations at the Orca and amendment quarries, respectively. In case of variation in operation between the nighttime hours and daytime hours, two worst-case scenarios (one for daytime and one for nighttime) will be determined.
- Preparation of a noise emission inventory for the worst-case noise emission scenario(s) using noise data from the previous assessment for Orca as well as noise data from other suitable noise databases for new noise sources at the amendment site (e.g., blasting, crushing and trucking).
- Completion of an inventory of nearest receptors (e.g. known active Aboriginal traditional use sites, dwellings) for both Orca and amendment quarries. If no receptors are identified within 1.5 km of the sites, locations at the 1.5km setback distances in various directions from the sites will be defined as noise Points of Reception for the purposes of the acoustic assessment.
- Establish target noise levels for the selected receptor locations, based on guideline provided in the British Columbia Noise Control Best Practices Guideline (2009).

- Completion of noise propagation modeling (based on ISO 9613 Part I & II) to determine potential receptor noise impacts corresponding to the worst-case noise emissions scenarios. The predicted receptor noise levels will be compared to target noise levels to assess effects and the need for potential noise mitigation measures.

4.2.4 Potential Effects

The Amendment Application will identify potential adverse effects to noise levels in a manner consistent with section 3.4 Potential Effects of this AAIR template. The Application will also identify measures to avoid, manage or otherwise mitigate potential adverse effects to ambient noise levels. A summary of potential Noise VC interactions with amendment components or activities is provided below in Table 5.

Table 6: Summary of Potential Noise VC Interactions with Amendment Components or Activities

Activity	Acoustic Environment
Site Preparation and Construction	
Vegetation clearing and removal of overburden/soils	X
New haul road	X
Operations	
Quarry development (drilling and blasting of aggregate)	X
Resource extraction and processing	X
Trucking to Orca Quarry	X
Fuel and explosives storage and handling	
Decommissioning, Closure, and Reclamation	
Removal of crushing facilities and infrastructure	X
Site remediation / reclamation	X

The Amendment Application will also describe the effects in relation to any nearby noise receptors that may potentially be affected by the amendment.

4.2.5 Mitigation Measures

The Amendment Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Amendment Application must be identified.

4.2.6 Residual Effects and their Significance

Where an adverse residual effect is identified, the Amendment Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in

section 3.6 Characterization of Residual Effects of this AAIR template.

Where an adverse residual effect is identified, the Amendment Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AAIR template.

4.2.7 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Amendment Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AAIR template;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AAIR template;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AAIR template; and
- Where an adverse residual cumulative effect is identified, the Amendment Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AAIR template.

4.2.8 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Amendment Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AAIR template.

4.3 Cluxewe River Salmonids

4.3.1 Introduction and Background

The Amendment Application will re-assess potential impacts of amendment related activities to aquatic communities of the Cluxewe River and associated tributaries. This VC was originally selected for the assessment due to concerns of First Nations, regulators and stakeholders. Tributaries and secondary channels to the Cluxewe River were not included in the initial assessment as there were no tributaries that traversed the Orca site.

No potential residual effects to the Cluxewe River were found during the Orca EA. It was concluded that impacts to Cluxewe River and associated aquatic communities could be avoided with the implementation

of appropriate mitigative measures, most significantly the establishment of the large riparian buffer zone along the entire length of the river adjacent to the project area, with no surface water flow from the project to the Cluxewe River. It was concluded that water flow, existing water quality, and food/nutrients (invertebrates, etc.) in the Cluxewe River will be unaffected by the Orca project.

4.3.2 Context and Boundaries

The Amendment Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with 3.2 Assessment Boundaries of the AIR Template.

The evaluation of potential impacts to salmonids inhabiting the Cluxewe River and associated tributaries will take into consideration factors such as proximity of fish to proposed extraction activities, watercourse crossing requirements for the new haul road, relevant life-history characteristics and requirements (e.g., water quality), and the probability of interaction between the VC and amendment related activities.

4.3.3 Existing Conditions

The evaluation of existing conditions will utilize existing information, supplemented as appropriate by site-specific surveys. There is extensive fisheries information available for the Cluxewe River and associated tributaries, primarily through surveys completed by WFP. Existing information includes:

- WFP environmental database (extensive database identifies fish-bearing and non-fish bearing watercourses and associated features);
- Fisheries Information Summary System (FISS);
- EcoCat: The Ecological Reports Catalogue; and
- Polaris Reports (various site-specific surveys completed in support of the Orca Project and surrounding areas [e.g., FishFor Contracting 2003, 2008a, 2008b]).

