

ENVIRONMENTAL CONSTRAINTS GAP ANALYSIS

Port Alberni Transshipment Hub (PATH)

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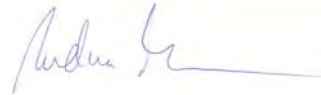
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1 INTRODUCTION

The Environment & Water business unit of SNC-Lavalin Inc. (SNC-Lavalin) was retained by Port Alberni Port Authority (PAPA) to provide a high level environmental gap analysis as part of the Port Alberni Transshipment Hub (PATH) Pre-Feasibility Study. This environmental gap and requirements assessment was based on best practices and the specific location, infrastructure, and features of the local and footprint environment of two proposed hub sites in Alberni Inlet, namely Sarita North and Sarita South. This report provides a summary of information sources as well as expert opinion used in the desk-top study to inform conclusions about the environmental suitability and constraints concerned with the two sites.

It should be noted that detailed environmental studies would be required before actual development of either site. The conclusions presented in this report should not be considered robust enough to serve that purpose.

1.1 Scope and Objectives

The objective of the Environmental Gap Analysis was to identify environmental constraints, risks and barriers to the development of a PATH site in Alberni Inlet by conducting a desk-top gap analysis to identify documented environmental characteristics and resources, as well as any potential environmental issues that could add significant cost to, or possibly halt, the proposed project.

1.2 Study Region

The study areas considered in this gap analysis are depicted in Figures 1-3, with their size and location shown in the table below.

Definitions are as follows:

- ◆ Site Footprint – The area of the each of the two proposed sites plus a 100 m buffer, including marine, foreshore and upland areas of each site footprint.
- ◆ Local Study Area (LSA) –The extent of the local study area of the marine region includes the area from Chimmin Point on Tzartus Island across to Concreve Island, extending seaward (west-southwest) to a line extending from the edge of Bordelais Islet south to the light on Cape Beale. Note that the use of the term “LSA” is for convenience and would not meet the requirements of a formal environmental assessment.

- ◆ Regional Study Area (RSA) – the extent of Barkley Sound within which indirect effects may be detected on marine, freshwater and terrestrial environmental features. Note that the use of the term “RSA” is for convenience and would not meet the requirements of a formal environmental assessment.
- ◆ Airshed Study Area (ASA) – the airshed considers the region from Barkley Sound eastward to Port Alberni.

Item	Sarita Bay South Site	Sarita Bay North Site
BC Mapsheet Grid	92 C085	92 C095, 92 C096 and 92 C085
Footprint Area	1.24 km ²	1.24 km ²
Local Study Area (LSA)	67.6 km ²	67.6 km ²
Regional Study Area (RSA)	1,612.6km ²	1,612.6km ²
Latitude & Longitude	125° 1' 35" W; 48° 53' 20" N	125° 0' 27" W; 48° 54' 23" N

1.3 Background regulatory context

Major federal and provincial regulations that were considered as part of the PATH gap analysis for environmental constraints:

Canada Wide Standards (Air)

The CWS includes standards not to be exceeded for two priority air contaminants: fine (respirable) suspended particulate matter, PM_{2.5} and ground level ozone, O₃.

B.C. Ambient Air Quality Objectives

The BCAAQOs are set for the criteria air contaminants in Canada, specified for both short-term and long-term averaging periods.

Fisheries Act

Section 35 of the federal Fisheries Act (2012) and the Fisheries Protection Program require that “*no person shall carry on any work, undertaking, or activity that results in serious harm to fish that are part of a commercial, recreational or aboriginal fishery, or to fish that support such a fishery*”. The Fisheries Act defines serious harm to fish “as the death of fish or any permanent alteration to, or destruction of, fish habitat”, and where habitat includes both the biotic and abiotic components of aquatic systems that are used by the fish species under consideration.

Section 36 of the Federal Fisheries Act prohibits the deposit of a deleterious substance into fish bearing waters unless authorized by a regulation under the *Fisheries Act*. Environment Canada (EC), on behalf of the Minister of Fisheries and Oceans, administers section 36 of the *Fisheries Act*, and DFO relies upon advice provided by EC regarding issues pertaining to water quality.

The Marine Mammal Regulations, under the Fisheries Act, prohibit the disturbance of marine and killing for reasons other than fishing under a license.

Species at Risk Act

SARA provides a legal framework for the protection of wildlife, and conservation of biological diversity and is administered by Environment Canada. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) ranks species as Extinct, Extirpated, Endangered, Threatened, Special Concern, Not at Risk or Data Deficient, and informs listing for species under SARA. SARA makes it an offence to kill, harm, harass, capture or take any individual listed under Schedule 1. These provisions include legal protection for the residence and identified critical habitat of SARA listed species.

The MBCA is an international agreement between the United States and Canada for the protection of migratory birds on federal, provincial, First Nations and private lands. The MBC Act outlaws the wilful destruction of migratory birds and prohibits the taking of eggs and disturbance of nests. It also prohibits the deposition of oil, oil waste and other substances that are harmful to migratory birds in waters or areas where they are present, except under permit.

Canadian Environmental Assessment Act (CEAA, 2012)

The CEA Act 2012 is a legislated environmental assessment regime, administered by the Canadian Environmental Assessment Agency, to ensure that federal agencies and bodies consider environmental concerns in decision-making. CEAA 2012 focuses the environmental assessment on potential effects to issues under federal jurisdiction, including: fish and fish habitat; aquatic species at risk; migratory birds; federal lands; effects that cross provincial or international boundaries; and, induced effects on Aboriginal peoples. The environmental assessment of a designated project must consider a range of factors such as: Environmental effects of the designated project, including effects of malfunctions or accidents, any resulting cumulative environmental effects; the significance of the environmental effects; Mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the designated project.

Additional Regulations of note:

Canadian Environmental Protection Act (1999)

Migratory Birds Convention Act (MBCA)

Explosives Act

Canada Shipping Act

British Columbia Wildlife Act

Environmental Assessment Act and Reviewable Project Regulations

BC Water Act

2 ENVIRONMENTAL GAP ANALYSIS METHODOLOGY

A desk-top risk screening was conducted to identify documented environmental characteristics and resources, including species-at-risk, sensitive ecosystems, seabird colonies and mammal haul-outs, recreational and commercial fisheries, among other resources, that would likely need to be considered in an environmental assessment of PATH, as well as to identify any potential environmental issues that could add significant cost to, or possibly halt, the proposed project.

The data gap analysis was conducted on the following major environmental components in light of regulatory context discussed above:

2.1 Terrestrial and Freshwater Environments

Information and data pertaining to freshwater fish and fish habitat, terrestrial vegetation and wildlife were collected for both site options within the local and regional study areas through a desk-top review of available ecological and regulatory databases and search engines including those available on provincial and federal government websites. The desk-top study included review of the following on-line resources:

- ◆ BC Conservation Data Center (CDC) Mapping and Searches;
- ◆ Species At Risk Act (SARA) Public Registry;
- ◆ iMap BC Mapping Tool;
- ◆ BC Habitat Wizard;
- ◆ Fish Information Summary System (FISS);
- ◆ E-Fauna BC;
- ◆ E-Flora BC;
- ◆ Sensitive Habitat Inventory and Mapping (SHIM) Tool;
- ◆ Canadian Important Bird Areas Database;
- ◆ BC Water Resources Atlas;
- ◆ TRIM mapping; and
- ◆ Google Maps.

2.2 *Marine Environments*

Information and data pertaining to marine fish and fish habitat, marine vegetation, sea birds, and marine mammals were collected for both site options and within the local and regional study areas through a desk-top review of available ecological and regulatory databases and search engines including those available on provincial and federal government websites. The desk-top study included review of the following on-line resources:

- ◆ Ministry of Environment, BC Species and Ecosystems Explorer;
- ◆ Species at Risk Act (SARA) Public Registry;
- ◆ DFO Mapster V3.1;
- ◆ Community Mapping Network (CMN);
- ◆ Pacific Coastal Resources Atlas (via CMN); and
- ◆ DFO Fisheries in the Pacific Region.

2.3 *Air Quality*

The documented preliminary estimates of marine and terminal activity were used to establish the expected mobile transportation source activity levels and first-order emission estimates. These emission estimates were developed from consideration of typical activity rates associated with container terminals in Canada (as identified through public reports such as the Port Metro Vancouver Landside Emissions Inventory, 2010; which is available from the port's website. Emission rates were developed through applying a consistent methodology used in Canada's Marine Emissions Inventory Tool (MEIT) and Port Emissions Inventory Tool (PEIT), both of which SNC-Lavalin developed for the federal government.

The impact of these emissions were evaluated by consideration of the proximity of sensitive receptors near the PATH sites and results of previous terminal-oriented dispersion studies completed by SNC-Lavalin staff (e.g., expert opinion).

2.4 Noise

Analysis of noise issues also relates to the preliminary estimates of activity developed for the terminal, noted above. Identification of the equipment and activities was linked to past noise studies completed at marine terminals, noting the expected noise emission levels for similar equipment types. By leveraging these studies the expected project noise levels were identified, noting any sensitivities that may exist for the nearby receptors, as well as potential mitigation steps that have been considered or employed at other marine terminals.

3 ENVIRONMENTAL GAP ANALYSIS

3.1 *Terrestrial and Freshwater Environments*

The PATH sites are located in the Coastal Western Hemlock very wet hypermaritime southern variant biogeoclimatic subzone (CWHvh1) of the Alberni-Clayoquot Regional District, South Island Forest District, and Ministry of Environment (MoE) 1 – Vancouver Island Region. On Vancouver Island, the CWHvh1 is restricted to a narrow coastal fringe on the outer coast from near Port Renfrew to Quatsino Sound. The elevation ranges from sea level to approximately 200 m (Green and Klinka, 1994).

Based on the desk-top review, Sarita Bay South Site and Sarita Bay North Site have distinct environmental features, and potential environmental constraints have been identified for each option summarized below. Also see details provided in Tables 1-2.

Sarita Bay South Site:

- ◆ There are two mapped watercourses on (and adjacent to) the site, one in the southwest and the other in the northeast of the site footprint. In addition, Sarita River estuary is located adjacent to the site, in the north.
- ◆ There are no mapped water bodies or wetlands/marshes/ponds on or adjacent to the site (within 100 m).
- ◆ The unnamed creek on the northeast side of the site is fish bearing.
- ◆ High value fish habitat has been identified in the coastal area between the site and Santa Maria Island.
- ◆ The site appears to be located in second growth forest.
- ◆ There has been one mapped plant species at risk (Nodding Semaphore Grass, provincially Blue-listed) recorded for the general area of the site (within the floodplain of Sarita River), however.
- ◆ There have been two mapped wildlife species at risk recorded for the site (warty jumping slug and band-tailed pigeon), as well as various wildlife species in the LSA and RSA (two amphibian species and five bird species), which could also potentially occur on the site.
- ◆ There are no UWR and WHA areas on or in the vicinity of the site.
- ◆ The site and LSA are within an IBA; in addition, Pacific Rim National Park is within the LSA/RSA.

- ◆ The site is situated 20 km from the nearest community (Bamfield) and 76 km from Port Alberni.
- ◆ The nearest access road is Bamfield Road (1.5 km southeast).

Sarita Bay North Site:

- ◆ There are three mapped watercourses within and adjacent to the site, including the Sarita River in the south, Carnation Creek in the north, and one unnamed tributary to Sarita River at the southeast boundary.
- ◆ There is one mapped water body (small lake) and one wetland within the site footprint, as well as one wetland near the south boundary of the site (west band of Sarita River).
- ◆ Chum and coho are the most abundant salmonids and occur in the smaller tributaries of the lower Sarita River, while chinook are restricted to the Sarita River mainstem and lower reaches of the South Sarita River. Cutthroat and steelhead are the most abundant trout species (Barry 2010). The Sarita River estuary includes a wide salt marsh area, with tidal channels and several small islands, and Carnation Creek is also fish bearing.
- ◆ The site appears to be located in second growth forest.
- ◆ There have been three mapped plant species at risk (Nodding Semaphore Grass, provincially Blue-listed; Paintbrush Owl-clover, provincially Blue-listed and Graceful Arrow-grass, provincially Red-listed) recorded in the area of the site (within the floodplain of Sarita River and in tidal mudflats of Carnation Creek).
- ◆ There have been no mapped wildlife species at risk recorded for the site; however various wildlife species have been mapped in the LSA and RSA (two amphibian species and five bird species), and these could potentially occur on the site.
- ◆ There are no UWR and WHA areas on or in the vicinity of the site.
- ◆ The site and LSA are within an IBA; in addition, Pacific Rim National Park is within the LSA/RSA.
- ◆ The site is situated 21 km from the nearest community (Bamfield) and 75 km from Port Alberni (about 700 m northeast of Sarita Bay South Site).
- ◆ The nearest access road is Bamfield Road (3 km southeast).

3.2 Marine Environments

In consideration of the potential environmental constraints of the PATH project on the marine environment, two spatial scale were considered: 1) marine transportation corridor, 2) hub sites.

