



Biophysical Inventory—Gabriola Island BC Ferry Terminal Rezoning



March 29, 2019

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Acknowledgement

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BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Introduction
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1.0 INTRODUCTION

BC Ferries is completing a Terminal Development Plan (TDP) for the Gabriola terminal at Descanso Bay on Gabriola Island. The TDP is being implemented to plan the next 25 years of operation and development for the terminal. The TDP for the Gabriola terminal includes requirements to amend the Island Trust Official Community Plan (OCP) and Zoning Bylaw for Gabriola Island.

Stantec has been retained to prepare, submit and manage the OCP and Zoning Bylaw amendment process with Island Trust. As part of this amendment and application process, Stantec has been requested to prepare a Biophysical Inventory for the existing and planned development of the Gabriola Island Ferry terminal consistent with Island Trust and BC *Environmental Assessment Act* (BC EAA) standards.

A biophysical inventory of the terminal was completed based on Island Trust inventory standards provided to Stantec December 7, 2018. The Biophysical Inventory includes a desktop and field survey of the terminal and area associated with marine, vegetation and wildlife habitats and sensitive species.

1.1 PROJECT DESCRIPTION

The development of the Gabriola Island Ferry terminal will include the construction of a new vessel berth in the same general location as the existing terminal. Changes to the upland area of the terminal will include road expansion for more ferry bound vehicles in dedicated queuing lanes and improved customer amenities such as a new passenger waiting room, pick-up/drop-off area, more short-term parking, and better traffic flows.



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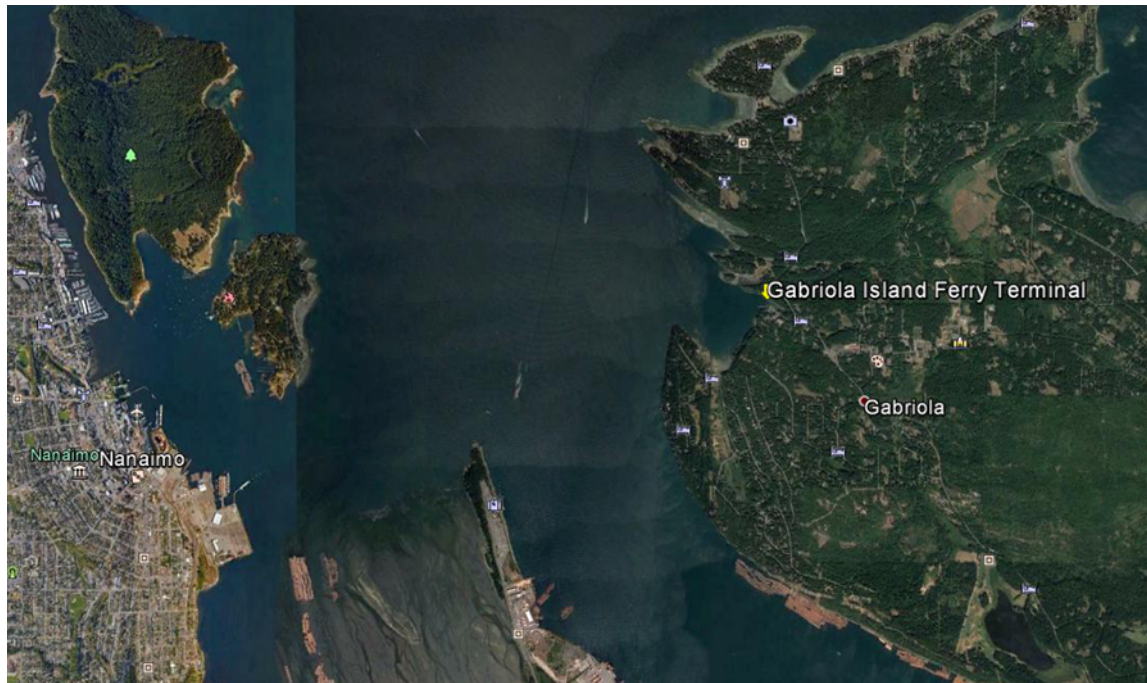


Figure 1 Gabriola Island Ferry Terminal Expansion Study Area Location

The study area is located in the Northumberland Channel inside the Nanaïmo Harbour limit on the western shore of Gabriola Island in Descanso Bay, British Columbia (Figure 1). Property details are provided in Table 1.

Table 1 Property Information Summary

Legal Description	Lot A, Plan VIP75538 (PID: 025-798-103) (upland lot including the parking lot) District Lot 2058, Plan VIP 75537 (PID: 025-798-090) (includes a portion of the parking lot and the marine area of the terminal)
Latitude/Longitude	49° 10' 40" N 123° 51' 30" W
Surrounding Area	The Study area and existing terminal is surrounded by the Northumberland Channel to the west and within Descanso Bay on the western shore of Gabriola Island facing Duke Point in the Nanaïmo Harbour, Vancouver Island.

The Study area includes the waterlots in which the ferry terminal is located. The terminal and existing facilities are located over the water extending to the highwater mark and in upland parking and terminal facility areas bordering on Easthom and North Roads (Figure 2).

The Study area is approximately 2.1 ha in area (Figure 3). A small parking lot and access road are located directly to the east of the existing ferry terminal along North Road. Access during the Biophysical Inventory was from land and existing roads in the terminal area.



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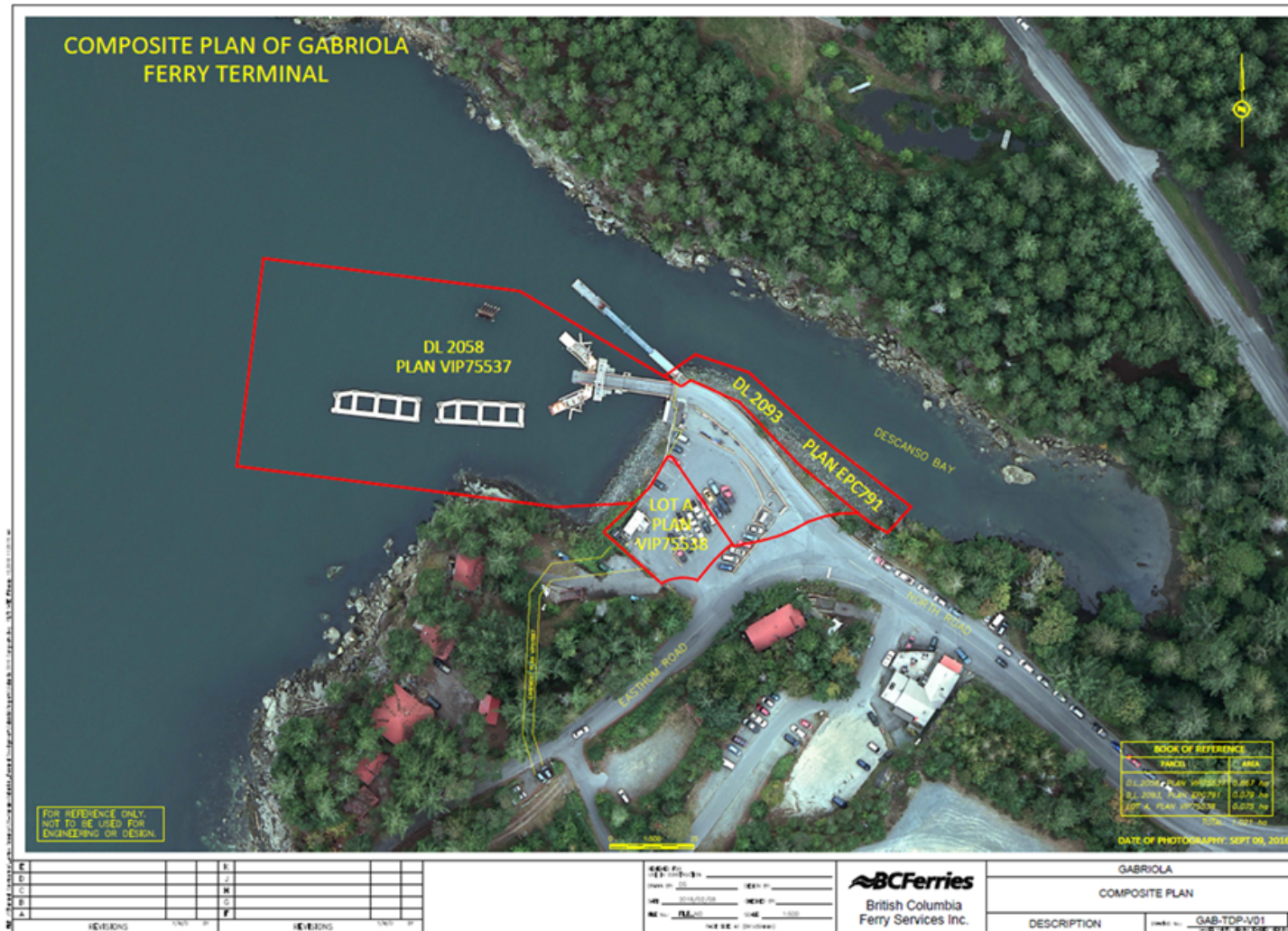




Figure 2 Gabriola Island Ferry terminal area





Notes
 1. Coordinate System: NAD 1983 UTM Zone 10N
 2. Data Sources: DataBC, Government of British Columbia;
 Natural Resources Canada; Microsoft Bing Imagery

 Terrestrial Study Area
 Marine Study Area

0 25 50 75 100
 1:2,750 (at original document size of 8.5x11)
 m



Project Location: Ferry Terminal, Gabriola Island, British Columbia
 Project Number: 1161107845
 Prepared by: LTRUDEL on 20190110
 Discipline Review by: MONIEL on 20190110
 GIS Review by: SPARKER on 20190123

Client/Project/Report
 Gabriola Island Ferry Terminal Expansion
 Biophysical Inventory Report

Figure No.