Other supporting information such as surface water quality data is also available for the Cluxewe River. In addition a supplementary water quality program was initiated in December 2017 consisting of bi-monthly sampling at four locations (three in the Cluxewe River [one upstream of the amendment site; one immediately downstream of the amendment site, and one downstream of the Orca Quarry] and one in the tributary leaving the LOO). Samples are analyzed for a range of parameters including: metals (dissolved and total), dissolved and total organic carbon, anions (including nitrate, nitrite, and sulphate), ammonia, alkalinity, total nitrogen, ortho-phosphate, and total suspended solids.

The Amendment Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AAIR template.

4.3.4 Potential Effects

The Amendment Application will identify potential adverse effects to the Cluxewe River and associated tributaries in a manner consistent with section 3.4 Potential Effects of this AAIR template. The Application will also identify measures to avoid, manage or otherwise mitigate potential adverse effects to local watercourses and associated aquatic communities. A summary of potential Cluxewe River VC interactions

with amendment components or activities is provided below in **Table 6**.

Table 7: Summary of Potential Cluxewe River VC Interactions with Amendment Components or Activities

Activity	Aquatic Environment
Site Preparation and Construction	
Vegetation clearing and removal of overburden/soils	X
New haul road	X
Operations	
Quarry development (drilling and blasting of aggregate)	X
Resource extraction and processing	
Trucking to Orca Quarry	X
Fuel and explosives storage and handling	
Decommissioning, Closure, and Reclamation	
Removal of crushing facilities and infrastructure	
Site remediation / reclamation	X

4.3.5 Mitigation Measures

The Amendment Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Amendment Application must be identified.

4.3.6 Residual Effects and their Significance

Where an adverse residual effect is identified, the Amendment Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AAIR template.

Where an adverse residual effect is identified, the Amendment Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AAIR template.

4.3.7 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Amendment Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to

occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AAIR template;

- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AAIR template;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AAIR template; and
- Where an adverse residual cumulative effect is identified, the Amendment Application will also describe the likelihood, Proponent’s significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent’s Determination of Significance and 3.9 Confidence and Risk of this AAIR template.

4.3.8 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Amendment Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AAIR template.

4.4 Additional Included VCs (if required)

If any additional VCs are identified for inclusion in the effects assessment, they will each have their own section, which will follow the format, structure, and methodology of the preceding three sections.

5.0 ECONOMIC EFFECTS ASSESSMENT

No valued components are expected to be assessed in this category, but potential economic VCs will be considered in the VC screening table.

6.0 SOCIAL EFFECTS ASSESSMENT

No valued components are expected to be assessed in this category, but a description of the social and land use setting will be provided in the project description (section 1), and potential social and land use VCs will be considered in the VC screening table.

7.0 HERITAGE EFFECTS ASSESSMENT

No valued components are expected to be assessed in this category, but potential heritage VCs will be considered in the VC screening table.

8.0 HEALTH EFFECTS ASSESSMENT

No valued components are expected to be assessed in this category, but potential health VCs will be considered in the VC screening table.

9.0 ACCIDENTS AND MALFUNCTIONS

The Amendment Application will include the following:

- Identification of potential accidents and malfunctions associated with proposed amendment activities;
- The overall methodology for assessing the potential risk of an event (likelihood and consequence);
- Definitions of each category of likelihood;
- Definitions for each category of consequence;
- An assessment of the likelihood of the event occurring, based on historical trends and predictive models;
- Identification of proposed measures to reduce the likelihood of the event;
- Assessment of consequence of the event, in a manner consistent with the direct effects assessment;
- Identification of measures to mitigate the consequences to valued components; and
- Conclusions on the potential risk (likelihood multiplied by consequence) of the accident or malfunction.

A preliminary list of potential accidents and malfunctions that could occur in any phase of the proposed amendment includes:

- Pre-Construction:
 - Vehicular accidents
 - Wildlife encounters
 - Personal health emergencies
- Construction, Operation, and Reclamation Periods:
 - Slips/trips/falls
 - Equipment incidents
 - Vehicular accidents

- Wildlife encounters
- Personal health emergencies
- Accidents involving project personnel and the public
- Accidental release of contaminants (fuel, sediment, chemicals, etc.)
- Explosives incidents
- Material handling incidents
- Structural failure of infrastructure (culverts, access roads)
- Chance find of archaeological items during quarrying activities

The Amendment Application will assess each potential accident or malfunction.