3.2.1 Marine transportation corridor

The LSA of the project is located within Barkley Sound, a fjord-like estuary that covers an area of about 800 km² and is characterized by four basins: Imperial Eagle Channel, Trevor Channel, Alberni Inlet and Effingham Inlet. Imperial Eagle Channel and Trevor Channel are divided by the 20 km long Tzartus Island and the Deer Group, and are connected at Junction Passage. The largest freshwater source flowing into Barkley Sound is from the Somass River, which enters at the head of Alberni Inlet, accounting for 50% of the freshwater input (Stonach et al. 1993). In winter and again in May, an upper brackish layer (<2 m - 4 m deep) extends for most of Alberni Inlet until Mutine Point where the brackish surface layer is mixed with saline oceanic water (Stonach et al. 1993). Further, it is thought that surface freshwater leaving Alberni Inlet exit Barkley Sound via Imperial Eagle Channel at Junction Passage, a narrow link between the north end of Trevor Channel and Imperial Eagle Channel. In fact, the majority of net inflow and outflow in Barkly Sound appears to originate at the mouth of Imperial Eagle Channel (>100 m deep), which allows for a large tidal exchange between ocean and estuarine waters. Thus, although Trevor Channel is >150 m deep and it is the main direct connection to Alberni Inlet, the shallow depth of 34 m at the mouth of the Channel prevents a large volume of cold salty water from entering or fresh water leaving Alberni Inlet.

Barkley Sound in general is well known for its high productivity of many commercial and recreational marine fisheries, such as Pacific herring, rockfish, halibut, crab, and salmon (see Table 4 and Figures 4a-4g). Part of the reason for this regional productivity is due to the upwelling of nutrient rich waters from the continental shelf into Barkley Sound and the mixing of this deep cold water into the surface light layer. The enhanced summer upwelling results in an abundance and diversity of fish in the region, and attracts many species of foraging marine mammal including migratory humpback whales, gray whales, stellar sea lions, killer whales, and many species of seabird. In fact, Barkley Sound has been identified as an important bird area, hosting six species of birds of global significance and two breeding species of national significance, with Trevor Channel in particular contains several nesting colonies of pelagic cormorants, pigeon guillemots, black oyster catchers, and glaucous-winged gulls, and concentrations of marbled murrelets, especially in southern portions of the channel (Figure 5).

DFO also recognizes the ecological and biological significance of Barkley Sound and Alberni Inlet and has designated it EBSA 23, a geographic bottleneck, which is unique for Pacific hake (resident) inshore stocks, and for aggregations of Pacific loons and duck wintering, pelagic seabirds (pigeon guillemots, marbled murrelets), Green sturgeon migrations, Basking shark historical concentrations, Olympia oyster Pacific oyster shrimp (2 species), and resulting in fitness consequences for surf scoters wintering and foraging, Gull and pelagic cormorants nesting, Resident gray whale foraging, Humpback whale foraging, Harbour seal foraging, Stellar sea lion foraging, adult and juvenile salmon foraging and migrations, Pacific herring spawning and foraging, juvenile eulachon rearing, sardine foraging, flatfish near shore juvenile rearing, Pacific sand lance burying habitats, and productive eelgrass (DFO 2013).

The desk-top review determined that the LSA is located within the range of 24 marine species at risk (see Table 5, Figures 6a-6e), including: northern abalone, sea otter, grey whale, harbour porpoise, stellar sea lions, marbled murrelets.

Ultimately, the key environmental constraints of PATH relate to increased marine traffic, namely Trans Pacific container vessels, feeder ships, and cellular barges within the Trevor Channel marine corridor, and ultimately to potential environmental effects on LSA and RSA marine resources, including, among others, increased risk of:

- ◆ groundings and spills;
- ◆ potential for accidents (e.g., collisions) and malfunctions;
- ◆ spread of invasive species through ballast water discharge;
- ◆ vessel strikes on whales in general and marine mammal species-at-risk in particular;
- ◆ underwater noise on marine mammals;
- ◆ ship wake on shoreline erosion;
- ◆ ship disturbance on surface foraging seabirds in general and species at risk, such as Marbled Murrelets in particular;
- ◆ ship strikes on seabirds at night because of attraction to lights; and
- ◆ in-air and underwater acoustic noise disturbance on seabirds.

Many of these risks will be reduced because there will only be one Trans Pacific container vessel per week arriving at PATH, and widely accepted mitigation measures can be implemented such as reduced vessel speed and tug escort that have been shown elsewhere to substantially reduce many of the listed potential effects. However, the increase in feeder ship and cellular barge traffic leaving PATH via Trevor Channel for lower mainland destinations is not known and may represent an additional environmental constraint, in part because of potential effects identified above but also because the southern portion of Trevor Channel, adjacent to Bamfield to Cape Beale and the Deer Group Islands is an important recreational fishing area with relatively high vessel density. This will be a key consideration in an EIA.

3.2.2 Hub site locations

From a marine environmental constraints perspective, the proposed construction and operation the hub sites may results in the following potential effects on local marine resources.

- ◆ Operation of facility (noise, light) on surrounding foreshore and coastal habitats and marine fish, birds and mammals.
- ◆ Displacement of several shellfish aquaculture sites.
- ◆ Infilling and cutting extensive areas of sensitive and productive foreshore and subtidal habitats.
- ◆ Infilling and destruction of productive estuarine habitat (e.g., saltmarshes, mudflats) with concomitant impacts on salmonids using the Sarita and Carnation Creek watersheds.
- ◆ Infilling of wetlands and lakes.
- ◆ Use or explosives for cutting of marine (and terrestrial) habitats.

More specifically, and based on the desk-top review, Sarita Bay South Site and Sarita Bay North Site have distinct environmental features, and potential environmental constraint have been identified for each option below. See Table 6.

Sarita Bay South Site:

- ◆ There is a First Nations shellfish aquaculture site within the footprint.
- ◆ The site falls within the likely distributions of more than 20 SARA Schedule 1 marine species at risk (see Table 5).
- ◆ There is an area of mapped eelgrass within the footprint.

- ◆ There are no commercial fisheries within the footprint.
- ◆ No ecological reserves or protected area within the footprint.

Sarita Bay North Site:

- ◆ There is a First Nations shellfish aquaculture site within the footprint.
- ◆ The site falls within the likely distributions of more than 20 SARA Schedule 1 marine species at risk (see Table 5).
- ◆ There is an area of mapped eelgrass within the footprint.
- ◆ The site would occupy a class 3 estuary, Sarita River estuary, which is known for its biological importance to water birds (ducks, geese, swans, loons, grebes) and salmonids.
- ◆ No commercial fisheries occur within the footprint.
- ◆ No ecological reserves or protected area occur within the footprint.

Overall, it is expected that activities associated with the construction and operation of the PATH site will directly and indirectly affect marine resources within the footprint primarily through: a) permanent alteration and loss of riparian, intertidal and subtidal fish habitats, b) changes to productivity of fish habitats, c) injury or mortality of marine fish and mammals, d) sensory disturbance to marine fish and mammals, and e) changes in water quality.

Note that the magnitude of permanent effects would have to be further assessed through detailed field studies and analyses. Overall, as per the federal Fisheries Act regarding serious harm, including death of fish and permanent alteration of fish and fish habitat, the project will require an authorization outlining avoidance, mitigation and offsetting plans.

Based on the desk study, we would expect that the placement of the PATH at the North Sarita Site will result in substantially greater environmental effects given its location within a class 3 estuary, supporting several salmonid populations and bird species. This places a large environmental constraint on the north Sarita site compared to the south Sarita site.

3.3 Air Quality

Emission generating activities expected during operations at the proposed terminal sites includes those listed in Table 1. The emission sources were identified from the Planning Criteria [Hatch Mott MacDonald, 329510-PO-230-SO-0001RevC] document (RMGs, AGVs) with additional sources that were not identified in the document but are included to account for additional emission sources that are commonly associated with container terminals.

Given the remote location of the proposed terminal sites, the existing, or background air quality is expected to be good. Ship movements associated with the port facilities further down the channel near Port Alberni are not considered to be high (based on an assessment of port operations completed by Transport Canada for the 2010 calendar year). These ship movements are the only significant local emission sources that would have influence on air quality at and near the proposed terminal sites (Table 7).

Emission estimates were completed for a typical year during with a higher activity level (e.g., once throughput has increased beyond the expected starting levels). In this sense, the estimates relate to a throughput of approximately 1.5 million TEUs or 80 containership visits over the year (which is higher than the expected one (1) ship per week that was expressed to SNC-Lavalin).

SNC-Lavalin assumed use of diesel for all equipment. This may constitute an over-estimate if alternative fuels (or electricity) are used for some of the transportation or cargo handling equipment. It's important to note that newer ships have much cleaner engines (lower NOx and PM emissions in particular) and an emissions control area (ECA) has been recently implemented for the west coast of North America, which requires use of cleaner (lower sulphur) diesel fuel. As such, vessel emissions will be considerably lower than in previous years.

Emission estimates on a g/s basis for the terminal as a whole, including all sources (and ships) for all of the criteria air contaminants of interest range from approximately 0.15 g/s (fine particulate matter) up to 5 g/s (NOx). These emission rates are averaged for the year. Most of these emissions are expected to relate to the marine sources (containerships in particular, as well as tugs) although the cargo handling equipment emissions are also significant. Emissions associated with the trucking movements are very low.

Worst case short-term emissions for a particular hour can be projected to be five times as high (a very conservative estimate), which would relate to two containerships at berth and the necessary associated tug and cargo handling activity. Based on previous terminal-oriented dispersion studies these maximum rates would not be expected to result in any exceedences of ambient air quality objectives or standards (including lower standards [e.g., CWS] that may be implemented for some air contaminants in future years) at or near the terminal location.

The emission levels are also not expected to cause any concerns for workers at the site, with the potential exception of crane operators being directly exposed to a ship plume (e.g., cab passing through the plume).

Construction emissions are also not considered to be problematic, with the potential exception of fugitive dust. It is expected that fugitive dust issues will be manageable if dust emissions develop (e.g., due to movement of earth and gravel, barge loading and unloading), by use of water sprays during relatively dry periods (if they occur during construction).

These expectations are similar for either the Sarita Bay South Site or the Sarita Bay North Site.

3.4 Noise

The transportation of containers between the vessels, the yard and the barges will be the main source of noise at a berth site. The trucking of local containers on the access road to the hub will also be a significant source of noise.

The noise from those activities will propagate outside the limits of the project and may affect the nearest sensitive receptors. The hub will be in a remote area but the operations can impact the following receptors:

- ◆ Sarita Bay South: Poett Nook Marina and Campground (1 km SW) and the Huu-ay-aht First Nation (1.5 km SW);
- ◆ Sarita Bay North: HUU-ay-aht First Nation (2 km E);
- ◆ Access road: Receptors within 300 m.

The noise from the operation at a berth will be composed of continuous and impact noise. The continuous noise will mainly come from the engines of the transportation equipment (crane, RMG and ASC) and the impact noise will be from the grabbing of the containers. Based on the *Planning Criteria [Hatch Mott MacDonald, 329510-PO-230-SO-0001RevC]* the berth operation sound level is estimated to be around 64 dBA at 1 km from a berth and 57 at 2 km. The trucking sound level is estimated to be around 58 dBA (50 km/h) and 63 dBA (90 km/h) at 30 m from the road.

According to the World Health Organization Noise Guidelines, outdoor sound levels in the range of 55 dBA can create serious annoyance daytime and evening, and 45 dBA outside bedrooms can disturb sleep. Therefore the noise from the transshipment hub operation can potentially be an issue at the nearest receptors and mitigation measured should be considered.

The nearest receptor from the Sarita Bay South site is the Poett Nook Marina and Campground located approximately 1 km SW. There is a valley between the berth site and the marina allowing the sound to propagate between the mountains. A noise barrier should be erected at the SW end of the berth to minimize the sound propagation in direction of the marina. The noise barrier could be composed of a solid wall, an earth berm or a stack of containers.

The nearest receptor from the Sarita Bay North site is the Huu-ay-aht First Nation approximately 2 km E. The mountains and the forest between the berth and the First Nation should attenuate the noise to acceptable levels.

Trucking should be limited to the daytime hours (7h00 -16h00) if possible. Mitigation measures such as relocation or compensation should be considered for sensitive receptors within 70 m from the road.

4 SUMMARY

Through a combination of desk-top study, local knowledge, expert opinion, and an understanding of environmental regulatory requirements, the following bullets highlight some of the potential environmental constraints that PATH might have on regional, local and site specific environmental resources. It is cautioned that conclusions about each individual constraint would ultimately require additional detailed investigations, including detailed environmental and risk assessments, to generate an understanding of the relative significance of each environmental constraint on PATH.

- ◆ The increase in container ship traffic in the main marine transportation corridor of Trevor Channel is expected to be one (1) visit per week and as such with best management practices (e.g., reduced speeds) the potential environmental effects can likely be minimized and/or mitigated.
- ◆ Feeder ship and barge traffic estimates were first order and effects cannot be fully evaluated at this time. Thus, the environmental constraints of increased vessel traffic will need to be more adequately examined during the environmental impact assessment.
- ◆ PATH (including marine transportation corridor and hub sites) occurs within an important bird area that hosts six species of birds of global significance and two breeding species of national significance, and thus may pose an environmental constraint.
- ◆ PATH (including marine transportation corridor and hub sites) occurs within region of several productive commercial, recreational, and aboriginal fisheries, and thus may pose an environmental constraint.
- ◆ PATH (including marine transportation corridor and hub sites) occurs within the distributional range of at least 20 marine species at risk, and thus may pose an environmental constraint.
- ◆ PATH (hub sites) occurs within the distributional range of at least 4 terrestrial wildlife species and 3 plant species at risk, and thus may pose an environmental constraint.
- ◆ The southern portion of marine transportation corridor (Trevor Channel) passes through an ecologically sensitive and popular recreational fishing area, adjacent to Bamfield, and thus may pose an environmental constraint.