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Title

**Gabriola Island Ferry Terminal Expansion
 Study Area**

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1.2 SIGNIFICANCE OF THE LAND AND NATURAL AMENITIES

The Site is located within the Strait of Georgia marine ecosection which is part of the Georgia Basin ecoregion and Pacific zone at the top of the British Columbia Marine Ecological Classification system hierarchy (Howes et al. 1997). The Strait of Georgia ecosection covers approximately 7,900 km² and is characterized by a shallow marine basin encompassed by coastal lowlands (Howes et al. 1997) between Vancouver Island and the mainland (Demarchi 1996). The physiographical features lead to protected waters often with high turbidity associated with freshwater discharge and seasonal plankton productivity. This ecosection receives substantial freshwater input from adjacent uplands during fall, winter and spring periods. The Strait of Georgia ecosection is part of the Georgia-Puget Basin ecoregion, which is in turn part of the Georgian Depression ecoprovince, all of which are encompassed in the Humid Temperate ecodomain at the highest level of the province's ecological classification hierarchy.

The National Climate and Data and Information Archive indicates that the nearest climate data station to the Site is located on Gabriola Island (Climate ID: 1023042; Lat: 49°09'14.000"/Long: 123°44'01.000"), at an elevation of 46.0 m above sea level (Environment Canada, 2018). Daily climate data has been collected at this station since 1967. Based on this data, Gabriola Island experiences a mild seasonal climate, with an average daily temperature of 9.3°C. The highest average annual temperature is recorded in July (16.9°C), and the lowest average annual temperatures are recorded in December (3.3°C) (Environment Canada, 2018). The annual average total amount of precipitation on Gabriola Island is 924 mm, with 884.3 mm as rainfall and the remainder as snow. The highest average level of precipitation typically occurs in November (146.9 mm) (Environment Canada, 2018).

The Gabriola Island Ferry terminal is located within the Coastal Douglas Fir, Moist Maritime biogeoclimatic subzone (CDFmm) restricted to low elevations, along southeast Vancouver Island from Bowser to Victoria, and the Gulf Islands south of Cortes Island. Elevational limits range from sea level to approximately 150 m (Green and Klinka 1994). The CDFmm lies in the rainshadow of Vancouver Island and the Olympic mountains, resulting in warm, dry summers and mild, wet winters. Growing seasons are very long and feature pronounced water deficits on zonal and drier sites (Green and Klinka 1994). Common tree species include Douglas-fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*) and grand fir (*Abies grandis*). The forest understory is typically dominated by salal (*Gaultheria shallon*), dull Oregon-grape (*Mahonia nervosa*), Oceanspray (*Holodiscus discolor*) and *Kindbergia oregana*; with lesser amounts of baldhip rose (*Rosa gymnocarpa*), snowberry (*Symphoricarpos albus*), hairy honeysuckle (*Lonicera hispidula*), vanilla-leaf (*Achlys triphylla*) and electrified cat's-tail moss (*Rytidiadelphus triquetrus*) (Green and Klinka, 1994). Drier sites are characterized by the presence of Garry oak and arbutus, as well as numerous members of the lily family (Green and Klinka 1994).

The majority of the Site is located within the marine environment of Northumberland Channel on the western side of Gabriola Island (Figure 1, 2, 3).



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1.3 METHODS

The Biophysical Inventory report is based on:

- Review of existing information on the Project and resources in the study area
- Review of information available from the BC Conservation Data Centre (CDC) Species and Ecosystem Explorer database and associated reports, Environment and Climate Change Canada's (ECCC) database on species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Integrated Land Management Bureau's (ILMB) Land and Resource Data Warehouse and the database
- Existing BC Ferry study reports for the Gabriola Island Ferry terminal
- Fisheries and Oceans Canada (DFO) Rockfish Conservation Area (RCA) (Northumberland Channel) DFO fisheries management area 17-5
- Recent orthographic aerial photos of the study area
- Field visit of the Site undertaken on November 23 and 24th, 2018, to verify and supplement the results of the information review, and to identify aquatic and terrestrial habitats within and immediately adjacent to the Study area (Table 2). The Project study area included areas of inventory for vegetation and wildlife in terrestrial areas, and for marine resources around Descanso Bay (Figure 3).

Table 2 Conditions at Time of Data Collection

Date	Activity	Conditions	Data Collector
November 22, 2018	Marine Survey	Night	Tim Edgell, PhD, RP Bio
November 23, 2018	Vegetation Survey	Morning	Meghan O'Neill, BSc., RP Bio
November 23, 2018	Wildlife Survey	Morning	Christina Ball, BSc, RP Bio



2.0 BIOPHYSICAL INVENTORY RESULTS

2.1 VEGETATION

There are 49 vascular plant species of management concern with potential to occur in the Project study area, according to a query of the BC CDC database (Appendix A). The query was based on species that could occur within the CDF biogeoclimatic zone and the South Island Forest District. The results were narrowed down to those habitat types documented in the study area (e.g., coniferous forest, riparian, cliff, rock outcrops, and vernal pools). There are no records of existing occurrences of either red- or blue-listed plant species within 3 km of the Project study area. The Project study area does not overlap any critical habitat for plant species at risk (Figure 4).

A query of the Invasive Alien Plant Program (IAPP) database revealed several occurrences of invasive plants (some of which are noxious weeds) in the Project study area. These include two occurrences of Scotch broom and Himalayan blackberry, one along Easthom Road, south of the ferry parking lot, and one along North Road about halfway between Skol Pub and the intersection with Taylor Bay Road (Figure 4).

There are 24 ecological communities of management concern with potential to occur in the Project study area (Appendix A). The query was based on red- and blue-listed ecological communities within the South Island Forest District and in the CDFmm. Wetland and estuary communities were removed, as they do not occur in the Project study area. A map legend was assembled for the project (Appendix B).

There are no mapped watercourses or wetlands in the Project study area, however a ditch with a large culvert empties into an unmapped watercourse that drains to the Descanso Bay. This stream may be seasonal and is deeply shaded by the surrounding forest. There is no mappable riparian community associated with the stream.

2.1.1 Field

Two red-listed ecological communities were documented during the site visit: the Douglas fir/Grand fir—Oregon grape community (CDFmm/04) and the Douglas fir—Salal community (CDFmm/01).

See detailed field results in Appendix C, and photos in Appendix D.

Douglas fir/Grand fir—Oregon grape (CDFmm/04)

According to the BC CDC community summary (BC CDC 2014), “This ecological community occurs on all aspects of mid-slopes and is found on morainal and inactive colluvial materials. Soils are well drained, have a medium texture, are moderately dry (relative within the subzone), and have a rich to very rich nutrient regime.”



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

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Douglas fir—Salal community (CDFmm/01)

According to the BC CDC community summary (BC CDC 2012), “This ecological community is found on mesic and slightly drier than mesic sites up to 380 m elevation (150 m, north of Duncan) in B.C. and the San Juan Islands of Washington State. These sites are usually on middle- to upper-slope positions with gentle topography, on all aspects. Some occurrences though, are on level sites, especially coarse glaciofluvial deposits. The soil nutrient regime is poor to medium. Soils are usually moderately well drained to well drained, with a sandy loam texture, though sandy and silty loam textures are also found. Parent materials are mostly morainal, and occasionally colluvial, marine or glaciofluvial. On the Gulf Islands colluvial parent materials are quite common.”