10.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The Amendment Application will include:

- The environmental factors deemed to have possible consequences on the proposed amendment, including, but not necessarily limited to, consideration of natural hazards such as:
 - Extreme weather (e.g., lightning, extreme precipitation event);
 - Seismic events; and
 - Forest fires.
- A description of any changes or effects on the proposed amendment that may be caused by the above-mentioned environmental factors;
- The likelihood and consequence of the changes or effects to relevant VCs;
- Practical mitigation measures, including design strategies and environmental contingency plans, to avoid or minimize the likelihood and consequence of the effects of the environment on the proposed amendment; and
- A conclusion about the potential risk of an effect of the environment on the proposed amendment and to relevant VCs.

Amendment Application Information Requirements

Part C – Aboriginal Consultation

PART C – ABORIGINAL CONSULTATION

11.0 ABORIGINAL CONSULTATION

11.1 Aboriginal Interests

The Aboriginal groups discussed in this section of the Amendment Application will include:

- Kwakiutl Band
- 'Namgis First Nation

Polaris has, and will continue to take, a proactive approach, consistent with their approach to developing the Orca deposit, and are currently in active information sharing with both the Kwakiutl Band and 'Namgis First Nations. Polaris has discussed the Orca EA amendment with the Kwakiutl and 'Namgis since early 2016 and to date there has been strong local support and engagement by both groups. Polaris currently has an equity partnership with the 'Namgis and band representatives participate on the Board of Directors. Polaris also has an Impact Benefits Agreement (IBA) with the Kwakiutl Band. Relations with both First Nations are excellent and constructive.

For each Aboriginal Group, the Amendment Application will include:

- A summary of past and planned consultation activities;
- A summary of the key issues and concerns raised by Aboriginal Groups relevant to the environmental assessment amendment, the Proponent's responses to those issues and concerns, and the status of resolution;
- A map that identifies Indian Reserves and Aboriginal communities, for the Aboriginal Groups and the project location;
- Traditional Ecological Knowledge and Traditional Land Use information, as available, with a description of how Traditional Ecological Knowledge (TEK) and Traditional Land Use Studies (TLUS) information was gathered and incorporated into the assessment of potential impacts of the proposed amendment activities on Aboriginal Interests;
- A description of the Aboriginal Interests of each group identified through secondary research techniques or provided directly through consultation activities. The description will include background information on ethnography, language, governance, economy and reserves;
- A description of potential adverse effects of the proposed Project on Aboriginal Interests;
- A description or summary of mitigation measures to avoid or reduce potential adverse effects on Aboriginal Interests consistent with section 3.5 Mitigation Measures of this AAIR template;

- A characterization of the residual adverse effects on Aboriginal Interests after mitigation using the methodology described in sections 3.6 Characterization of Residual Effects, 3.7 Likelihood, and 3.9 Confidence and Risk of this AAIR template and incorporating the findings of the VC chapters in the Application that are relevant to Aboriginal interests;
- A summary of any outstanding Aboriginal Interests issues identified by Aboriginal groups; and
- A summary of publically available arrangements or agreements reached between the proponent and Aboriginal Groups.

11.2 Other Matters of Concern to Aboriginal Groups

The Amendment Application will include:

- A list of other matters of concern raised by Aboriginal Groups with respect to potential environmental, economic, social, heritage and health effects of the proposed Project, which have not already been considered in the discussion about Aboriginal Interests;
- A description (or summary if described elsewhere in the Amendment Application) of the mitigation measures to address potential effects on other matters of concern to Aboriginal Groups;
- A characterization of the residual adverse effects after mitigation, in a manner consistent with assessment methodology in this AAIR template; and
- A description of how these matters of concern have been addressed from the perspective of the Aboriginal Groups and the Proponent.

11.3 Issue Summary Table

The Amendment Application will include:

- A Summary Table (see example below) that identifies Aboriginal Interests or other matters of concern to Aboriginal Groups that may be impacted by the proposed Project, and the measures to avoid, mitigate or otherwise manage the effects; and
- An Appendix which contains comments received from Aboriginal Groups regarding this section of the Amendment Application.

Table 8: Summary Table of the Results of Aboriginal Consultation related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage / Information Source	Issue – Aboriginal Interest	Issue – Other Matters of Concern	Analysis of Potential Effect	Proposed Measures to Avoid, Mitigate or Otherwise Manage Effects	Status of Issue (e.g. resolved, ongoing resolution, referred to agency, etc.)