- ◆ Because of the relatively new transportation and cargo handling equipment that would be expected to be used for operations (e.g., new, large containerships), air emissions are not expected to be problematic. This statement also reflects that the regional air is “clean” the vast majority of the time due to remoteness of the hub sites and location near the open Pacific, and relatively strong winds along the inlet. There are also few sensitive receptors (residences) near the two sites.
- ◆ Because of the remoteness of the hub sites, noise constraints are minimal. Some attention should be considered for mitigation of noise propagation between the site and the nearest receptor locations during operations.
- ◆ Minor terrestrial environmental constraints for Sarita south.
- ◆ Minor terrestrial environmental constraints for Sarita north.
- ◆ Several freshwater environmental constraints identified for Sarita north, including effects on 3 fish bearing watercourses, one lake, one wetland, and thus represents an important environmental constraint.
- ◆ The north Sarita hub site would overtop the Sarita River (class 3) estuary known for salmonid production and as an important water bird area, and thus represents an important environmental constraint.

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6 LIMITATIONS AND CLOSURE

This report has been prepared by the Environment & Water business unit of SNC-Lavalin Inc. (SNC-Lavalin) for Port Alberni Port Authority (PAPA). It is intended for the sole and exclusive use of PAPA, their affiliated companies and partners, and their respective insurers, agents, employees and consultants collectively, "PAPA-P". Any use, reliance on or decision made by any person other than PAPA-P based on this report is the sole responsibility of such other person. PAPA-P and SNC-Lavalin make no representation or warranty to any other person with regard to this report and the work referred to in this report and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, and decision made or any action taken based on this report or the work referred to in this report.

The investigation undertaken by SNC-Lavalin with respect to this report and any conclusions or recommendations made in this report reflect SNC-Lavalin's judgment based on publicly available information at the time of the gap analysis on the date(s) set out in this report

If project site locations or applicable regulatory standards change or if any additional information becomes available at a future date, SNC-Lavalin requests notification so that we may decide if modifications to the findings, conclusions and recommendations in this report may be necessary.

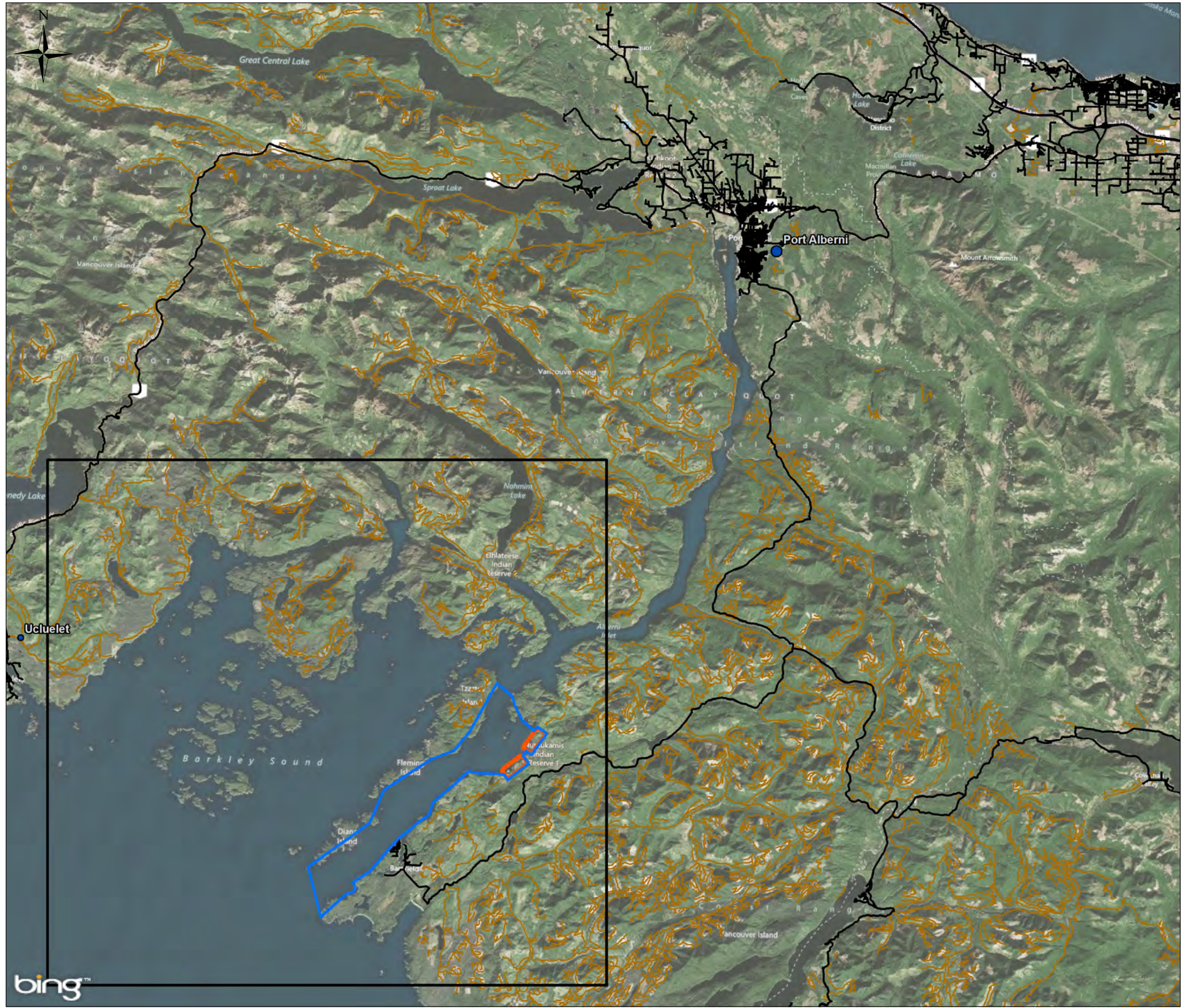
Other than by PAPA-P, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of SNC-Lavalin. Nothing in this report is intended to constitute or provide a legal opinion.

SNC-Lavalin acknowledges that the persons signing this report have demonstrable experience, and are familiar with completing the work as described in the statement of work.

APPENDIX A



Figures



LEGEND

-  Marine & Terrestrial Regional Study Area
-  Local Study Area
-  Proposed Sites
-  Roads
-  Forest Tenure Roads

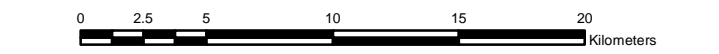


NOTES

1. Original in colour.
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3. Intended for illustration purposes, accuracy has not been verified for construction or navigation purposes.

REFERENCES

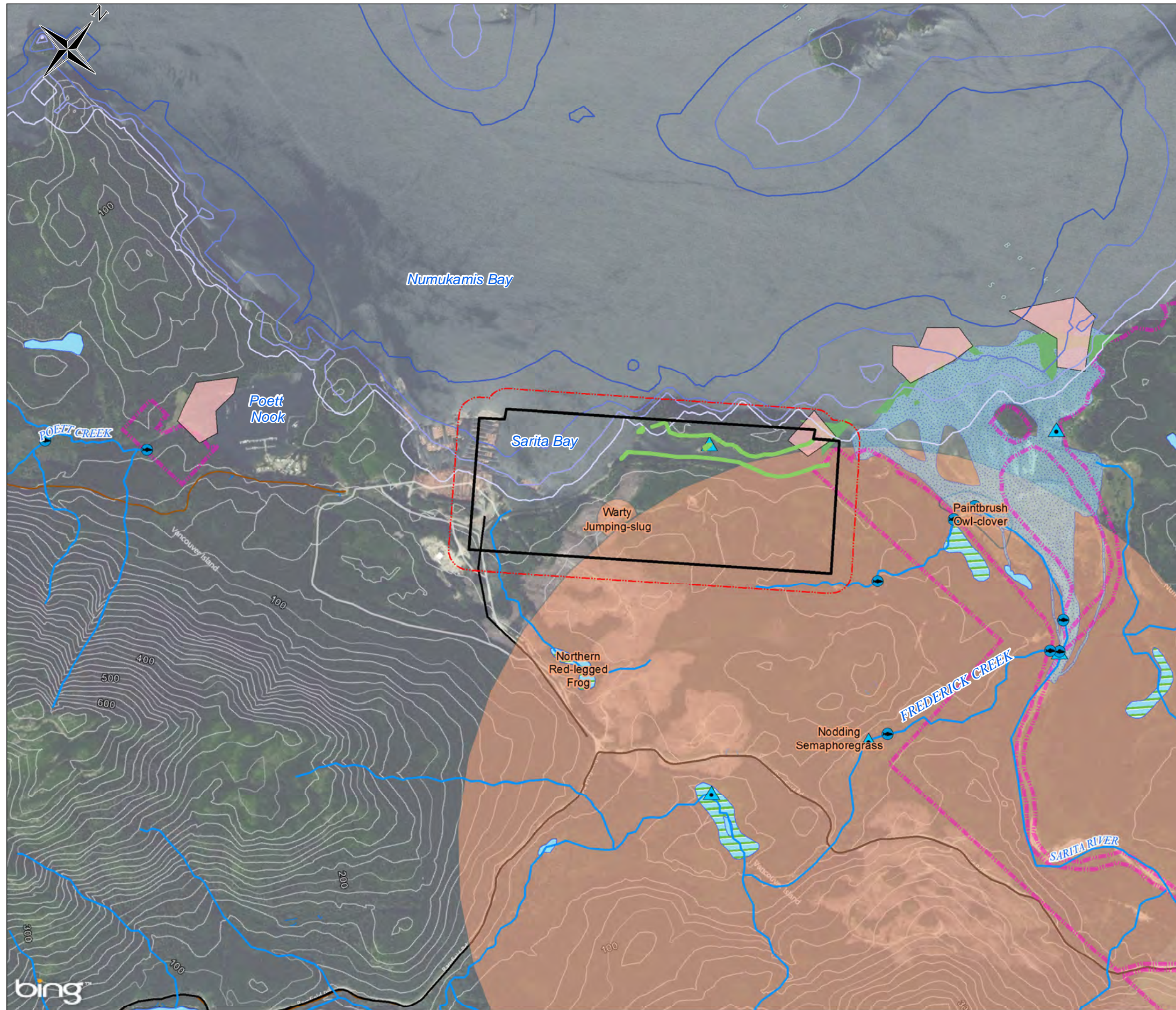
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CLIENT NAME: Port Alberni Port Authority	PROJECT LOCATION: Alberni Inlet, Vancouver Island, BC
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Project Location and Study Areas

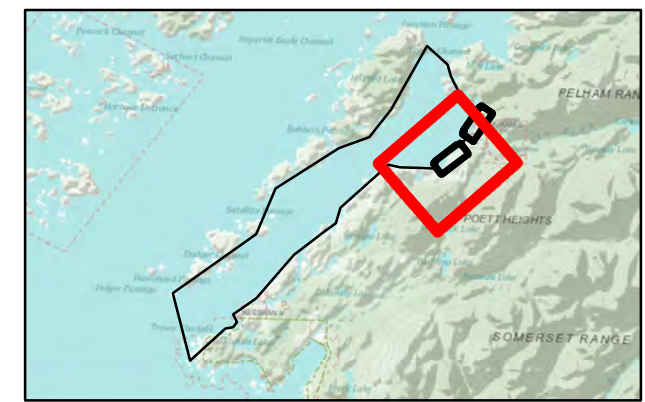
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CHKD: CLKR	PROJ COORD SYS: NAD 1983 UTM Zone 10N			



LEGEND

- Sarita South Site (~1.24km²)
 - 100m Buffer
 - Eelgrass (Various Sources)
 - Shellfish Aquaculture (Approx)
 - High Value Fish Habitat¹
 - Fish Observation Points
 - Streams
 - Lakes
 - Wetlands
 - Estuary (PECP Ranking = 3²)
 - CDC Listed Species Occurrence
 - Indian Reserve Boundaries
 - Road
 - Forest Tenure Roads
- Bathymetry (m)**
- 100
 - 50
 - 20
 - 5

Local Study Area

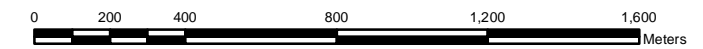


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REFERENCES

1. Bing Imagery
2. BCGOV ILMB Crown Registry and Geographic Base Branch (CRGB) (data accessed through www.GeoBC.gov.bc.ca)
3. From Barry, K. 2010
4. ²Ryder, J.L., J.K. Kenyon, D. Buffett, K. Moore, M. Ceh, and K. Stipec. 2007. An integrated biophysical assessment of estuarine habitats in British Columbia to assist regional conservation planning. Technical Report Series No. 476. Canadian Wildlife Service, Pacific and Yukon Region, Delta, BC