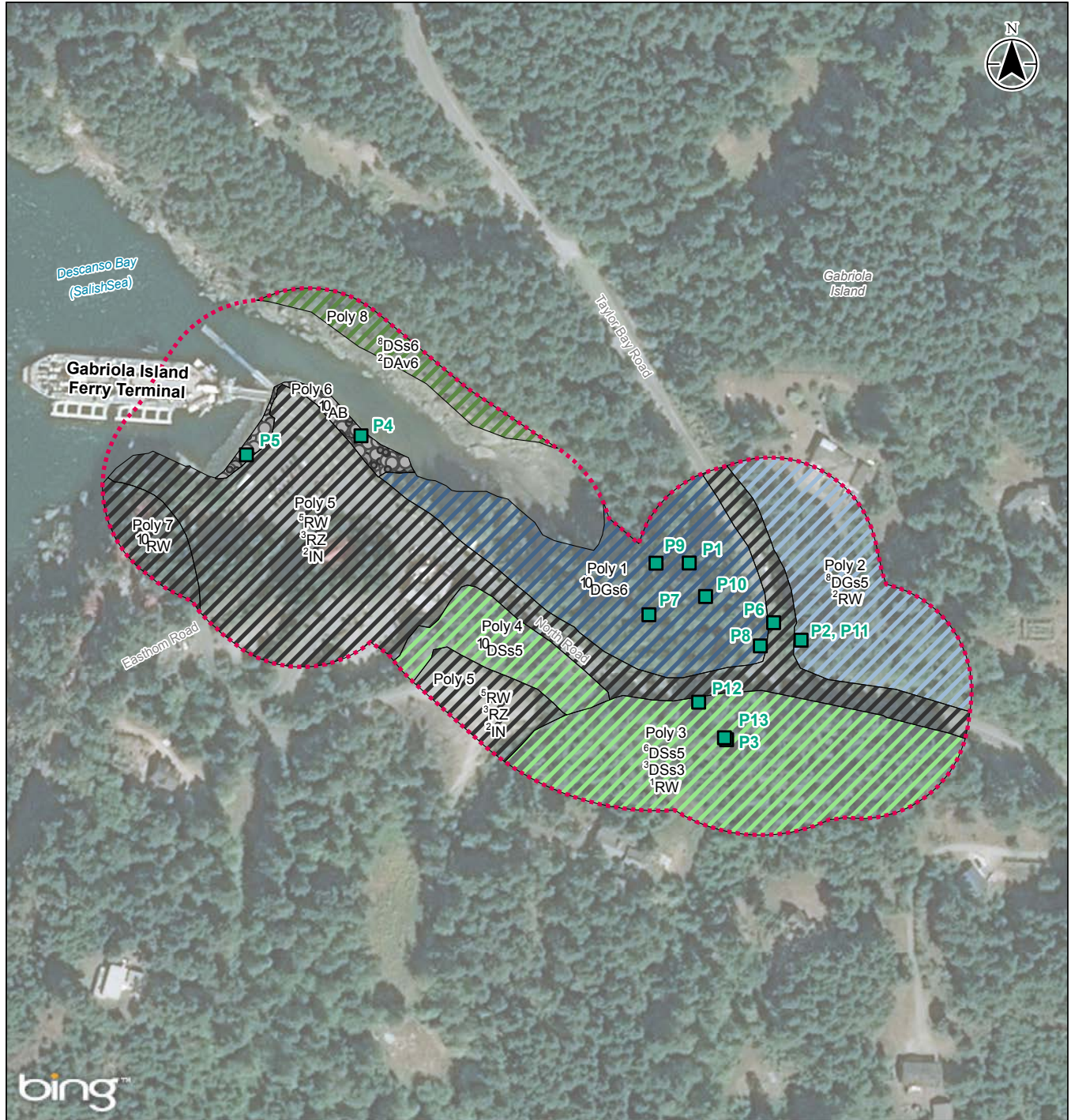
Several invasive species were documented during the field visit. The polygons they were documented in and their listing status under the BC *Weed Control Act* and by the Coastal Invasive Plant Committee are documented in Table 3 and in the field results in Appendix C.

Because of the timing of the field visit in fall, the presence of plant species of conservation concern could not be confirmed. A spring/summer survey is recommended prior to construction.

Table 3 Invasive Plant Species Documented During the Site Visit

Common Name	Scientific Name	Polygon	BC Weed Control Act and Regulation	Coastal Invasive Plant Committee
English Holly	<i>Ilex aquifolium</i>	1	-	Control
Daphne	<i>Daphne laureola</i>	1, 4	-	Contain
Scotch broom	<i>Cytisus scoparius</i>	1, 2	-	Control
Bull thistle	<i>Cirsium vulgare</i>	2	-	-
Canada thistle	<i>Cirsium arvense</i>	2	Schedule A, Part I	Control
Annual sow-thistle	<i>Sonchus oleraceus</i>	2	Schedule A, Part I	-
Scentless mayweed	<i>Tripleurospermum inodorum</i>	2	Schedule A, Part I	-
Himalayan blackberry	<i>Rubus armeniacus</i>	6	-	Control
Hairy cat's ear	<i>Hypochaeris radicata</i>	1, 2, 6	-	Control
Orchardgrass	<i>Dactylis glomerata</i>	1, 2, 4, 6	-	Control





Notes
 1. Coordinate System: NAD 1983 UTM Zone 10N
 2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; Microsoft Bing Imagery

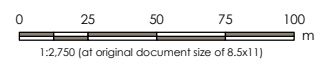
- Terrestrial Study Area
- Survey Location

Dominant Ecological Community (structural stage)

- ▨ Douglas fir - Oregon grape (young forest)
- ▨ Douglas fir - Oregon grape (mature forest)
- ▨ Douglas fir - Salal (young forest)
- ▨ Douglas fir - Salal (mature forest)

Dominant Sparsely Vegetated and Anthropogenic

- ▨ Rural
- ▨ Armoured Bank



Project Location: Ferry Terminal, Gabriola Island, British Columbia
 Project Number: 1161107845
 Prepared by: LTRUDEL on 2019/01/10
 Discipline Review by: MONIEL on 2019/01/10
 GIS Review by: SPARKER on 2019/01/23
 Client/Project/Report: Gabriola Island Ferry Terminal Expansion Biophysical Inventory Report

Figure No.

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Vegetation and Wildlife Field Sites, Photographs, Ecological Communities and Other Features

Biophysical Inventory Results
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2.2 WILDLIFE

Based on a desktop review of exiting data there are 24 wildlife species of management concern which may occur in the study area. This includes three amphibian, 16 bird, and five mammal species (Table 4). There are occurrence records for six of the species of management concern within or near the study area: bald eagle (*Haliaeetus leucocephalus*), barn swallow (*Hirundo rustica*), common murre (*Uria aalge*), double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias fannini*), and marbled murrelet (*Brachyramphus marmoratus*) (Table 4).

The Wildlife Tree Stewardship database indicates that there was a bald eagle nest site in a tree at the junction of North Road and Taylor Bay Road. This tree is marked as a Wildlife Habitat Tree (Figure 4). No bald eagle nest was visible during the site visit and the last nest record for this tree was in 2001 (CMN 2018).

The project area does not overlap any Important Bird Areas, Wildlife Habitat Areas, Ungulate Winter Range, or Critical Habitat.

Table 4 Wildlife Species of Management Concern which may Occur within the Gabriola Island Ferry Terminal Study Area

Species Name	Scientific Name	BC Status ¹	COSEWIC Status ²	SARA Schedule 1 Status ³
Amphibians				
Northern red-legged frog	<i>Rana aurora</i>	Blue	Special Concern	Special Concern
Wandering salamander	<i>Aneides vagrans</i>	Blue	Special Concern	Special Concern
Western toad	<i>Anaxyrus boreas</i>	Yellow	Special Concern	Special Concern
Birds				
Bald eagle	<i>Haliaeetus leucocephalus</i>	Yellow	-	-
Band-tailed pigeon	<i>Patagioenas fasciata</i>	Blue	Special Concern	Special Concern
Barn swallow ⁵	<i>Hirundo rustica</i>	Blue	Threatened	Threatened
Brant	<i>Branta bernicla</i>	Blue	-	-
Common murre	<i>Uria aalge</i>	Red	-	-
Double-crested cormorant	<i>Phalacrocorax auritus</i>	Blue	-	-
Evening grosbeak	<i>Coccothraustes vespertinus</i>	Yellow	Special Concern	-
Great blue heron, <i>fannini</i> subspecies ⁴	<i>Ardea herodias fannini</i>	Blue	Special Concern	Special Concern
Marbled murrelet	<i>Brachyramphus marmoratus</i>	Blue	Threatened	Threatened
Northern goshawk, <i>laingi</i> subspecies	<i>Accipiter gentilis laingi</i>	Red	Threatened	Threatened



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Table 4 Wildlife Species of Management Concern which may Occur within the Gabriola Island Ferry Terminal Study Area

Species Name	Scientific Name	BC Status ¹	COSEWIC Status ²	SARA Schedule 1 Status ³
Northern pygmy-owl, <i>swarthi</i> subspecies	<i>Glaucidium gnoma swarthi</i>	Blue		-
Olive-sided flycatcher	<i>Contopus cooperi</i>	Blue	Special Concern	Threatened
Osprey	<i>Pandion haliaetus</i>	Yellow	-	-
Peregrine falcon, <i>pealei</i> subspecies ⁴	<i>Falco peregrinus pealei</i>	Blue	Special Concern	Special Concern
Purple martin	<i>Progne subis</i>	Blue	-	-
Western screech-Owl, <i>kennicottii</i> subspecies	<i>Megascops kennicottii kennicottii</i>	Blue	Threatened	Threatened
Mammals				
American water shrew, <i>brooksi</i> subspecies	<i>Sorex navigator brooksi</i>	Blue	-	-
Ermine, <i>anguinae</i> subspecies	<i>Mustela erminea anguinae</i>	Blue	-	-
Keen's myotis	<i>Myotis keenii</i>	Blue	-	-
Little brown myotis	<i>Myotis lucifugus</i>	Yellow	Endangered	Endangered
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	Blue	-	-
<p>NOTES:</p> <p>¹ Provincial Status: Red = any indigenous species or subspecies that is extirpated, endangered, or threatened in BC; Blue = any indigenous species or subspecies considered to be of special concern in BC; Yellow = species considered to be secure and not at risk of extinction</p> <p>² COSEWIC Status: Endangered = species facing imminent extirpation or extinction; Special Concern = species that may become threatened or endangered; Threatened = species likely to become endangered</p> <p>³ SARA Status: Endangered = species that are facing extinction or extirpation; Special Concern = species with characteristics that make it sensitive to natural events or human activities; Threatened = species that may become endangered</p> <p>⁴ Nests protected year-round under the BC <i>Wildlife Act</i></p> <p>⁵ Nests protected year-round under SARA</p> <p>SOURCES: Nagorsen and Brigham 1993; Nagorsen 1996, 2005; Hatler et al. 2008; Davidson et al. 2015; Rodewald 2015; BC CDC 2018a, b; GeoBC 2018a,b; e-Fauna BC 2018; GOC 2018c</p>				