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Amendment Application Information Requirements

Part D – Public Consultation



PART D – PUBLIC CONSULTATION

12.0 PUBLIC CONSULTATION

The Amendment Application will include a report on the results of implementation of the approved Public Consultation Plan including:

- Background information:
 - Identification of local governments, residents, property owners, and other rights holders who are potentially impacted by the proposed Project;
 - Maps of local government boundaries, private land, tenures/authorizations, or residences with respect to the proposed Project; and
 - Background information about each potentially affected municipality and/or stakeholder group.
- Public Consultation:
 - A summary of the past and planned consultation activities;
 - A summary of any proposed changes to the approved Public Consultation Plan as a result of feedback from local governments, stakeholders or individuals, or experience from consultation to date; and
 - A description of the key issues raised by the public that are relevant to the EA amendment, the responses to those issues, and the status of their resolution.
- Summary Table:
 - Identification of concerns raised by the public and the measures to avoid, reduce or mitigate those impacts. This information will be provided in the form of a table.



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Amendment Application Information Requirements

Part E – Management Plans and Follow-Up Programs



PART E - MANAGEMENT PLANS AND FOLLOW-UP PROGRAMS

13.0 MANAGEMENT PLANS

The Amendment Application will include a list of Management Plans for all phases of the proposed Amendment, including but not limited to:

- Environmental Management Plan, including as applicable such plans as:
 - Air Quality and Dust Control Management Plan
 - Blasting Management Plan
 - Erosion and Sediment Control Plan
 - Soil Management Plan
 - Noise Management Plan
 - Waste Management Plan
 - Spill Prevention, Control, and Countermeasures Plan
 - Fish and Fish Habitat Management Plan
- Quarry Surface Water Management Plan
- Reclamation and Closure Plan
- Emergency Response Plan
- Traffic Control Plan
- Health and Safety Management Plan

Detailed descriptions of each proposed management plan, including relevant mitigation measures that have been described for each of the VCs.

14.0 MONITORING & FOLLOW-UP PROGRAMS

The Amendment Application will include:

- A description of the monitoring and follow-up programs the Proponent will implement, including their activities, objectives and reporting; and
- Reporting structure as identified within the environmental management plans, monitoring plans and EA Certificate Conditions.

Amendment Application Information Requirements

Part F – Conclusions

PART F - CONCLUSIONS

15.0 CONCLUSIONS

The Amendment Application will:

- Provide the Proponent's conclusions regarding the potential for the amendment to result in any significant adverse effects on VCs;
- Request an EA Certificate Amendment for the proposed Project; and
- Acknowledge the need, if applicable, to successfully complete a federal EA and subsequent permitting/authorization processes prior to proceeding with Project construction, operation and decommissioning.

15.1 Summary of Residual Effects

The Amendment Application will summarize all potential residual effects, including cumulative residual effects, in a table format that depicts the potential effect, project phases, project activity or physical work linked to the effect, proposed mitigation and significance of effect on VCs.

15.2 Summary of Mitigation Measures

The Amendment Application will include a table that identifies the proposed measures to mitigate potential impacts to VCs as shown in Table 9. This information provides the foundation for the development of a Table of Conditions for the proposed Project, which would be appended to an EA Certificate Amendment, should one be issued.

Table 9: Summary of Proposed Mitigation Measures

No.	VC and Effect	Proposed Mitigation Measure	Timing	Legal Requirement?	Responsible Agency
Environmental					
1.1					
1.2					
Social					
2.1					

16.0 REFERENCE MATERIAL

The Proponent will provide a list of reference material used in developing the Amendment Application.

- BC Environmental Assessment Office, 2013. Guideline for the Selection of Valued Components and Assessment of Potential Effects.
- BC Oil and Gas Commission, 2009. British Columbia Noise Control Best Practices Guideline. March 2009. 26 Pages.
- FishFor Contracting, 2008. Bear Creek Area of Interest Fish Habitat Assessment. Report prepared for Dillon Consulting Limited, October 2008. 33 Pages.
- FishFor Contracting, 2008. West Cluxewe Area of Interest Fish Habitat Assessment. Report prepared for Dillon Consulting Limited, October 2008. 21 Pages.
- FishFor Contracting, 2003. Cluxewe River Fish Habitat Assessment. Orca Sand and Gravel Project. 91 Pages.
- Orca Sand & Gravel Ltd, 2005. Application for an Environmental Assessment Certificate for the Orca Sand and Gravel Project.
- Ministry of Energy, Mines and Petroleum Resources, 2008. Health Safety and Reclamation Code for Mines in British Columbia, Mining and Minerals Division. 356 Pages.

17.0 APPENDICES

This section will include the appendices referenced in the Amendment Application.

Information prepared by professionals and provided under their professional seal will be identified in the Amendment Application and the related sealed studies will be included in an Appendix.