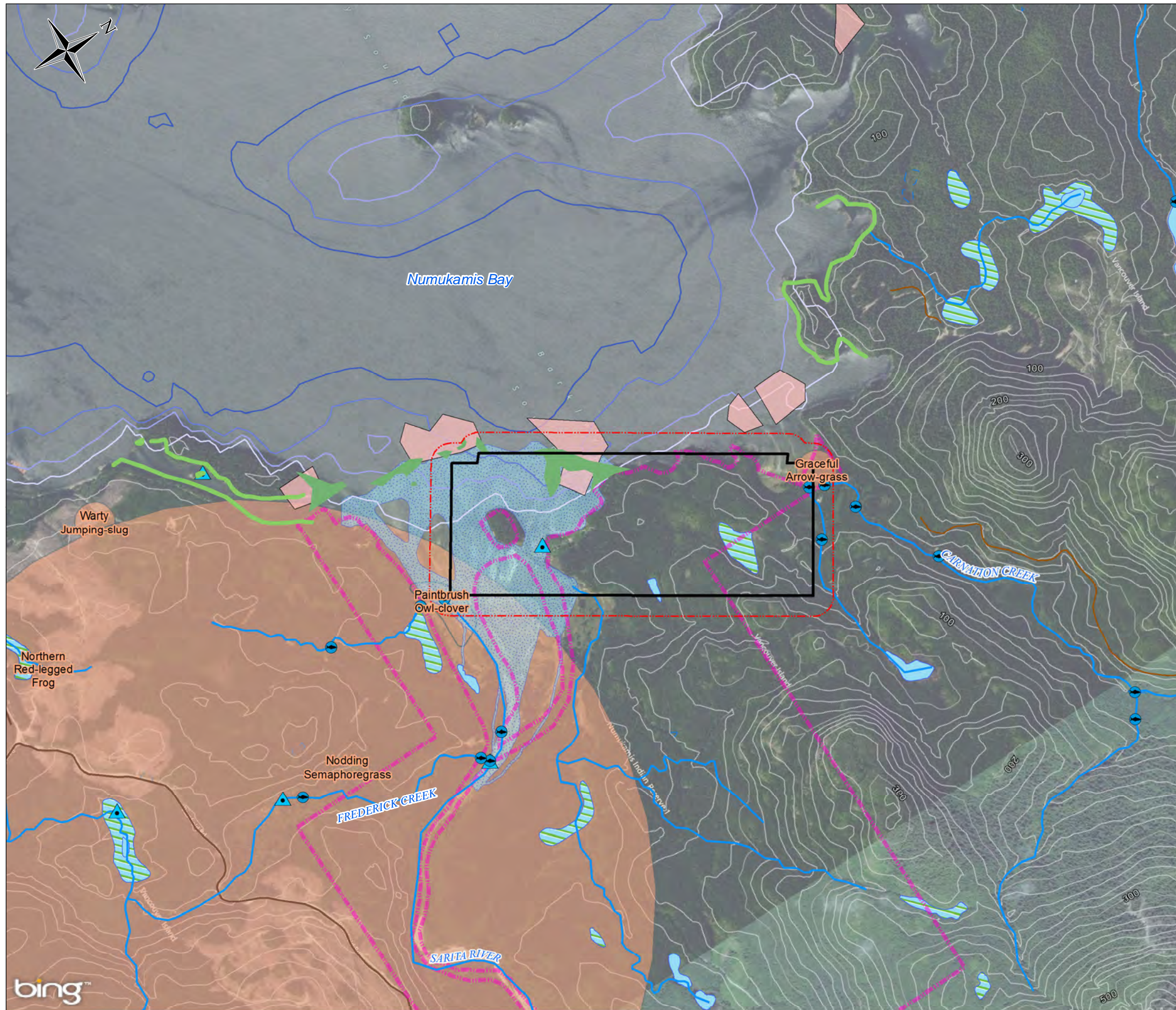


CLIENT NAME: Port Alberni Port Authority PROJECT LOCATION: Alberni Inlet, Vancouver Island, BC

Sarita Bay South Site - Environmental Constraints

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CHKD: CLKR	PROJ COORD SYS: NAD 1983 UTM Zone 10N	618358-002A	

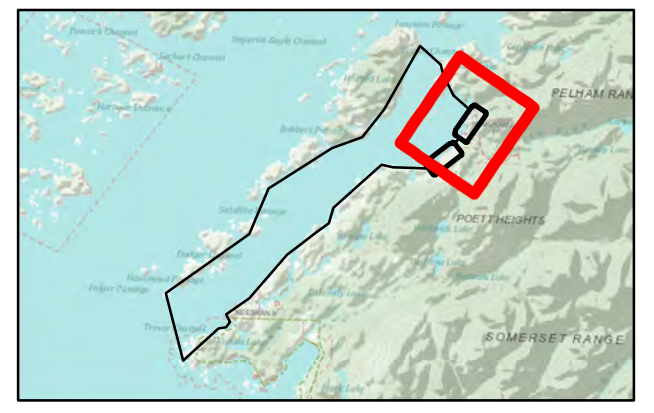
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LEGEND

- Sarita North Site (~1.24km²)
 - 100m Buffer
 - Eelgrass (Various Sources)
 - Shellfish Aquaculture (Approx)
 - High Value Fish Habitat¹
 - Fish Observation Points
 - Streams
 - Lakes
 - Wetlands
 - Estuary (PECP Ranking = 3²)
 - CDC Listed Species Occurrence
 - Indian Reserve Boundaries
 - Road
 - Forest Tenure Roads
- Bathymetry (m)**
- 100
 - 50
 - 20
 - 5

Local Study Area

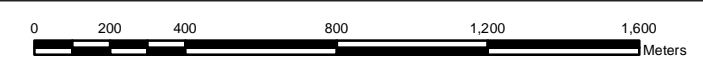


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3. From Barry, K. 2010
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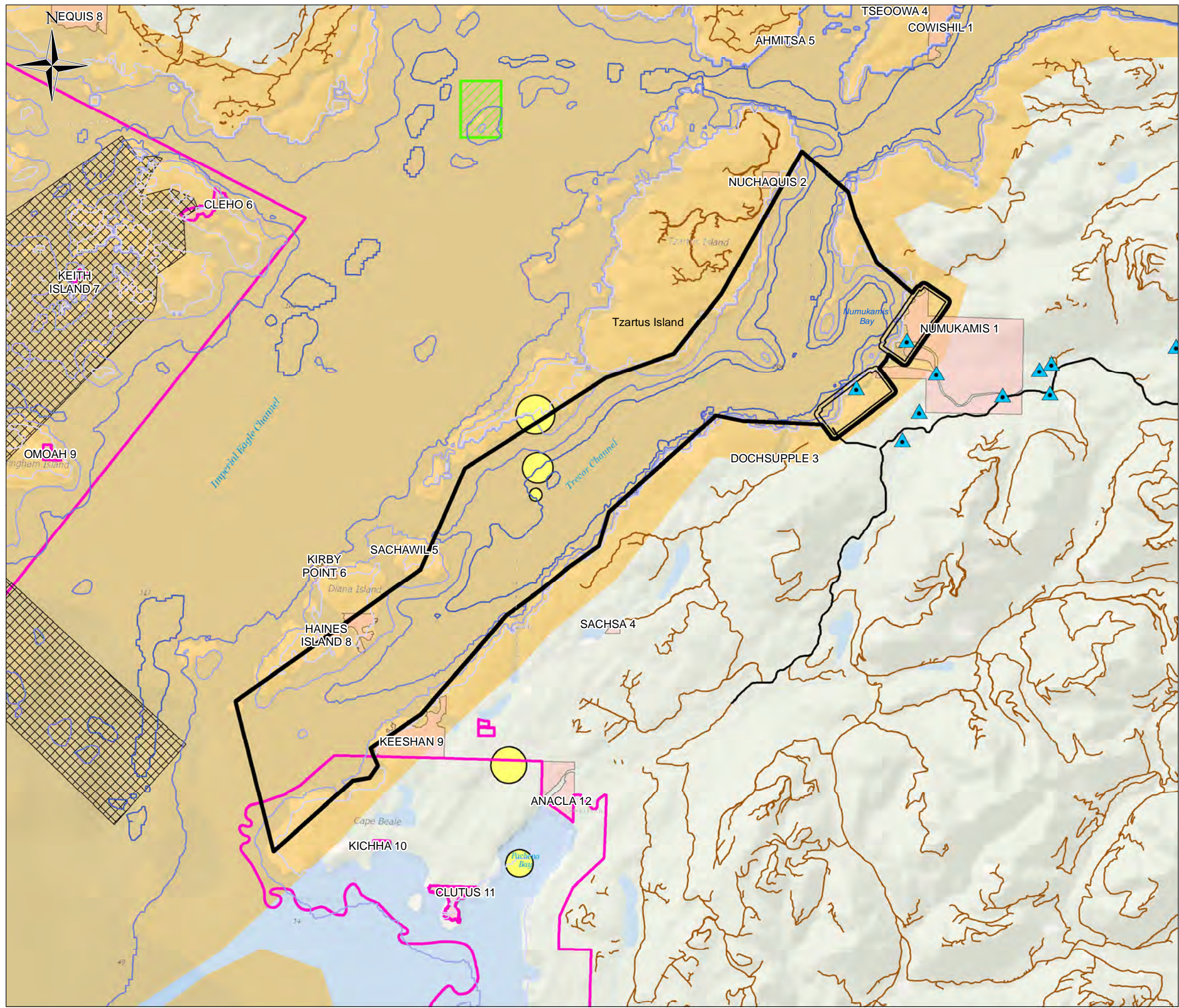


CLIENT NAME: Port Alberni Port Authority	PROJECT LOCATION: Alberni Inlet, Vancouver Island, BC
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**Sarita Bay North Site -
Environmental Constraints**

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CHKD: CLKR	PROJ COORD SYS: NAD 1983 UTM Zone 9N	618358-002B	

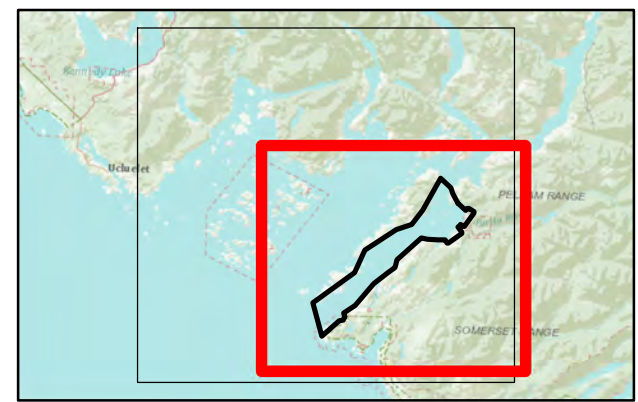




LEGEND

- Local Study Area
- Proposed Sites
- Pacific Rim National Park
- Baeria Rocks Ecological Reserve
- Indian Reserve Boundaries
- High Value Fish Habitat¹
- Important Bird Area
- Rockfish Conservation Area
- Marbled Murrelet
- Road
- Forest Tenure Roads
- Bathymetry (m)**
- 100
- 50
- 20
- 5

Regional Study Area

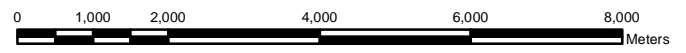


NOTES

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REFERENCES

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2. BCGOV ILMB Crown Registry and Geographic Base Branch (CRGB) (data accessed through www.GeoBC.gov.bc.ca)
3. *From Barry, K. 2010



CLIENT NAME: Port Alberni Port Authority	PROJECT LOCATION: Alberni Inlet, Vancouver Island, BC
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Project Local Study Area - Environmental Constraints

BY: LH	SCALE: 1:100,000	DATE: 2014/04/01	REF No: REV: 0
CHKD: CLKR	PROJ COORD SYS: NAD 1983 UTM Zone 10N	618358-003	

Fisheries Resources

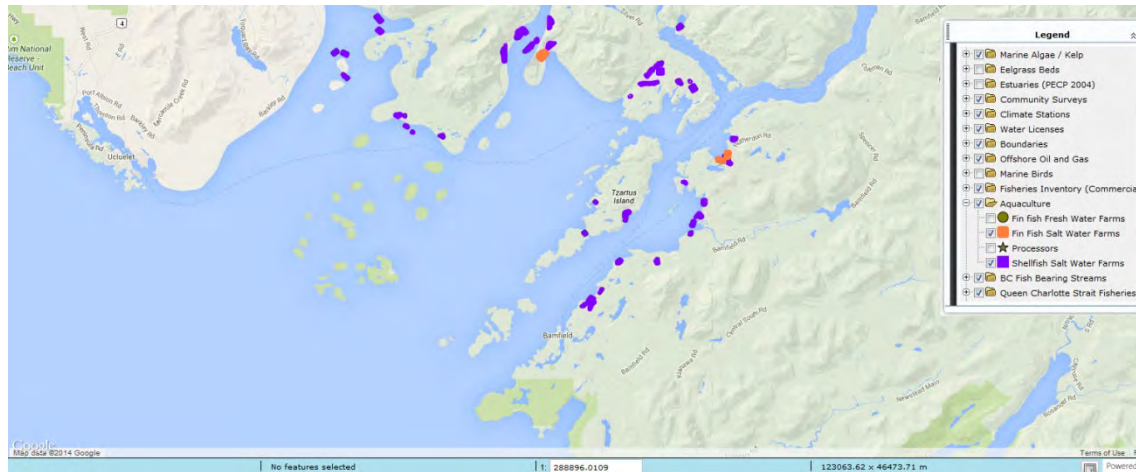


Figure 4a: Fin fish and shellfish aquaculture sites located in the LSA and RSA (source: Pacific Coastal Resource Atlas of BC).