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Biophysical Inventory Results

March 29, 2019

2.2.1 Field

The natural areas adjacent to the terminal and North Road are mature Douglas fir and cedar forests, with big-leaf maple present along the edge of North Road. During the wildlife survey, two wildlife species of management concern were detected: one great blue heron and one bald eagle. Other wildlife species, not of management concern, detected during the survey include:

- American wigeon (*Mareca americana*)
- Belted kingfisher (*Megaceryle alcyon*)
- Chestnut-backed chickadee (*Poecile rufescens*)
- Common merganser (*Mergus merganser*)
- Common raven (*Corvus corax*)
- Golden-crowned kinglet (*Regulus satrapa*)
- Pacific wren (*Troglodytes pacificus*)
- Red-breasted nuthatch (*Sitta canadensis*)
- Spotted towhee (*Pipilo maculatus*)
- Northern Pacific treefrog (*Pseudacris regilla*)

No nests or significant wildlife features were detected in the study area. A low-use wildlife trail was detected south of the intersection of North Road and Taylor Bay Road (Figure 4). A small cave was found near the wildlife trail; however the cave showed no signs of use by wildlife and is not a suitable den site (Figure 4).

The culvert under Taylor Bay Road discharges into an unmapped ditch / watercourse, which then discharges into Descanso Bay (Figure 4). This stream appears to be seasonal and is deeply shaded by the surrounding forest. The amphibian species which may occur in the study area breed in standing water (Matsuda et al. 2006) and are unlikely to use this small watercourse to breed. A northern Pacific treefrog was heard calling in the forest around the stream.

2.3 MARINE

Hydrographic charts indicate that the Northumberland Channel in the vicinity of the Gabriola Ferry terminal are deeper than 11 m and reach depths greater than 150 m in the Northumberland Channel (Figure 1). The Northumberland Channel is an important navigation route connecting to the Nanaimo Port Authority and Duke Point Ferry terminal and Duke Point terminals. The Gabriola Island Ferry terminal at Descanso Bay, is a route between Nanaimo and Gabriola Island. A portion of Descanso Bay is a small intertidal bay adjacent to the existing ferry terminal.

The Strait of Georgia marine ecosection supports a neritic plankton community and provides substantial habitat for shellfish and a nursery for salmon and herring and other marine fishes (Howes et al, 1997).



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Biophysical Inventory Results

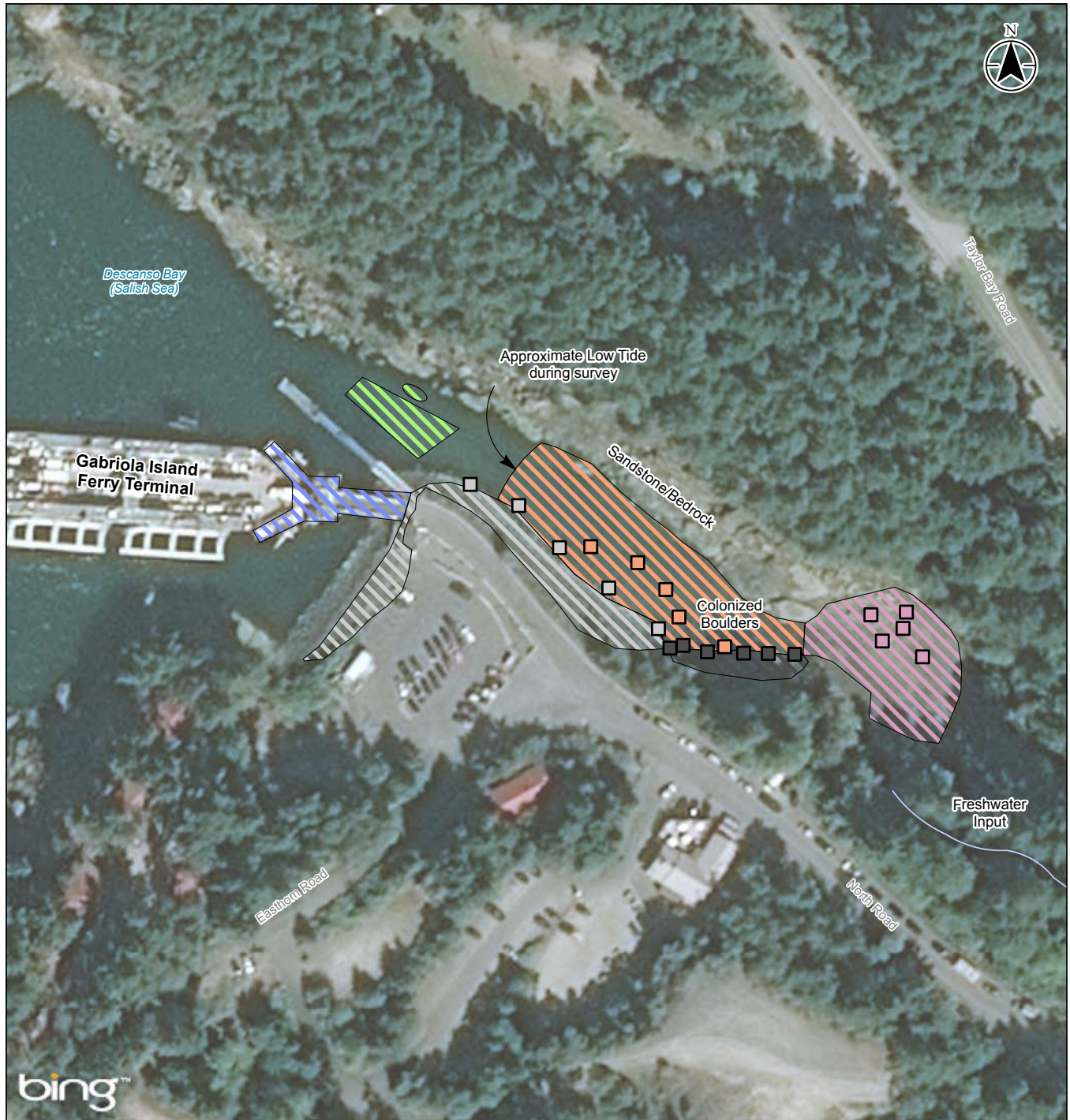
March 29, 2019

The foreshore extends approximately two to five metres between the existing ferry terminal pilings and the intertidal zone and consists of a slope covered with boulders (rip-rap) (Figure 5). The marine ferry terminal substructure and seafloor surrounding the terminal is expected to provide habitat for a variety of common invertebrate and vertebrate species. The ferry terminal substructure provides substrate for sessile invertebrates, such as feather dusters, mussels, and barnacles, to colonize.

Small intertidal fish species, such as shiner perch (*Cymatogaster aggregate*) and tubesnout fish (*Aulorhynchus flavidus*) may use the ferry terminal pilings as shelter habitat. Pacific herring are known to migrate northward through Northumberland channel from feeding areas (DFO, 2018). Spawning areas have been documented along the mid-east coast of Vancouver Island north and south of Nanaimo (DFO, 2018). No background information regarding fish presence is available for local marine resources in the Northumberland Channel area. Eelgrass beds have been observed adjacent to the terminal in the intertidal areas of Descanso Bay and were observed over the past decades in a similar location (EBA 2008).

Marine mammals, such as harbour seal (*Phoca vitulina*), are commonly found in harbours and coastal areas, and may occasionally occur near the Gabriola Island Ferry terminal. Frequent boat traffic and human use of the terminal is expected to deter frequent mammal use. California sea lion (*Zalophus californianus*) may occur in Northumberland channel and adjacent marine habitat and have been observed in areas of deeper water in the region. Marine mammal populations within Northumberland channel may vary seasonally with salmon and herring distribution.





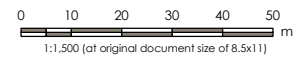
Notes
 1. Coordinate System: NAD 1983 UTM Zone 10N
 2. Data Sources: DataBC, Government of British Columbia;
 Natural Resources Canada; Microsoft Bing Imagery

Marine Habitat Survey Point

- Anoxic Mud; Very Silty
- Bedrock Walls Undercut
- Gravel Sand Mud
- Rip Rap

Marine Habitat

- Anoxic Mud; Very Silty
- Bedrock Walls Undercut
- Gravel Sand Mud
- Rip Rap
- Eelgrass
- Colonized Existing Dock Infrastructure



Project Location: Ferry Terminal, Gabriola Island, British Columbia
 Project Number: 1161107845
 Prepared by: LTRUDEL on 20191010
 Discipline Review by: TEDGELL on 20191010
 GIS Review by: SPARKER on 20191023

Client/Project/Report: Gabriola Island Ferry Terminal Expansion Biophysical Inventory Report

Figure No.

5

Title

Marine Habitat Mapping, Quadrat Locations, Photographs and Other Features

2.3.1 Field

Marine surveys were conducted both at low and high tides on November 23 and 24th, 2018. Intertidal areas were walked and shovel dig surveys completed in exposed areas of sediment. Subtidal habitat areas were observed from the shoreline or from above on docks and the terminal infrastructure. Marine surveys identified six marine habitat types at and around the Gabriola Island Ferry terminal, summarized in Figure 5, including:

- Habitat A (Anoxic Mud) —intertidal unconsolidated mud, habitat area closest to the upland area of Descanso Bay:
 - This is the habitat area closest to the creek mouth at head of bay comprising very silty sediments. The upper 2–10 cm appeared to be mixed/oxygenated sediment, while deeper areas of substrate were black and anoxic (rotten egg odour). Digging found clams and cockles in shallow surface sediments with presence of lugworms (above the anoxic sediments). Pacific oyster shells were scattered throughout the habitat area as both live and dead oysters. Rip-rap areas had a low cover of barnacles, some *Fucus*, brown tuft algae (unidentified *Ectocarpus*) and low density of Pacific oysters.
- Habitat B (Gravel, Sand Mud) —intertidal unconsolidated sediments, mixture of mud, sand and gravel in the mid portions of Descanso Bay:
 - Sediment in habitat B did not appear to be comprised of anoxic substrate (colour and odour) and the upper 10 cm of sediment was mixed. Small clams and cockles found in shallow depths of sediments. Rip-rap in the habitat were colonized by barnacles with abundance Pacific oyster shells in the habitat area.
- Habitat C (Rip Rap) —intertidal rip-rap wall adjacent to the ferry terminal access onto the marine ramp in the outer portion of Descanso Bay:
 - Riprap was heavily colonized with barnacles throughout and dominant at higher intertidal elevations. *Fucus* was distributed at high intertidal elevations. Greater diversity of algae and invertebrates were observed at lower intertidal elevations. Large Pacific oysters were abundant. Limpets abundant at high intertidal elevations. Low intertidal elevations had an observed high cover of barnacles and rare observations *Pisaster ochre* stars and rare leather stars. *Ulva* (green) and *Mastocarpus* (red) algae were common in habitat C.
- Habitat D (Bedrock Walls) —intertidal exposed and undercut sandstone bedrock wall area in southern portion of Descanso Bay:
 - Adjacent small forested area there was limited area of bedrock habitats within the Study area. Colonization of the bedrock was similar to that observed on the adjacent rip-rap. Green algae dominated cover at high intertidal (*Ulva linza* or perhaps *Acrosiphonia*) with common observations of limpets. Barnacles and Pacific oysters were dominant fauna on the bedrock. The bedrock habitat was vertical with a strong banding across its surface from low intertidal barnacles and oysters, to high intertidal green algae
- Habitat E (Eelgrass) —intertidal eelgrass bed at the marine end of Descanso Bay:
 - Eelgrass bed was observed in a similar location as noted from a survey in June 2008 (EBA 2008). The eelgrass bed is visible from the public dock to the south. When the eelgrass was



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wetted with a higher tide, schools of shiner perch were observed swimming between the eelgrass bed and terminal infrastructure

- Habitat F (Dock Infrastructure) —subtidal habitat area around ferry terminal pilings:
 - Viewed from terminal and docks, the seawater was clear and piling were heavily colonized with large plumose anemones and surrounded by sandy seafloor across entire terminal area. Small fish were observed around the pilings.

Table 5 Marine Species Observed During Field Surveys

Common Name	Scientific Name	Provincial/Federal SARA Status	Presence—Habitat Area	% Cover/Relative Abundance
Rockweed	<i>Fucus spp.</i>	-	A C, D	10% 50 - 80%
Turkish washcloth	<i>Mastocarpus papillatus</i>	-	B, C D	Common Rare
Brown Tuft Algae	<i>Ectocarpus spp.</i>		A	Rare
Sea Lettuce	<i>Ulva linza</i>	-	C, D	Common
Green Sea lettuce	<i>Enteromorpha intestinalis</i>	-	D	100%
Eelgrass	<i>Zostera spp.</i>	-	E	Common
Ribbon Kelp	<i>Alaria marginata</i>	-	C, F	Common
Sand worm	<i>Arenicola marina</i>	-	A, B	Rare
Pacific lugworm	<i>Abarenicola pacifica</i>	-	A, B	Rare
Ribbon worm	<i>Tubulanus spp.</i>	-	A, B	Rare
Plumose anemone	<i>Metridium farcimen</i>	-	F	Common
Pisaster ochre stars	<i>Pisaster ochraceus</i>	-	C	Rare
Leather star	<i>Demasterias imbricata</i>	-	C	Rare
California mussel	<i>Mytilus spp.</i>	-	D	Rare
Pacific Oyster	<i>Crassostrea gigas</i>	-	A, B, C, D	Common Rare
Acorn Barnacle	<i>Belanus glandulus</i>	-	B, C, D	50% 80%
Littleneck or Manilla clam	<i>Macoma spp. & Venerupis philippinarum</i>	-	A, B	Rare
Snail	<i>Lithuania spp.</i>	-	B, C, D	Common
Limpet	<i>Acmaea sp.</i>	-	B, C D	Common Rare
Nuttall's Cockle	<i>Clinocardium nuttallii</i>	-	A, B	Rare
Hermit crab	<i>Spp.</i>	-	B, C, D	Rare
Shore crab	<i>Hemigrapsus spp.</i>	-	B, C, D	Rare
Amphipod	<i>Spp.</i>	-	B, C D	Rare Common



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Shiner Perch	<i>Cymatogaster aggregate</i>	-	E, F	Common
Tubesnout	<i>Aulorhynchus flavidus</i>	-	F	Common

2.4 PHOTOGRAPHS

Representative photos of mapped communities and interesting terrestrial features (vegetation and wildlife) are described in Table 6, and the locations are shown on Figure 4, photos are in Appendix D.

Table 6 Photo points

Photo Point	Location (UTM Coordinates)	Photographer	Date	Description
Anthropogenic Features as noted on Figure 3				
P8	437664mE 5447462mN	MO	11/23/2018	Culvert in Polygon 1
Natural Features as noted on Figure 3				
P1	437631mE 5447500mN	MO	11/23/2018	Polygon 1—Mature Douglas fir/Grand fir—Oregon grape community (Red-Listed)
P2	437689mE 5447485mN	MO	11/23/2018	Polygon 2—Young Douglas fir/Grand fir—Oregon grape community (Red-Listed)
P3	437648mE 5447419mN	MO	11/23/2018	Polygon 3—Young Douglas fir/Salal community (Red-Listed)
P4	437589mE 5447452mN	MO	11/23/2018	Polygon 6—Sparse rip-rap vegetation
P5	437427mE 5447550mN	MO	11/23/2018	Himalayan blackberry above rip-rap in Polygon 6
P6	437670mE 5447473mN	MO	11/23/2018	Veteran Douglas fir wildlife habitat tree in Polygon 1
P7	437613mE 5447477mN	CB	11/23/2018	Creek in Polygon 1
P9	437616mE 5447500mN	MO	11/23/2018	Holly patch in Polygon 1
P10	437639mE 5447485mN	MO	11/23/2018	Daphne in Polygon 1
P11	437689mE 5447485mN	MO	11/23/2018	Bull thistle and ditch in Polygon 2
P12	437635mE 5447436mN	CB	11/23/2018	Cave in Polygon 3
P13	437647mE 5447420mN	CB	11/23/2018	Low-use wildlife train in Polygon 3



Next Steps
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3.0 NEXT STEPS

Stantec has completed a desktop review of publicly available information and a Project-specific field survey to describe and map existing biophysical conditions in and around the planned Gabriola Island Ferry terminal. The biophysical inventory surveys followed Island Trust guidance and included review of the site conditions and existing vegetation, wildlife and wildlife habitats, marine habitats, and species at risk.