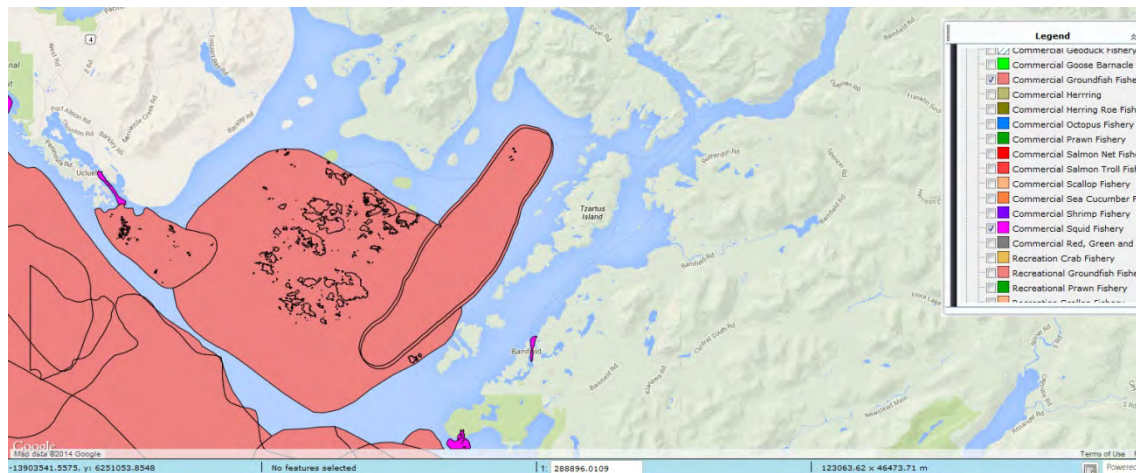


Figure 4b: Commercial groundfish and squid fisheries located in the LSA and RSA (source: Pacific Coastal Resource Atlas of BC).

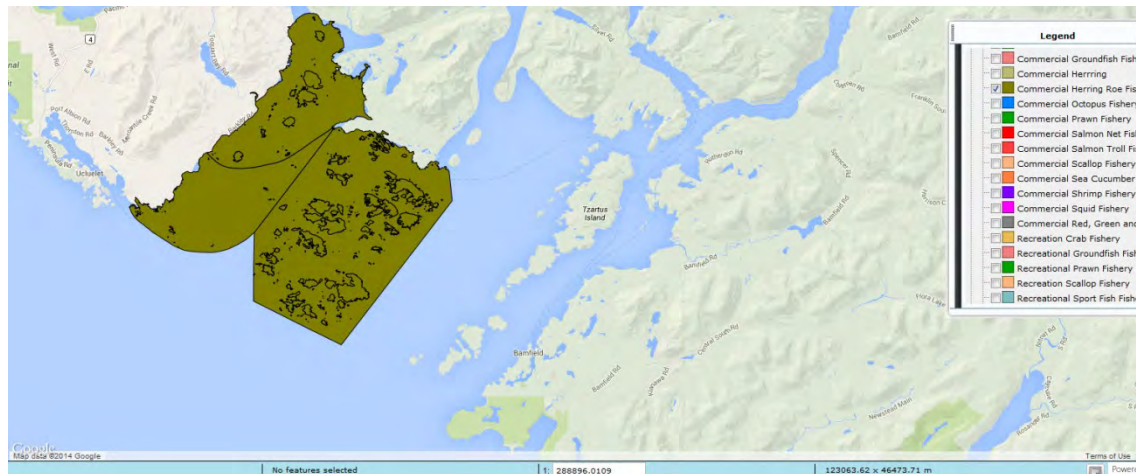


Figure 4c: Commercial herring roe fisheries located in the LSA and RSA (source: Pacific Coastal Resource Atlas of BC).

Fisheries Resources (cont'd)



Figure 4d. Commercial prawn and recreational sport fisheries located in the LSA and RSA (source: Pacific Coastal Resource Atlas of BC).

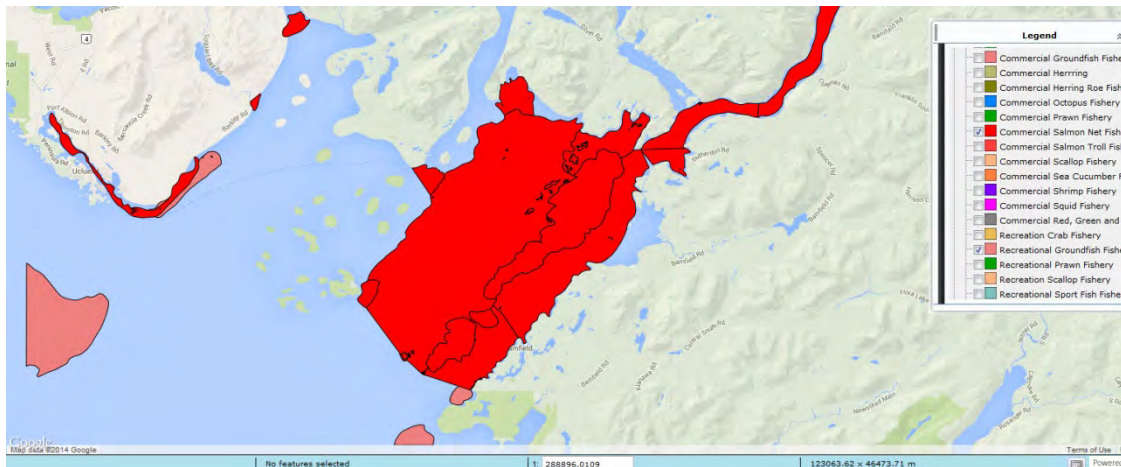


Figure 4e: Commercial salmon net and recreational groundfish fisheries located in the LSA and RSA (source: Pacific Coastal Resource Atlas of BC).

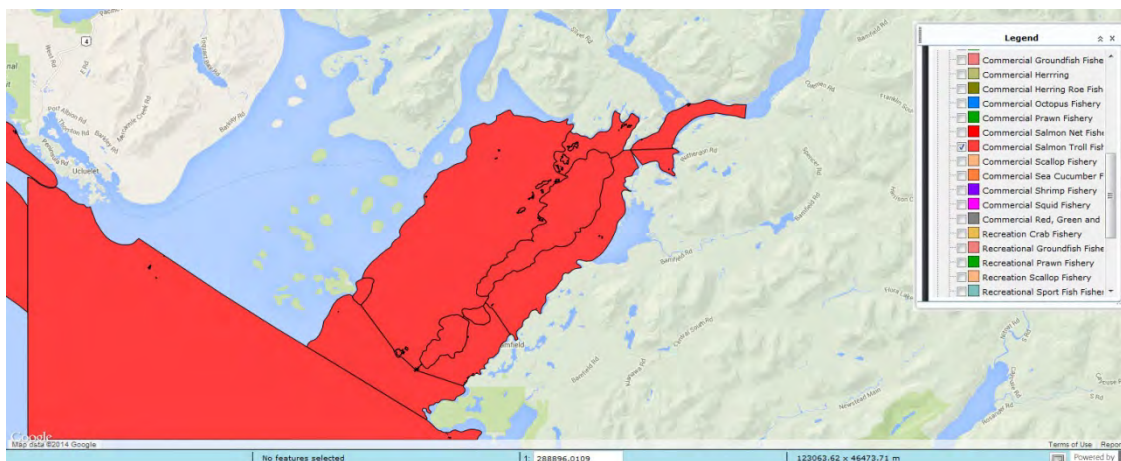


Figure 4f: Commercial salmon troll fisheries located in the LSA and RSA (source: Pacific Coastal Resource Atlas of BC).

Fisheries Resources (cont'd)

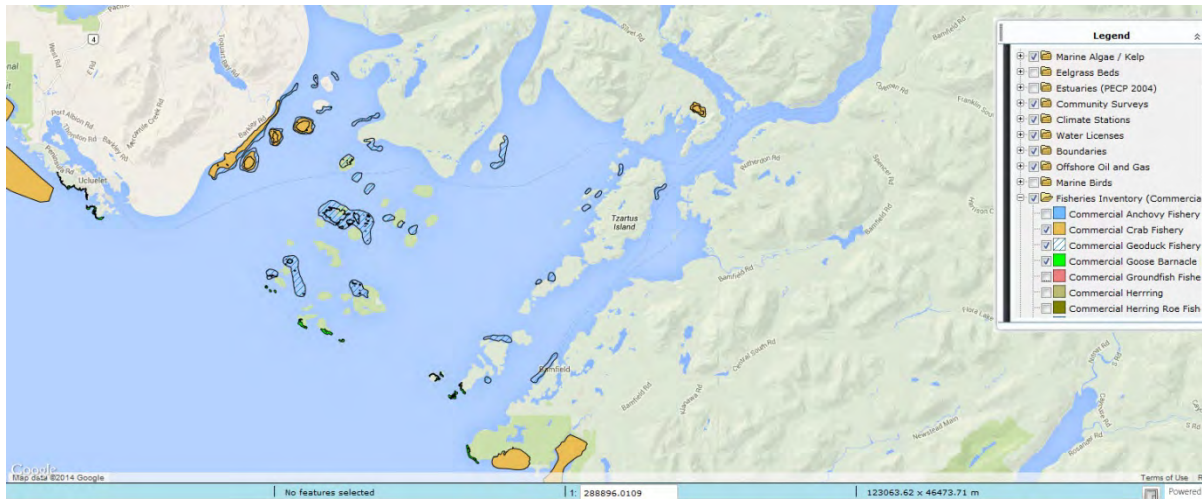


Figure 4g: Commercial crab, geoduck, and goose barnacle fisheries located in the LSA and RSA (source: Pacific Coastal Resource Atlas of BC).



Figure 5: Seabirds colonies noted by Environment Canada in Barkley Sound (source: BC Marine Conservation Analysis). Glaucous winged gull (top left), Black oyster catcher (top right), Pelagic cormorant (bottom left), Pigeon Guillemot (bottom right).

Marine Mammals

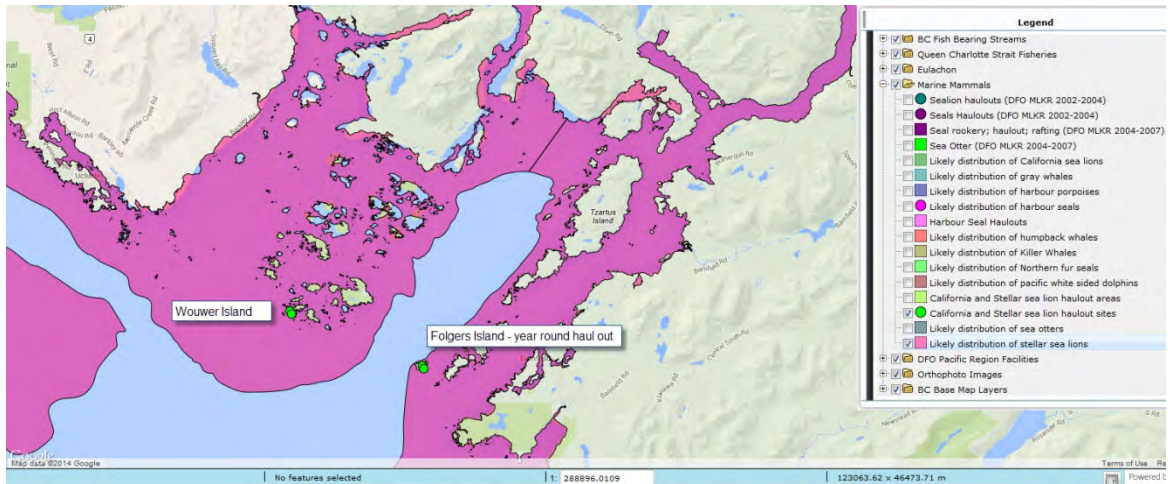


Figure 6a: Likely distribution of Steller sea lions and known Steller and California sea lion haul outs in the RSA and LSA (source: Pacific Coastal Resource Atlas of BC).

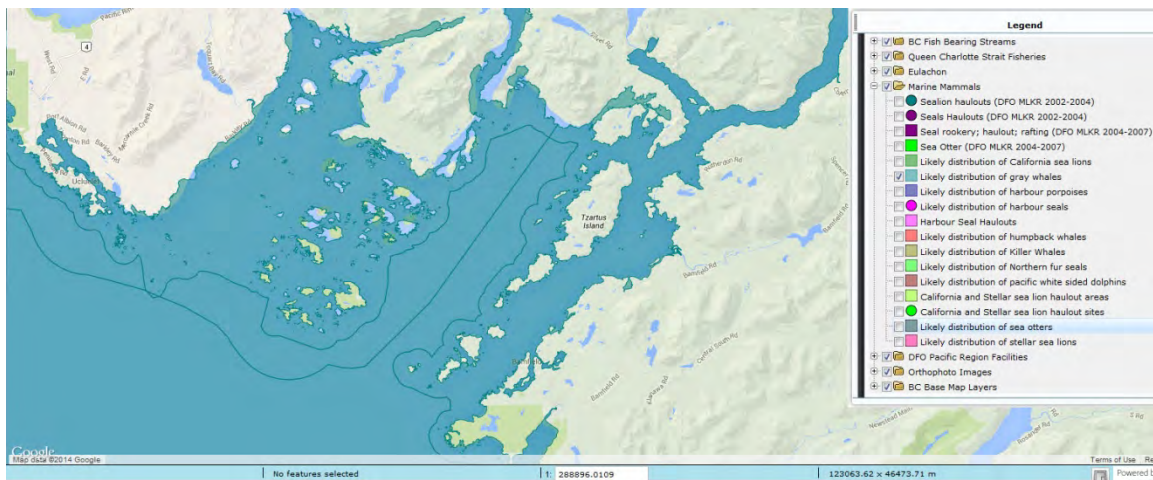


Figure 6b: Likely distribution of gray whales in the RSA and LSA (source: Pacific Coastal Resource Atlas of BC).

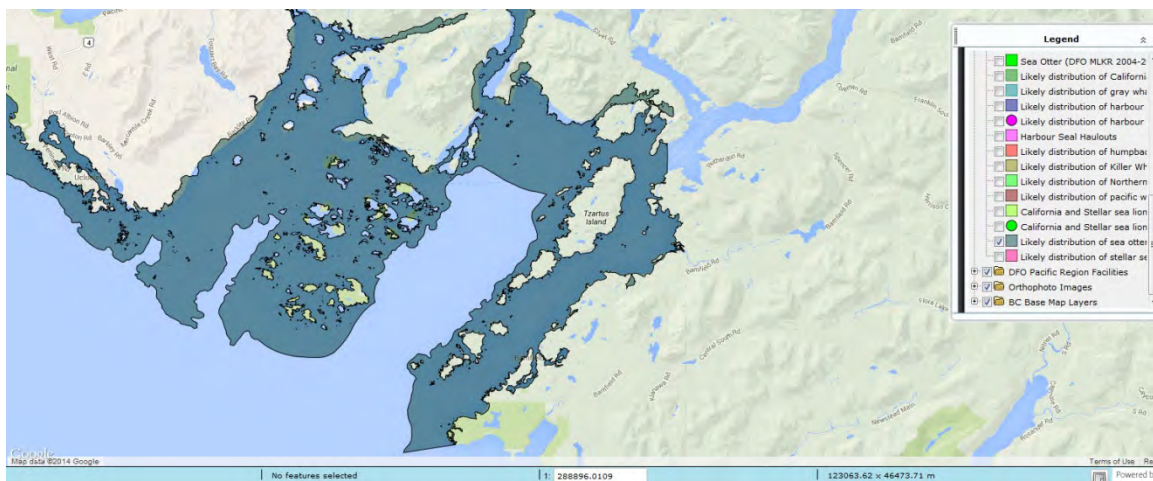


Figure 6c: Likely distribution of sea otters in the RSA and LSA (source: Pacific Coastal Resource Atlas of BC).

Marine Mammals (cont'd)

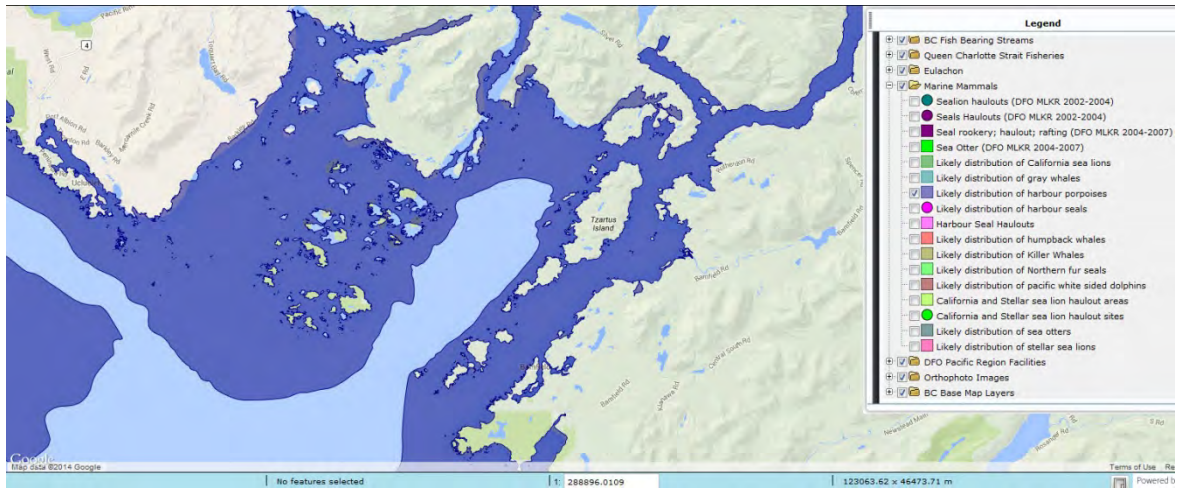


Figure 6d: Likely distribution of harbour porpoises in the RSA and LSA (source: Pacific Coastal Resource Atlas of BC).

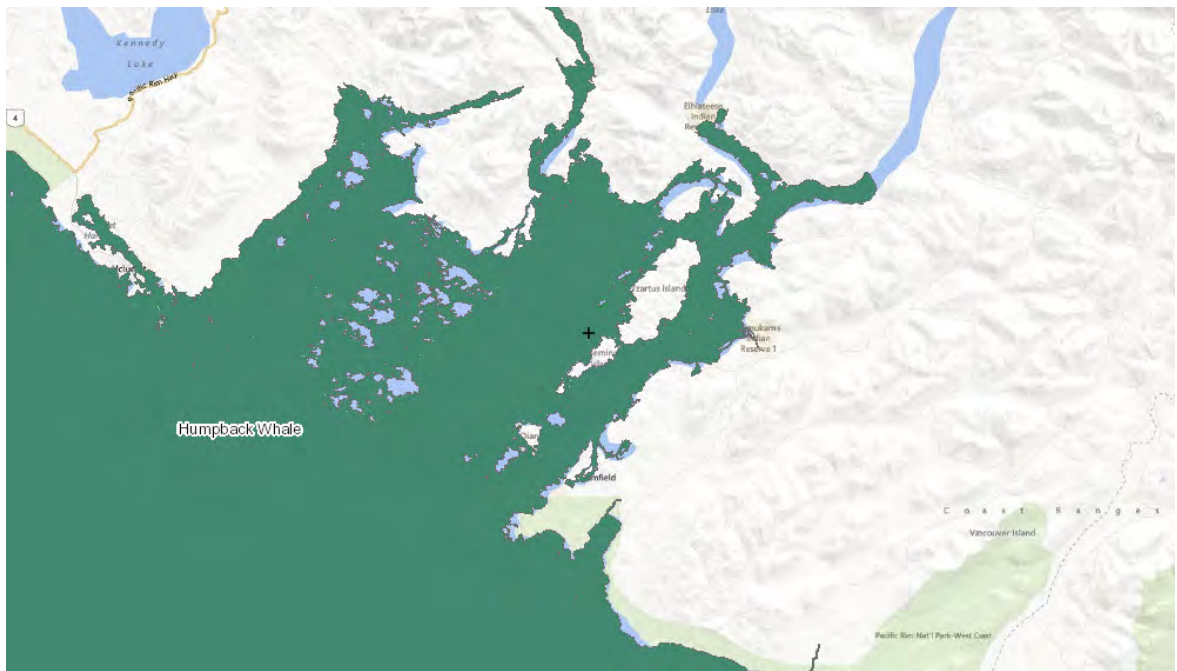


Figure 6e: Ecologically important marine areas for humpback whales (source: DFO Mapster V.3).

APPENDIX B



Tables

Table 1: Terrestrial Features or Issues Identified for the Sarita Bay Site Options

Environmental Features	Sarita Bay South	Sarita Bay North	Comments	Source
Terrestrial Features				
Forest Cover	Forest cover is second growth, dominated by young western redcedar (<i>Thuja plicata</i>) and western hemlock (<i>Tsuga heterophylla</i>) and also Sitka spruce (<i>Picea sitchensis</i>); mapped habitats are characteristic of moist soil regimes, including understory of horsetail sedge fen and sedge-dwarf willow moist meadow.	Forest cover is second growth, dominated by young western redcedar (<i>Thuja plicata</i>) and western hemlock (<i>Tsuga heterophylla</i>) and also yellow cedar (<i>Chamaecyparis nootkatensis</i>); mapped habitats are characteristic of moist soil regimes, including understory of horsetail sedge fen.	TEM mapping exists for both sites as per iMap (Weyerhaeuser / Sarita)	iMap BC, Google Maps
Mapped Sensitive Occurrences of Plant Species At Risk	<u>On Site:</u> Nodding Semaphore Grass (<i>Pleuropogon refractus</i>) has been identified within the floodplain forest of Sarita River, potentially on-site (provincial Blue List).	<u>On Site:</u> Paintbrush Owl-clover (<i>Castilleja ambigua ssp. ambigua</i>) has been identified at the mouth of Sarita River (over 700 m ²) (provincial Blue List). Graceful Arrow-grass (<i>Triglochin concinna</i>) has been identified in tidal mudflats of Carnation Creek (provincial Red List). Nodding Semaphore Grass (<i>Pleuropogon refractus</i>) has been identified within the floodplain forest of Sarita River, potentially on-site (provincial Blue List). <u>Off Site:</u> Nodding Semaphore Grass has also been identified off-site approximately 4 km upstream of Carnation Creek.	--	iMap BC; BC CDC; E-Flora BC;
Mapped Sensitive Occurrences of Ecosystems At Risk	None mapped on site	None mapped on site	--	iMap BC; BC CDC;
Mapped Sensitive Occurrences of Wildlife Species At Risk (including amphibians, birds, reptiles, mammals, and invertebrates)	<u>On Site:</u> Warty jumping slug (<i>Hemphillia glandulosa</i>) identified in coniferous forest with leaf litter (provincial Blue List, SARA Special Concern). Band-tailed pigeon (<i>Patagioenas fasciata</i>) breeding site on point north of Log Sort (east of the south tip of Santa Maria Island) (provincial Blue List, SARA Special Concern). <u>Off Site (in LSA):</u> Barn swallow (<i>Hirundo rustica</i>) breeding at Poett Nook Marina and east of Poett Nook Lagoon (provincial Blue List).	None mapped on site <u>Off Site (in LSA):</u> Brandt's cormorant (<i>Phalacrocorax penicillatus</i>) in Numukamis Bay and in Bamfield area. Common murre (<i>Uria aalge</i>) in Numukamis Bay off of Numukamis First Nation Reserve	<u>Off Site (in LSA):</u> Wandering salamander (<i>Aneides vagrans</i>) in Bamfield and on Tzartus Island (provincial Blue List). Olive-sided flycatcher (<i>Contopus cooperi</i>) in Bamfield and on Pachena Beach (provincial Blue List, SARA Threatened). Tufted puffin (<i>Fratercula cirrhata</i>) in Bamfield (provincial Blue List). Western screech-owl (<i>Megascops kennicottii</i>) north of Bamfield. <u>Off Site (in RSA):</u> Northern red-legged frog (<i>Rana aurora</i>) in a small wetland marsh connected to unnamed creek (wsc 930-109800) approx. 400m south of the site (provincial Blue List, SARA Special Concern). Northern red-legged frog in Grappler Pond 4.4 km southwest of the site, and on Tzartus Island 5.5 km northwest of the site. Common nighthawk (<i>Chordeiles minor</i>) at Pachena Beach (SARA Threatened). Caspian tern (<i>Hydroprogne caspia</i>) between Fleming and Diana Islands (provincial Blue List).	iMap BC; BC CDC; E-Fauna BC
Ungulate Winter Range (UWR) and Wildlife Habitat Areas (WHA)	None mapped	None mapped	The nearest ungulate winter range (for Mule Deer) is located 9 km to the east, north of Sarita Lake	iMap BC
Parks and Protected Areas	The site and LSA are within an Important Bird Area (IBA)	The site and LSA are within an IBA	<u>Off Site (in LSA):</u> Pacific Rim National Park is located southwest of the sites (Bamfield area). <u>Off Site (in RSA):</u> Pacific Rim National Park's (Broken Group Islands) are located northwest of the sites. An Ecological Reserve (Baeria Rocks) is located northwest of the sites.	iMap BC; Drawing 618358-003
Agricultural Land Reserve (ALR)	Not in ALR	Not in ALR	--	iMap BC
Topography / Elevation	Generally northwest facing slope on gentle to moderately steep terrain; elevation between 0 and 50 m asl	Generally west-facing slope on gentle to steep terrain; elevation between 0 m and 100 m asl	--	Site Drawings; iMap BC;
Ecoregion/Ecosection	Western Vancouver Island Ecoregion (WVI); Windward Island Mountains (WIM)	Western Vancouver Island Ecoregion (WVI); Windward Island Mountains (WIM)	--	BC CDC; Biogeoclimatic Ecosystem Classification (BEC) system

Table 1 (Cont'd): Terrestrial Features or Issues Identified for the Sarita Bay Site Options

Environmental Features	Sarita Bay South	Sarita Bay North	Comments	Source
Infrastructure/Access				
Distance to nearest Community	Approximately 300 m to Sarita Logging Camp (Weyerhaeuser); approx. 1 km to Poett Nook Marina and Campground; approx. 20 km to Bamfield; approx. 76 km to Port Alberni	Approximately 700 m to Sarita Bay South Site; approx. 75 km to Port Alberni	--	Google Maps
Access Roads	Bamfield Road is in the vicinity of the site (approx. 1.5 km to the southeast) and existing Forest Service Spur Roads intersect the site.	Bamfield Road is in the vicinity of the site (approx. 3 km to the southeast) and existing Forest Service Spur Roads intersect the site.	--	Site Drawings; Google Map
Other Considerations				
First Nations	Indian Reserve Numukamis 1 intersects with the northeast section of the site; Indian Reserve Dochsupple 3 (Huu-Ay-Aht First Nation) is located within 1 km to the south-west in Poett Nook Bay	Indian Reserve Numukamis 1 (Huu-Ay-Aht First Nation) is located within (and beyond) the entire site	--	iMap BC