The next stages of planning and detailed design for the expansion and improvement of the terminal will include the need for additional field surveys associated with the requirements for permitting and authorizations for the project construction including:

- spring / summer - rare plant and invasive plant species – growing season
- spring / summer and fall marine fisheries and fish habitats (surveys in the footprint area for sensitive life stages and species habitat use)
- spring / summer - breeding bird and nesting

Consistent with discussions in the community and BC Ferries Gabriola Island Terminal Development Plan, there is opportunity to locally enhance and restore natural habitats in and around the terminal area associated with expansion and improvement plans. These opportunities include:

- management and removal of existing invasive plant species
- planting native plants around the site and an opportunity to tie in with the proposed landscaping plan and stormwater management bioswales
- removal of existing terminal creosol wooden piles in marine habitats
- installation of new marine-sensitive steel painted piles as part of the terminal infrastructure
- restoration and enhancement of marine habitats in Descanso Bay to promote eelgrass and marine vegetated habitats
- addition of diverse and complex structured rock reef habitat areas along the shoreline outside of Descanso Bay adjacent to the marine terminal area



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4.0 CLOSURE

We trust the information provided in this biophysical inventory is sufficient for the requirements for the Island Trust rezoning application. If you have any questions or require further information, please do not hesitate to contact Mark Johannes at (604) 418-1095 or mark.johannes@stantec.com

Regards,

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APPENDIX A

VEGETATION—POTENTIAL SPECIES AND ECOLOGICAL COMMUNITIES OF MANAGEMENT CONCERN

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Appendix A Vegetation—Potential Species and Ecological Communities Of Conservation Concern
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Appendix A VEGETATION—POTENTIAL SPECIES AND ECOLOGICAL COMMUNITIES OF CONSERVATION CONCERN

A.1 POTENTIAL SPECIES OF MANAGEMENT CONCERN

Table A-1 Potential Species of Management Concern in the CDF, South Island Forest District

Common Name	Scientific Name	BC List ¹	COSEWIC ²	SARA ³	Habitat Subtype ⁴
bearded owl-clover	<i>Triphysaria versicolor</i> ssp. <i>versicolor</i>	Red	Endangered	Endangered	Rock/Sparsely Vegetated Rock; Meadow
bog bird's-foot lotus	<i>Hosackia pinnata</i>	Red	Endangered	Endangered	Vernal Pools/Seasonal Seeps; Meadow; Grassland; Riparian Herbaceous;
brook spike-primrose	<i>Epilobium torreyi</i>	Red	Endangered	Endangered	Meadow; Grassland; Conifer Forest—Dry;
California buttercup	<i>Ranunculus californicus</i>	Red	Endangered	Endangered	Rock/Sparsely Vegetated Rock; Garry Oak Maritime Meadow
coast manroot	<i>Marah oregana</i>	Red	Endangered	--	Pasture/Old Field; Hedgerow; Rock/Sparsely Vegetated Rock; Meadow
coast microseris	<i>Microseris bigelovii</i>	Red	Endangered	Endangered	Vernal Pools/Seasonal Seeps; Rock/Sparsely Vegetated Rock; Meadow
coastal wood fern	<i>Dryopteris arguta</i>	Blue	Special Concern	Special Concern	Stream/River; Cliff; Rock/Sparsely Vegetated Rock; Grassland; Deciduous/Broadleaf Forest; Conifer Forest—Dry; Mixed Forest (deciduous/coniferous mix); Garry Oak Woodland; Garry Oak Coastal Bluffs
Columbian water-meal	<i>Wolffia columbiana</i>	Blue	--	--	Pond/Open Water; Riparian Herbaceous
common bluecup	<i>Githopsis specularioides</i>	Red	--	--	Vernal Pools/Seasonal Seeps; Rock/Sparsely Vegetated Rock; Grassland; Garry Oak Maritime Meadow



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Appendix A Vegetation—Potential Species and Ecological Communities Of Conservation Concern

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**Table A-1 Potential Species of Management Concern in the CDF,
South Island Forest District**

Common Name	Scientific Name	BC List ¹	COSEWIC ²	SARA ³	Habitat Subtype ⁴
cup clover	<i>Trifolium cyathiferum</i>	Blue	--	--	Vernal Pools/Seasonal Seeps; Riparian Forest; Riparian Shrub; Garry Oak Maritime Meadow
deltoid balsamroot	<i>Balsamorhiza deltoidea</i>	Red	Endangered	Endangered	Rock/Sparsely Vegetated Rock; Grassland; Mixed Forest (deciduous/coniferous mix); Sand Dune; Beach; Garry Oak Woodland
dense-flowered lupine	<i>Lupinus densiflorus</i> var. <i>densiflorus</i>	Red	Endangered	Endangered	Cliff; Garry Oak Maritime Meadow
dwarf bramble	<i>Rubus lasiococcus</i>	Blue	--	--	Conifer Forest—Mesic (average); Conifer Forest—Moist/wet
dwarf red fescue	<i>Festuca rubra</i> ssp. <i>mediana</i>	Blue	--	--	
dwarf sandwort	<i>Sabulina pusilla</i>	Red	Endangered	Endangered	Vernal Pools/Seasonal Seeps; Meadow; Grassland; Conifer Forest—Dry; Garry Oak Vernal Pool
fern-leaved desert-parsley	<i>Lomatium dissectum</i> var. <i>dissectum</i>	Red	--	--	Rock/Sparsely Vegetated Rock; Meadow; Grassland; Mixed Forest (deciduous/coniferous mix); Garry Oak Maritime Meadow
giant chain fern	<i>Woodwardia fimbriata</i>	Blue	--	--	Stream/River; Rock/Sparsely Vegetated Rock
graceful cinquefoil	<i>Potentilla gracilis</i> var. <i>gracilis</i>	Red	--	--	Rock/Sparsely Vegetated Rock; Meadow; Grassland; Conifer Forest—Dry
Gray's desert-parsley	<i>Lomatium grayi</i> var. <i>grayi</i>	Red	Threatened	Threatened	Cliff; Rock/Sparsely Vegetated Rock; Talus; Conifer Forest—Dry; Garry Oak Woodland
green-fruited sedge	<i>Carex interrupta</i>	Blue	--	--	Stream/River; Riparian Herbaceous; Gravel Bar
heterocodon	<i>Heterocodon rariflorus</i>	Blue	--	--	Vernal Pools/Seasonal Seeps; Conifer Forest—Mesic (average); Conifer Forest—Moist/wet; Garry Oak Maritime Meadow



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**Table A-1 Potential Species of Management Concern in the CDF,
South Island Forest District**

Common Name	Scientific Name	BC List ¹	COSEWIC ²	SARA ³	Habitat Subtype ⁴
Howell's triteleia	<i>Triteleia howellii</i>	Red	Endangered	Endangered	Meadow; Deciduous/Broadleaf Forest; Conifer Forest—Dry; Garry Oak Woodland; Garry Oak Coastal Bluffs
Howell's violet	<i>Viola howellii</i>	Red	--	--	Rock/Sparsely Vegetated Rock; Meadow; Conifer Forest—Moist/wet; Garry Oak Woodland
Idaho blue-eyed-grass	<i>Sisyrinchium idahoense</i> var. <i>segetum</i>	Red	--	--	
Kincaid's lupine	<i>Lupinus oreganus</i> var. <i>kincaidii</i>	Red	Extirpated	Extinct	Rock/Sparsely Vegetated Rock; Grassland; Garry Oak Woodland
Lindley's microseris	<i>Uropappus lindleyi</i>	Red	Endangered	Endangered	Cliff; Meadow; Deciduous/Broadleaf Forest; Conifer Forest—Dry; Garry Oak Coastal Bluffs
Macoun's groundsel	<i>Packera macounii</i>	Blue	--	--	Rock/Sparsely Vegetated Rock; Grassland; Conifer Forest—Dry
Macoun's meadow-foam	<i>Limnanthes macounii</i>	Red	Threatened	Threatened	Meadow; Deciduous/Broadleaf Forest; Garry Oak Vernal Pool; Garry Oak Maritime Meadow
Macrae's clover	<i>Trifolium dichotomum</i>	Red	--	--	Cliff; Rock/Sparsely Vegetated Rock; Talus; Meadow; Garry Oak Coastal Bluffs
northern adder's-tongue	<i>Ophioglossum pusillum</i>	Blue	--	--	Fen; Pasture/Old Field; Meadow; Riparian Herbaceous; Cold Spring
Nuttall's quillwort	<i>Isoetes nuttallii</i>	Blue	--	--	Vernal Pools/Seasonal Seeps; Stream/River; Rock/Sparsely Vegetated Rock; Meadow; Conifer Forest—Dry; Garry Oak Woodland; Garry Oak Vernal Pool; Garry Oak Maritime Meadow
phantom orchid	<i>Cephalanthera austiniiae</i>	Red	Endangered	Threatened	Conifer Forest—Mesic (average); Mixed Forest (deciduous/coniferous mix)
pine broomrape	<i>Orobanche pinorum</i>	Red	--	--	Conifer Forest—Mesic (average); Conifer Forest—Moist/wet



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**Table A-1 Potential Species of Management Concern in the CDF,
South Island Forest District**

Common Name	Scientific Name	BC List ¹	COSEWIC ²	SARA ³	Habitat Subtype ⁴
poverty clover	<i>Trifolium depauperatum</i> var. <i>depauperatum</i>	Blue	--	--	Vernal Pools/Seasonal Seeps; Rock/Sparsely Vegetated Rock; Meadow; Grassland; Garry Oak Vernal Pool
prairie lupine	<i>Lupinus lepidus</i>	Red	Endangered	Endangered	Rock/Sparsely Vegetated Rock; Meadow; Garry Oak Maritime Meadow
purple sanicle	<i>Sanicula bipinnatifida</i>	Red	Threatened	Threatened	Rock/Sparsely Vegetated Rock; Deciduous/Broadleaf Forest; Garry Oak Woodland; Garry Oak Maritime Meadow
rough-leaved aster	<i>Eurybia radulina</i>	Red	--	--	Rock/Sparsely Vegetated Rock; Conifer Forest—Dry; Garry Oak Woodland
salt marsh Philadelphia daisy	<i>Erigeron philadelphicus</i> var. <i>glaber</i>	Red	--	--	
sand lacepod	<i>Thysanocarpus curvipes</i>	Blue	--	--	Stream/River; Rock/Sparsely Vegetated Rock; Meadow; Grassland; Garry Oak Woodland
seaside bird's foot lotus	<i>Hosackia gracilis</i>	Red	Endangered	Endangered	Rock/Sparsely Vegetated Rock; Garry Oak Maritime Meadow
slender popcornflower	<i>Plagiobothrys tenellus</i>	Red	Threatened	Threatened	Meadow; Grassland; Conifer Forest—Dry; Garry Oak Woodland; Garry Oak Coastal Bluffs
slimleaf onion	<i>Allium amplexans</i>	Blue	--	--	Vernal Pools/Seasonal Seeps; Rock/Sparsely Vegetated Rock; Meadow; Garry Oak Woodland; Garry Oak Coastal Bluffs
small-flowered tonella	<i>Tonella tenella</i>	Red	Endangered	Endangered	Vernal Pools/Seasonal Seeps; Rock/Sparsely Vegetated Rock; Talus; Conifer Forest—Dry; Garry Oak Woodland
Texas toadflax	<i>Nuttallanthus texanus</i>	Red	--	--	Vernal Pools/Seasonal Seeps; Cliff; Rock/Sparsely Vegetated Rock; Grassland; Sand Dune; Garry Oak Coastal Bluffs