Table 2: Freshwater Features or Issues Identified for the Sarita Bay Site Options

Environmental features	Satita Bay South	Sarita Bay North	Comments	Source
Freshwater Aquatic Features				
Mapped watercourses	<p><u>On Site:</u> There are two watercourses within (and adjacent to) the site: One unnamed creek (watershed code [wsc] 930-109800) enters the site from the southwest flowing north into Christie (Sarita) Bay near the Log Sort. A second unnamed creek (wsc 930-110700) is located adjacent to the site on the northeast side, and drains north into a wetland on the west bank of Sarita River. In addition, Sarita River estuary is located adjacent to the site, in the north.</p>	<p><u>On Site:</u> There are three main watercourses within and adjacent to the site including some of their tributaries: Sarita River, its estuary (wsc 930-110800), and a tributary to Sarita River (wsc 930-110800-01500) cover the southern third of the site. An unnamed tributary connected to a small lake (no wsc) is within the east boundary of the site. Carnation Creek (wsc 930-112200) and two of its tributaries (one with wsc 930-112162, the other with wsc 930-110800-11200) are located on the north boundary of the site.</p>	Carnation Creek has been the site of various Forest and Fisheries Research Projects, as part of the Fish-Forestry Interaction Program, which was initiated in 1970 (FLNRO, 2009).	Habitat Wizard; iMap; TRIM
Surface Water Flow	Surface water from the site is inferred to drain north and northwest into Christie (Sarita) Bay.	Surface water from the site is inferred to drain west and northwest into Nukumis Bay.	--	Site drawings; iMap BC
Mapped Water Bodies (Lakes)	There are no mapped water bodies within or in the vicinity of the site.	<p><u>On Site:</u> There is one small lake within the site footprint (east-centre). <u>Off Site:</u> There are two small lakes within 350 m and 450 m of the site (northeast and southeast of the site footprint).</p>	--	iMap BC
Mapped Wetlands / Marshes / Ponds	<p><u>On Site:</u> None. <u>Off Site:</u> There is one mapped wetland marsh approximately 400 m south of the site; it is connected to the unnamed creek that crosses the site on the southwest side (wsc 930-109800).</p>	<p><u>On Site:</u> There is one mapped wetland marsh within the site footprint, located in the northeast, draining into an unnamed tributary to Carnation Creek. There is one mapped wetland marsh on the south boundary of the site, on the west bank of Sarita River (potentially on site).</p>	--	Habitat Wizard; iMap BC
Groundwater Wells	<p><u>Off Site:</u> There is one well (tag # 65542; 225 ft depth) approximately 300 m southwest of the site boundary, near Christie (Sarita) Bay. The owner is recorded as MacMillan Bloedel LT. (now Weyerhaeuser)</p>	None mapped	--	BC Water Resources Atlas
Fish Species	<p>Unnamed creek (wsc 930-109800): none mapped Unnamed creek (wsc 930-110700): Coastal Cutthroat Trout, Coho Salmon, Rainbow Trout, Prickly Salmon.</p>	<p>Sarita River and tributaries: Coastal Cutthroat Trout, Rainbow Trout, Coho Salmon, Steelhead Trout, Chum Salmon, Pink Salmon, Chinook Salmon, Sockeye Salmon, Dolly Varden, Kokanee, Threespine Stickleback, Prickly Sculpin, Lamprey. Carnation Creek and tributaries: Pink Salmon, Coho Salmon, Coastal Cutthroat Trout, Chum Salmon, Chinook Salmon, Sockeye Salmon, Rainbow Trout, Steelhead Trout, Prickly Sculpin, Coastrange Sculpin. Unnamed tributary (no wsc): none mapped.</p>	Carnation Creek has been the site of various Forest and Fisheries Research Projects, as part of the Fish-Forestry Interaction Program, which was initiated in 1970 (FLNRO, 2009).	Habitat Wizard; FISS; Barry 2010; FLNRO, 2009
Fish Habitat	High value fish habitat (good quality habitat with high complexity) has been identified in the channel between Santa Maria Island and the Site;	High quality estuarine habitat has been identified in the Sarita River estuary - known rearing and overwintering habitat. Known Chinook, Chum, Coho spawning habitat have been identified in the Sarita River mainstem.		Barry 2010
Mapped Occurrences of Fish Species At Risk	None mapped	None mapped	--	BC CDC

Table 3: Marine corridor environmental features or issues

Environmental feature	Regional Study Area (RSA)	Local study Area (LSA)	Comment	Source
Aquaculture	There are several shellfish and finfish aquaculture sites within the RSA.	There are several shellfish and finfish aquaculture sites within the LSA.	Huu-ay-aht First Nations	Pacific Coastal Resource Atlas
Breeding Birds	There are known breeding bird colonies within the RSA.	None mapped.	--	Pacific Coastal Resource Atlas
Federally Listed Species (SARA)	<p>There are known occurrences of Marbled Murrelets within the RSA.</p> <p>Other aquatic SARA identified for the general area include:</p> <ul style="list-style-type: none"> - harbour porpoise, - Steller sea lions, - sea otters, - basking shark (historical abundance and recent sightings 99-08), - black-footed albatross, - blue whale, - bluntnose sixgill shark, - fin whale, - grey whales, - green sturgeon (migration route to overwintering), - transient orca populations, - leatherback turtles, - longspine thornyhead, - north Pacific right whale, - northern abalone, - Olympia oyster, - roughey rockfish (types I & II), - sei whale, - short-tailed albatross, - tope, and - yelloweye rockfish (outside waters type). <p>The RSA is considered an important feeding ground for humpback whales. There are known mapped occurrences of Olympia oyster in the RSA. There are known Steller sea lion haul outs at Mara Rock (year-round) and Wouwer Island (winter). Juvenile six gill shark have been observed and tagged in the RSA.</p>	<p>There are known occurrences of Marbled Murrelets within the LSA.</p> <p>Other aquatic SARA identified for the general area include:</p> <ul style="list-style-type: none"> - harbour porpoise, - Steller sea lions, - sea otters, - basking shark (historical abundance and recent sightings 99-08) - black-footed albatross, - blue whale, - bluntnose sixgill shark, - fin whale, - grey whales, - green sturgeon (migration route to overwintering), - transient orca populations - leatherback turtles - longspine thornyhead - north Pacific right whale, - northern abalone, - Olympia oyster, - roughey rockfish (types I & II), - sei whale, - short-tailed albatross, - tope, and - yelloweye rockfish (outside waters type). <p>The LSA is considered an important feeding ground for humpback whales. There is a known Steller sea lion haul out at Folger Island (winter). Juvenile six gill shark have been observed and tagged in the LSA.</p>	RSA is considered to be a Marine Ecologically and Biologically Significant Area (EBSA).	Pacific Coastal Resource Atlas; SARA; CDC; DFO Mapster
Fisheries	<p>The following commercial fisheries are identified within in the RSA:</p> <ul style="list-style-type: none"> - Groundfish - Herring roe - Prawn - Salmon net - Salmon troll - Geoduck - Goose barnacle - Crab - Red sea urchin <p>The following recreational fisheries are identified within in the RSA:</p> <ul style="list-style-type: none"> - Groundfish 	<p>The following commercial fisheries are identified within in the LSA:</p> <ul style="list-style-type: none"> - Squid - Salmon net - Salmon troll - Geoduck - Goose barnacle - Red sea urchin <p>The following recreational fisheries are identified within in the LSA:</p> <ul style="list-style-type: none"> - Sport fishing - Groundfish 	--	Pacific Coastal Resource Atlas; DFO mapster

Table 3 (Cont'd): Marine corridor environmental features or issues

Environmental feature	Regional Study Area (RSA)	Local study Area (LSA)	Comment	Source
Herring Spawn	There is mapped occurrence of herring spawn within the RSA.	There is mapped occurrence of herring spawn within the LSA (north of the two sites at Congreve Island).	--	Pacific Coastal Resource Atlas
Marine Mammals	The RSA is within the likely distribution area of California sea lions and northern fur seals, and harbour seal haul outs.	The LSA is within the likely distribution area of California sea lions and northern fur seals, and harbour seal haul outs.	--	Pacific Coastal Resource Atlas
National Parks/Reserves	Baeria Rocks and the Pacific Rim National Park - Broken Island Group fall within the RSA.	The northern end of the Pacific Rim National Park – West Coast Trail overlaps with the south end of the LSA.	--	Pacific Coastal Resource Atlas
Provincially Listed Species (CDC)	Red-listed species, Brandt's cormorant and the common murre, have been identified at Starlight Reef.	None mapped	--	MoE
Rockfish Conservation Areas (RCA)	There are designated RCAs located in the Broken Group and Folger Passage.	None mapped	--	DFO - Fisheries in the Pacific Region
Other	Pacific sand lance and eulachon are known to occur within the RSA.	Pacific sand lance and eulachon are known to occur within the LSA.	--	DFO Mapster

Table 4: Marine resources identified for the LSA and RSA in the Pacific Coastal Resource Atlas

Issues of Concern		Regional or Local	Actual location(s)	Pathway
Herring spawn		Regional	Northwest coast/shore of Barkley sound	Habitats and Species Concentration -> Herring Spawning (polygon)
		Local	N and S of the site options	
Algae	Sea grass, rockweed, red algae, brown algae, green algae, algae)	Regional	Northwest coast/shore of Barkley sound	Marine Algae / Kelp -> Algae
Eelgrass		Regional	Northwest coast/shore of Barkley sound	Eelgrass Beds -> BC Eelgrass 2004
		Local	SW tip of Tzartus Island	
		Regional	Northwest coast/shore of Barkley sound	Eelgrass Beds -> Heagle Eelgrass
		Regional	Northwest coast/shore of Barkley sound	Eelgrass Beds -> Shorezone segments
		Local	Continuous and patchy segments - continuous eelgrass on Vanc Isl shoreline (across from Santa Maria Island); Patchy (on SE shore of Santa Maria Island) and no data (for NW shore of Santa Maria Isl.); No eelgrass (mouth/along estuary); no data (North of estuary).	
		Regional	Northwest coast/shore of Barkley sound	Eelgrass Beds -> Eelgrass (DFO MLKR 2002-2004)
		Local	Several eelgrass polygons offshore of the estuary mouth (and south near bamfield)	Eelgrass Beds -> Eelgrass locations
Estuary		Local	Mouth of the South Sarita River	Estuaries (PECP 2004) -> Estuary
Bird	Marbled Murrelet (endangered)	Regional	Barkley Sound (near Broken Grp)	Marine Birds -> MAMU Endangered Species
		Local	Deer Group/Trevor Channel	
	Breeding seabirds	Regional	Barkley Sound – Baeria Rocks, Starlight Reef, Great Bear Rock	Marine Birds -> Pop'n of all breeding seabirds
Fisheries	Commercial/ Recreational crab	Regional	Northwest coast/shore of Barkley sound	Fisheries Inventory
	Commercial geoduck	Regional	Barkley sound	
		Local	NE coast Tzartus Island & Trevor Channel nr Bamfield	
	Commercial Goosebarnacle	Regional & Local	South end of the local area along the outer edge of the Broken Grp	
	Commercial Groundfish	Regional	Barkley Sound	
	Recreational Groundfish	Local	Tapaltos Bay	
	Commercial Herring Roe	Regional	Barkley Sound	
	Commercial Prawn	Regional	N end of Barkley Sound	
	Commercial Salmon Net & Troll	Regional & Local	Incl entire route/local area	
	Commercial Squid	Local	Nr Bamfield	
Recreational Sport Fish	Regional & Local	Disbursed throughout Barkley Sound and the local area (but not in the immediate vicinity of the site options)		
Aquaculture	Finfish salt water	Regional	San Mateo & Jane Bay	Aquaculture
	Shellfish salt water	Regional	North shoreline of Barkley Sound	
		Local	FN sites at mouth of the South Sarita River; east side of Tzartus; Trevor Channel to the south	
	Finfish salt water	Regional	San Mateo & Jane Bay	
Marine Mammals	California Sea Lion	Regional & Local		Marine Mammals -> Likely distribution of California Sea Lion
		Regional	Sites in Broken Grp and nr Hammond Passage	Marine Mammals -> California and SSL haulout sites
	gray whales	Regional & Local		Likely distribution of gray whales
	harbour porpoise	Regional & Local		Marine Mammals -> Likely distribution of harbour porpoise
	Harbour seals	Regional & Local		Marine Mammals -> harbour seal haulouts
	northern fur seals	Regional & Local		Marine Mammals -> Likely distribution of northern fur seals
	steller sea lions	Regional & Local		Marine Mammals -> Likely distribution of steller sea lions
	sea otters	Regional & Local		Marine Mammals -> Likely distribution of sea otters
Fish bearing streams	Chinook	Regional & Local	Incl South Sarita River	BC Fish Bearing Streams
	Chum			
	Coho			
	Cutthroat trout			
	Sockeye			
	Steelhead			