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**Table A-1 Potential Species of Management Concern in the CDF,
South Island Forest District**

Common Name	Scientific Name	BC List ¹	COSEWIC ²	SARA ³	Habitat Subtype ⁴
Washington springbeauty	<i>Claytonia washingtoniana</i>	Red	--	--	Cliff; Talus; Conifer Forest—Dry; Mixed Forest (deciduous/coniferous mix)
white meconella	<i>Meconella oregana</i>	Red	Endangered	Endangered	Rock/Sparsely Vegetated Rock; Deciduous/Broadleaf Forest; Garry Oak Coastal Bluffs
white-lip rein orchid	<i>Platanthera ephemerantha</i>	Red	--	--	Conifer Forest—Dry; Garry Oak Woodland
white-top aster	<i>Sericocarpus rigidus</i>	Blue	Special Concern	Special Concern	Rock/Sparsely Vegetated Rock; Meadow; Mixed Forest (deciduous/coniferous mix)
yellow sand-verbena	<i>Abronia latifolia</i>	Blue	--	--	--
<p>NOTES:</p> <p>¹ BC List: Red "includes any indigenous species or subspecies that have, or are candidates for, Extirpated, Endangered, or Threatened status in British Columbia" (BC CDC 2018). Blue "includes any indigenous species or subspecies considered to be of Special Concern (formerly Vulnerable) in British Columbia" (BC CDC 2018).</p> <p>² COSEWIC: Endangered is "a species facing imminent extirpation or extinction" (BC CDC 2018). Special Concern is "a species of special concern because of characteristics that make it is particularly sensitive to human activities or natural events" (BC CDC 2018). Threatened is "a species that is likely to become endangered if limiting factors are not reversed" (BC CDC 2018). Extirpated is "a species that no longer exists in the wild in Canada, but occurring elsewhere" (BC CDC 2018).</p> <p>³ SARA: endangered, Special Concern, Threatened, and Extirpated are defined the same as COSEWIC above. Extinct is "A species that no longer exists" (BC CDC 2018).</p> <p>⁴ Excludes the following habitat subtypes due to study area conditions: estuary, deciduous/broadleaf forest, marsh, bog, fen, swamp, beach, mudflat, pasture/old field, meadow, grassland, pond/open water, vernal pools/seeps, sand dune, stream/river, and woodland.</p>					



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix A Vegetation—Potential Species and Ecological Communities Of Conservation Concern
March 29, 2019

A.2 POTENTIAL ECOLOGICAL COMMUNITIES OF MANAGEMENT CONCERN

Table A-2 Potential Ecological Communities of Management Concern in the CDFmm, South Island Forest District

Common Name	Scientific Name	BC List ¹	Site Series	Ecosystem Group ²
Terrestrial Realm				
Arbutus/hairy manzanita	<i>Arbutus menziesii</i> / <i>Arctostaphylos columbiana</i>	Red	CDFmm/00	Forest: Broadleaf—dry
black cottonwood—red alder/salmonberry	<i>Populus trichocarpa</i> — <i>Alnus rubra</i> / <i>Rubus spectabilis</i>	Blue	CDFmm/08	Flood Group (F): Middle Bench Flood Class (Fm); Forest: Broadleaf - moist/wet
black knotweed—yellow sand-verbena	<i>Polygonum paronychia</i> — <i>Abronia latifolia</i>	Red	CDFmm	Beach Group (B): Beachland Class (Bb)
Douglas-fir—arbutus	<i>Pseudotsuga menziesii</i> — <i>Arbutus menziesii</i>	Red	CDFmm/02	Forest: Coniferous—dry
Douglas-fir/Alaska oniongrass	<i>Pseudotsuga menziesii</i> / <i>Melica subulata</i>	Red	CDFmm/03	Forest: Coniferous—dry
Douglas-fir/dull Oregon-grape	<i>Pseudotsuga menziesii</i> / <i>Berberis nervosa</i>	Red	CDFmm/01	Forest: Coniferous—mesic
dune wildrye—beach pea	<i>Leymus mollis</i> ssp. <i>mollis</i> — <i>Lathyrus japonicus</i>	Red	CDFmm	Beach Group (B): Beachland Class (Bb)
Garry oak—arbutus	<i>Quercus garryana</i> — <i>Arbutus menziesii</i>	Red	CDFmm/00	Forest: Broadleaf—dry
Garry oak/California brome	<i>Quercus garryana</i> / <i>Bromus carinatus</i>	Red	CDFmm/00	Forest: Broadleaf—dry
Garry oak/oceanspray	<i>Quercus garryana</i> / <i>Holodiscus discolor</i>	Red	CDFmm/00	Forest: Broadleaf—dry
grand fir/dull Oregon-grape	<i>Abies grandis</i> / <i>Berberis nervosa</i>	Red	CDFmm/04	Forest: Coniferous—mesic
grand fir/three-leaved foamflower	<i>Abies grandis</i> / <i>Tiarella trifoliata</i>	Red	CDFmm/06	Forest: Coniferous—moist/wet
large-headed sedge Herbaceous Vegetation	<i>Carex macrocephala</i> Herbaceous Vegetation	Red	CDFmm/00	Beach Group (B): Beachland Class (Bb)
northern wormwood—red fescue/grey rock-moss	<i>Artemisia campestris</i> — <i>Festuca rubra</i> / <i>Racomitrium canescens</i>	Red	CDFmm	Beach Group (B): Beachland Class (Bb)



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix A Vegetation—Potential Species and Ecological Communities Of Conservation Concern
March 29, 2019

Table A-2 Potential Ecological Communities of Management Concern in the CDFmm, South Island Forest District

Common Name	Scientific Name	BC List ¹	Site Series	Ecosystem Group ²
red alder/salmonberry/common horsetail	<i>Alnus rubra/Rubus spectabilis/Equisetum arvense</i>	Blue	CDFmm/09; CDFmm/FI51; CWHvh1/10; CWHvh1/FI51; CWHvh2/10; CWHvh2/FI51; CWHwh1/09; CWHwh1/FI51	Flood Group (F): Low Bench Flood Class (FI)
Roemer's fescue—junegrass	<i>Festuca roemerii—Koeleria macrantha</i>	Red	CDFmm/00; CWHxm1/00	Grassland Group (G): Grassland Class (Gg)
tiny mousetail—montias—Macoun's meadow-foam	<i>Myosurus minimus—Montia spp.—Limnanthes macounii</i>	Red	CDFmm/00	Hydrogenic Group (H): Vernal Pool Class (Hv)
Wallace's selaginella/reindeer lichens	<i>Selaginella wallacei/Cladina spp.</i>	Blue	CDFmm; CWHxm1; CWHxm2	Grassland Group (G): Grassland Class (Gg); Rock Group (R): Rock Outcrop Class (Ro)
western redcedar—Douglas-fir/Oregon beaked-moss	<i>Thuja plicata—Pseudotsuga menziesii/Eurhynchium oreganum</i>	Red	CDFmm/05	Forest: Coniferous—moist/wet
western redcedar/common snowberry	<i>Thuja plicata/Symphoricarpos albus</i>	Red	CDFmm/07	Flood Group (F): Highbench Flood; Forest: Mixed—moist/wet
western redcedar/Indian-plum	<i>Thuja plicata/Oemleria cerasiformis</i>	Red	CDFmm/13	Forest: Coniferous—moist/wet
western redcedar/sword fern—skunk cabbage	<i>Thuja plicata/Polystichum munitum—Lysichiton americanus</i>	Blue	CDFmm/11; CDFmm/Ws53; CWHdm/12; CWHdm/Ws53; CWHxm1/Ws53; CWHxm2/12; CWHxm2/Ws53	Forest: Coniferous—moist/wet; Wetland Realm—Mineral Wetland Group: Swamp Wetland Class (Ws)
western redcedar/vanilla-leaf	<i>Thuja plicata/Achlys triphylla</i>	Red	CDFmm/12	Forest: Coniferous—moist/wet
Arbutus/hairy manzanita	<i>Arbutus menziesii/Arctostaphylos columbiana</i>	Red	CDFmm/00; CWHxm1/00	Forest: Broadleaf—dry
<p>NOTES:</p> <p>¹ BC List: Red 'includes any indigenous species or subspecies that have, or are candidates for, Extirpated, Endangered, or Threatened status in British Columbia' (BC CDC 2018). Blue "includes any indigenous species or subspecies considered to be of Special Concern (formerly Vulnerable) in British Columbia" (BC CDC 2018).</p> <p>² Excludes the following ecosystem realms due to study area conditions: wetland and estuarine.</p>				