Table 5: Marine species at risk thought to occur in the PATH LSA and RSA

Common	Latin	Level of Concern		Distribution area (as per SARA)	Occurrence
Basking Shark	<i>Cetorhinus maximus</i>	SARA Schedule 1, endangered	Fish	- Basking sharks are planktivores, and areas with high concentrations of zooplankton (small crustaceans and fish larvae drifting in the water column) appear to be their favoured habitat, typically including fronts where water masses meet, headlands, and around islands and bays with strong tidal flow. They spend much of their time near the surface, although there is recent evidence that basking sharks may also use deepwater habitats greater than 1,000 m	
Black-footed Albatross	<i>Phoebastria nigripes</i>	SARA Schedule 1, special concern	Bird	- The Black-footed Albatross is considered an offshore species, but from May to October it is common over waters within a few nautical miles of the British Columbia coast; during summer, an estimated 2500 birds occur within Canadian waters. During the chick-rearing stage, breeding birds forage in the California Current as far north as British Columbia. Black-footed Albatross numbers peak in Canadian waters during the post-breeding dispersal in August and early September.	
Blue whale (Pacific)	<i>Balaenoptera musculus</i>	SARA Schedule 1, endangered	Mammal	- Occurs in offshore waters off the west coast of Canada and migrates past Vancouver Island (northwards in spring and southwards in fall) range widely, inhabiting both coastal and open waters. - Remains mostly offshore in the open ocean. Feeding aggregations are often found at the continental shelf edge where upwelling produces krill.	Regional
Bluntnose Sixgill Shark	<i>Hexanchus griseus</i>	SARA Schedule 1, special concern	Fish	- Bluntnose sixgill sharks are likely well distributed throughout much of Canada's Pacific waters including inlets, continental shelf and slope and the Strait of Georgia. - Although the bluntnose sixgill shark is found from the surface to depths of 2500 m, it is primarily a deepwater species found in waters below 91 m.	
Fin Whale	<i>Balaenoptera physalus</i>	SARA Schedule 1, threatened	Mammal		Regional (low)
Green sturgeon	<i>Acipenser medirostris</i>	SARA Schedule 1, special concern	Fish	- It is found on the Pacific coast, near the mouths of large rivers. - Usually found in salt water, occupying fresh water only during the spawning season. These fish inhabit the brackish waters found at the mouth of large rivers. Movements are linked to water temperature and food availability. Green Sturgeons are bottom feeders.	
Grey Whale (eastern north Pacific)	<i>Eschrichtius robustus</i>	SARA Schedule 1, special concern	Mammal	- Commonly observed in the LSA/RSA from spring to late autumn	
Harbour Porpoise	<i>Phocoena phocoena</i>	SARA Schedule 1, special concern	Mammal	- On the west coast, members of the Pacific Ocean population occur throughout the coastal waters of British Columbia. - Found primarily over continental shelves, and occasionally in deeper waters. The Harbour Porpoise sometimes frequents bays and harbours, particularly during the summer. They are known to spend time in areas which have physiographic features that help to concentrate prey, or make prey easier to capture.	
Humpback Whale (North Pacific)	<i>Megaptera novaeangliae</i>	SARA Schedule 1, special concern	Mammal	- The range extends along the full length of the west coast of British Columbia to northwestern Alaska. - Migrate seasonally between high-latitude feeding areas in summer and low-latitude breeding and calving areas in winter. Canadian waters are used primarily for feeding.	Regional
Killer Whale (NE Pacific Transient)	<i>Orcinus orca</i>	SARA Schedule 1, threatened	Mammal	- They have been recorded throughout almost all salt-water (and some fresh-water) areas, including many long inlets, narrow channels and deep embayments. Both resident and transient Killer Whales have been recorded year-round off the Pacific coast.	Regional
Killer Whale (NE Pacific Southern Resident)	<i>Orcinus orca</i>	SARA Schedule 1, endangered	Mammal	- Do not appear to be limited by such habitat considerations as depth, water temperature, or salinity. They are found in all oceans, in water temperatures ranging from below 0°C to warm tropical waters. They have been recorded in water ranging from shallow (several metres) to open ocean depths. They will occasionally spend considerable time in brackish water and will even enter rivers. Habitat use does differ between "residents" and "transients". "Transients" tend to spend more time in water less than 5m deep, often foraging in inter-tidal areas at high tides.	Regional (low)
Killer Whale (NE Pacific offshore)	<i>Orcinus orca</i>	SARA Schedule 1, threatened	Mammal		
Leatherback Turtle	<i>Dermochelys coriacea</i>	SARA Schedule 1, endangered	Reptile	- Migratory sea turtles that breed in tropical or subtropical waters and move to temperate waters in search of food (chiefly jellyfish) at other times of the year. There are fewer sightings on the west coast, and these occur between July and September.	Regional (low)
Longspine Thornyhead	<i>Sebastolobus altivelis</i>	SARA Schedule 1, special concern	Fish	- In British Columbia this species occurs along the continental slope at depths between 500 m and 1,600 m. The predominant population group can be found in DFO fisheries management region WCVI (West Coast Vancouver Island). The species prefers soft sand or mud bottoms in deep-water environments characterized by low productivity (slow growth), high pressure, and reduced oxygen concentrations.	
North Pacific Right Whale	<i>Eubalaena japonica</i>	SARA Schedule 1, endangered	Mammal		Regional
Northern Abalone	<i>Haliotis kamtschatkana</i>	SARA Schedule 1, endangered	Mollusc	- The Northern Abalone occurs from the lower intertidal zone to at least 100 m depth; adults are usually found at <10 m depth. The abalone prefer a firm substrate, usually rock in exposed or semi-exposed coasts. They are patchily distributed within this habitat.	Regional
Olympia Oyster	<i>Ostrea lurida</i>	SARA Schedule 1, special concern	Mollusc	- Olympia oysters are mainly found in the lower intertidal and shallow subtidal zones of saltwater lagoons and estuaries. They have also been found on tidal flats, tidal channels, bays and sounds, in splash pools, near freshwater seepage, or attached to pilings or the undersides of floats. On the outer coast, this oyster species is only found in protected locations. Within suitable habitat, Olympia oysters need hard substrate for settlement.	Regional
Rougheye Rockfish (Type I & II)	<i>Sebastes sp</i>	SARA Schedule 1, special concern	Fish	- Occur along the continental slope at depths between 170 and 660 m. - Highest densities occur on the sea floor with soft substrates, in areas with frequent boulders and on slopes greater than 20°. Rougheye co-occur with numerous commercially harvested species, including arrowtooth flounder, Pacific ocean perch, Dover sole, petrale sole, shortspine thornyhead, and sablefish.	

Table 5 (Cont'd): Marine species at risk thought to occur in the PATH LSA and RSA

Common	Latin	Level of Concern		Distribution area (as per SARA)	Occurrence
Sea otter	<i>Enhydra Lutris</i>	SARA Schedule 1, special concern	Mammal	- The species inhabits shallow, coastal waters. It seldom ranges more than 1 -2 km from shore. Usually, it forages in depths of 30 m or less. All Sea Otters, particularly mothers with pups, seem to prefer areas with kelp canopies, but kelp is not an essential habitat requirement. Habitat use varies with weather and marine conditions. Off Vancouver Island, for example, otters move offshore during extended periods of calm, and they congregate in sheltered inshore areas during storms.	Regional (low)
Sei Whale	<i>Balaenoptera borealis</i>	SARA Schedule 1, endangered	Mammal	- There have been no sightings of Sei Whales off Canada's Pacific coast since commercial whaling was halted in 1976. There has, however, been limited survey effort and Sei Whales may have been mistaken for Fin or Minke whales. - It favours temperate, deep offshore habitat more than other species of large whales. Records kept during commercial whaling off British Columbia indicate that less than 0.5% of the Sei Whales were caught on the continental shelf.	Regional (low)
Short-tailed Albatross	<i>Phoebastria albatrus</i>	SARA Schedule 1, threatened	Bird	- Species occurs off the coast of British Columbia, where it has been observed in every month other than December. Since 1996, 34 Short-tailed Albatrosses have been observed in or within 50 km of Canada's Exclusive Economic Zone. - At-sea observations and recent satellite tracking studies indicate that Short-tailed Albatrosses are associated with the outer continental shelf and upper slope waters; marine habitats that are characterised by upwelling and high biological productivity.	
Steller sea lion	<i>Eumetopias jubatus</i>	SARA Schedule 1, special concern	Mammal	- Three main breeding areas are present in British Columbia and 21 year-round haulout sites. - In summer, these animals generally are seen within 60 km of the coasts, in water less than 400 m deep, but they sometimes venture up to 200 km offshore. The animals regularly haul out year round and tend to form compact groups with practically no space between individuals.	
Tope	<i>Galeorhinus galeus</i>	SARA Schedule 1, special concern	Fish	- Although Tope are rarely seen today in Canadian waters, Tope are known to occur in Canada's Pacific continental shelf waters along Vancouver Island, Queen Charlotte Sound, and into Hecate Strait.	
Yelloweye rockfish (outside waters)	<i>Sebastes ruberrimus</i>	SARA Schedule 1, special concern	Fish		

Table 6: Environmental Features or Issues Identified for the Two Sarita Bay Site Options

Environmental Feature/Issue	Sarita Bay South	Sarita Bay North	Comment	Source
Marine Features				
Aquaculture	There is a First Nations shellfish aquaculture site within the site footprint (northeast).	There is a First Nations shellfish aquaculture site within the site footprint (west).	Huu-ay-aht First Nations	Pacific Coastal Resource Atlas
Birds	The site is within the general area for marine birds (scoters, pelagic birds, Pacific loons, ducks, gulls, pigeon gillemont, pelagic cormorant nesting colonies); no specific species or occurrences mapped for the site.	The site is within the general area for marine birds (scoters, pelagic birds, Pacific loons, ducks, gulls, pigeon gillemont, pelagic cormorant nesting colonies); no specific species or occurrences mapped for the site.	--	Pacific Coastal Resource Atlas; DFO Mapster
Eelgrass	There is an area of mapped eelgrass within the site footprint (north and northeast).	There is an area of mapped eelgrass within the site footprint (west).	--	Pacific Coastal Resource Atlas; DFO Mapster
Estuaries	None mapped	The estuary at the mouth of the Sarita River is located in the southwest section of the proposed site will	--	Pacific Coastal Resource Atlas
Federally Listed Species (SARA)	The site falls within the likely distribution area of SARA Schedule 1 species, including: <ul style="list-style-type: none"> - harbour porpoise, - Steller sea lions, - sea otters, - basking shark (historical abundance and recent sightings 99-08), - green sturgeon (migration route to overwintering, and - juvenile six gill sharks (observed and tagged in the general area). <p>The area is considered an important feeding ground for humpback whales.</p>	The site falls within the likely distribution area of SARA Schedule 1 species, including: <ul style="list-style-type: none"> - harbour porpoise, - Steller sea lions, - sea otters, - basking shark (historical abundance and recent sightings 99-08), - green sturgeon (migration route to overwintering, and - juvenile six gill sharks (observed and tagged in the general area). <p>The area is considered an important feeding ground for humpback whales.</p>	BS is considered an important feeding ground for humpback whales; The area is considered to be a Marine Ecologically and Biologically Significant Area (EBSA).	Pacific Coastal Resource Atlas; SARA; DFO Mapster
Fisheries	None mapped	None mapped	--	Pacific Coastal Resource Atlas
Herring Spawn	None mapped	None mapped	--	Pacific Coastal Resource Atlas
Marine Mammals	The site falls within the likely distribution area of California sea lions and northern fur seals, and harbour seal haul outs.	The site falls within the likely distribution area of California sea lions and northern fur seals, and harbour seal haul outs.	--	Pacific Coastal Resource Atlas; SARA
National Parks/Reserves	None mapped	None mapped	--	Pacific Coastal Resource Atlas
Provincially Listed Species (CDC)	Blue-listed species, great blue heron, green heron, peregrine falcon, barn swallow, and Caspian tern are identified as occurring in the general area.	Blue-listed species, great blue heron, green heron, peregrine falcon, barn swallow, and Caspian tern are identified as occurring in the general area.	--	MoE
Rockfish Conservation Areas	None mapped	None mapped	--	DFO - Fisheries in the Pacific Region
Other	Eulchon are known to occur within the area of the site. The area of the site is within important marine ecological areas for big skate, Pacific hake, herring, juvenile flatfish, salmon, sandpaper skate, and sardine.	Eulchon are known to occur within the area of the site. The area of the site is within important marine ecological areas for big skate, Pacific hake, herring, juvenile flatfish, salmon, sandpaper skate, and sardine.	--	DFO Mapster

Table 7: Summary of Key Terminal Emission Sources and Activity Rates

Identified Source	Associated Equipment types	Number of Units	Average Power Rating (hp) for each unit	Average Usage (hours/year for each unit)
Terminal Equipment				
Automated guided vehicles (AGVs)	Yard trucks (hostler, Goats, Terminal Tractors)	40	200	2200
Rail Mounted Cranes (RMGs)	Cranes (not RTGs), Rubber Tire Gantries (RTGs)	20	700	1000
Generators	Generators	10	250	225
Stackers	Top or Side Picks (Reach Stackers)	20	260	2200
Marine Equipment				
Containership	n/a	80 (visits)	As per model (approx 100,000 hp main engine and 2,500 hp aux demand at berth)	45% occupancy expected, 2 hours of local manoeuvre per visit
Tugs (for barges)	n/a	2,500 (visits)	As per model (approx 2,500 hp main engines)	2 hour turnaround assumed with engines (each)
Onroad Equipment				
Container trucks	Class 8 Tractor Trailers	3,000 visits	As per model	15 minutes idle, 5 minutes manoeuvre