APPENDIX B

MAP LEGEND

Appendix B MAP LEGEND

B.1 FORESTED COMMUNITY MAP CODES

BEC	SITE SERIES	Map Code	Site Series Name	Assumed Site Modifiers	Typical SMR	Description	Map Code Used (Y/N)	Red- or Blue- Listed
CDFmm	01	DS	Douglas fir—Salal	j, m, s	Subxeric—mesic	See LMH 28	Y	Red
CDFmm	02	DA	Douglas fir/shore pine—Arbutus	j, d, m, r	xeric	See LMH 28	N	Red
CDFmm	03	DO	Douglas fir—Oniongrass	d, m, r	xeric	See LMH 28	N	Red
CDFmm	04	DG	Douglas fir/Grand fir—Oregon grape	d, j, m	subxeric—mesic	See LMH 28	Y	Red
CDFmm	05	RK	Western redcedar/Douglas fir—Kindbergia	d, j, m	subhygric—hygric	See LMH 28	N	Red
CDFmm	06	RF	Western redcedar/Grand fir—Foamflower	d, j, m	Subhygric—hygric	See LMH 28	N	Red

B.2 ANTHROPOGENIC AND SPARSE MAP CODES

Code	Ecosystem Unit	Definition	Common Modifiers	Map Code Used (Y/N)
AB	Armoured Bank	Armoured rip-rap bank	not applicable	Y
BE	Beach	The area that expresses sorted sediments reworked in recent time by wave action. It may be formed at the edge of fresh or salt water bodies ² .	not applicable	N
CF	Cultivated Field	A flat or gently rolling, non-forested, open area that is subject to human agricultural practices (including plowing, fertilization and non-native crop production) which often result in long-term soil and vegetation changes.	not applicable	N
CL	Cliff	A steep, vertical or overhanging rock face ³ .	q, z	N
CO	Cultivated Orchard	An agricultural area composed of single or multiple tree species planted in rows. Pruning maintains low, bushy trees.	not applicable	N



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix B Map Legend

March 29, 2019

Code	Ecosystem Unit	Definition	Common Modifiers	Map Code Used (Y/N)
CV	Cultivated Vineyard	An agricultural area composed of single or multiple species of grapes planted in rows, usually supported on wood or wire trellises.	not applicable	N
ES	Exposed Soil	Any area of exposed soil that is not included in any of the other definitions. It includes areas of recent disturbance, such as mud slides, debris torrents, avalanches, and human-made disturbances (e.g., pipeline rights-of-way) where vegetation cover is less than 5%. ²	k, r, w	N
GB	Gravel Bar	An elongated landform generated by waves and currents and usually running parallel to the shore. It is composed of unconsolidated small rounded cobbles, pebbles, stones, and sand.	not applicable	N
GC	Golf Course	Flat to gently rolling grass-covered thoroughways and open areas set out for the playing of golf. The fairways are usually separated by isolated rows or patches of trees, shrubs and small bodies of water (forested areas and water bodies to be mapped as separate units).	not applicable	N
GP	Gravel Pit	An area exposed through the removal of sand and gravel ² .	k,w	N
IN	Industrial	An area of industrial use, such as a tank farm or port.	not applicable	Y
LA	Lake	A naturally occurring static body of water, greater than 2 m deep in some portion. The boundary for the lake is the natural high water mark ²	not applicable	N
MI	Mine	An unvegetated area used for the extraction of mineral ore and other materials ¹ .	not applicable	N
MU	Mudflat Sediment	Flat plain-like areas dominated by fine-textured sediments. These areas are found in association with freshwater, saltwater or estuarine bays (at low tide), lakes, ponds, rivers and streams ² .	not applicable	N
OW	Shallow Open Water	A wetland composed of permanent shallow open water and lacking extensive emergent plant cover. The water is less than 2 m deep. (If vegetated, these units should develop into site series groups for interpretation.)	not applicable	N
PD	Pond	A small body of water greater than 2 m deep, but not large enough to be classified as a lake (e.g., less than 50 ha).	not applicable	N
RE	Reservoir	An artificial basin created by the impoundment of water behind a human-made structure such as a dam, berm, dyke, or wall ² .	not applicable	N



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix B Map Legend

March 29, 2019

Code	Ecosystem Unit	Definition	Common Modifiers	Map Code Used (Y/N)
RI	River	A watercourse formed when water flows between continuous, definable banks. The flow may be intermittent or perennial. An area that has an ephemeral flow and no channel with definable banks is not considered a river ² .	not applicable	N
RN	Railway Surface	A roadbed with fixed rails for possibly single or multiple rail lines ² .	not applicable	N
RO	Rock Outcrop	A gentle to steep, bedrock escarpment or outcropping, with little soil development and sparse vegetative cover.	k, r, w	N
RW	Rural	Any area in which residences and other human developments are scattered and intermingled with forest, range, farm land, and native vegetation or cultivated crops. (Forested areas and cultivated fields should be mapped as separate units.) ¹	not applicable	Y
RZ	Road surface	An area cleared and compacted for the purpose of transporting goods and services by vehicles; including roads used for transporting mining ore.	not applicable	Y
TA	Talus	Angular rock fragments of any size accumulated at the foot of steep rock slopes as a result of successive rock falls. It is a type of colluvium ^{2, 4} .	k, r, w	N
TZ	Mine Tailings	Solid waste materials directly produced in the mining and milling of ore ² .	not applicable	N
UR	Urban/ Suburban	An area in which residences and other human developments form an almost continuous covering of the landscape. These areas include cities and towns, subdivisions, commercial and industrial parks, and similar developments both inside and outside city limits. (Forested areas, such as parks, should be mapped as separated units.) ¹	not applicable	N



APPENDIX C

FIELD RESULTS AND DESCRIPTION OF MAPPED POLYGONS

Appendix C FIELD RESULTS AND DESCRIPTION OF MAPPED POLYGONS

C.1 POLYGON 1 FIELD DATA

Polygon ID	1
Ecological Community	Douglas fir/Grand fir—Oregon grape
Classification	CDFmm/04
Structural Stage:	6—Mature Forest
Status (BC List)	Red Listed
Photopoint (s):	PP1
Ecological Community Description:	Mixed age mature Western redcedar (<i>Thuja plicata</i>) / Douglas fir (<i>Pseudotsuga menziesii</i>) forest with patches of bigleaf maple (<i>Acer macrophyllum</i>), and a few scattered grand fir (<i>Abies grandis</i>). A few very large veteran trees with DBH over 100 cm. Polygon slopes to the northeast from North Road and to the west from Taylor Bay Road and slope spans from upper to toe slope. The understorey is dominated by sword fern (<i>Polystichum munitum</i>) and dull Oregon-grape (<i>Mahonia nervosa</i>), with Oregon beaked moss (<i>Kindbergia oregana</i>), with very little salal (<i>Gaultheria shallon</i>).
Disturbance Notes:	The polygon is adjacent to the ferry queue and likely receives foot traffic. Holly (<i>Ilex aquifolium</i>) and daphne (<i>Daphne laureola</i>) are occasionally present throughout the polygon. The road edge of the polygon contains occasional Scotch broom (<i>Cytisus scoparius</i>), as well as hairy cat's ear (<i>Hypochaeris radicata</i>) and orchardgrass (<i>Dactylis glomerata</i>).
Anticipated Change/Succession:	Deer grazing and soil disturbance may restrict recruitment of understorey species.
Wildlife observations:	na



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix C Field Results and Description of Mapped Polygons

March 29, 2019

Vegetation Species	Percent Cover (%)						Notes
	Main Canopy	Secondary Canopy	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
<i>Thuja plicata</i> (western redcedar)	40						
<i>Pseudotsuga menziesii</i> (Douglas-fir)	30						
<i>Abies grandis</i> (grand fir)	5						
<i>Acer macrophyllum</i> (bigleaf maple)	*						Bigleaf maple located in patches outside this plot
<i>Mahonia nervosa</i> (dull Oregon-grape)			40				
<i>Vaccinium parviflora</i>			4				
<i>Symphoricarpos hesperius</i> (trailing snowberry)			1				
<i>Gaultheria shallon</i> (salal)			1				
<i>Ilex aquifolium</i> (English holly)						*	Holly patch documented outside plot, in forest
<i>Daphne laureola</i> (daphne)						*	Daphne documented outside plot, in forest
<i>Cytisus scoparius</i> (Scotch broom)						*	Scotch broom documented outside plot, along roadside
<i>Polystichum munitum</i> (sword fern)				45			
<i>Rubus ursinus</i> (trailing blackberry)				3			
<i>Poaceae</i> (grass species)				2			No flowers or fruit for species ID
<i>Hypochaeris radicata</i> (hairy cat's ear)						*	documented outside plot along roadside
<i>Dactylis glomerata</i> (orchardgrass)						*	documented outside plot along roadside
<i>Eurhynchium oreganum</i> (Oregon beaked moss)					10		
<i>Hycomium splendens</i> (step moss)					5		



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix C Field Results and Description of Mapped Polygons
March 29, 2019

C.2 POLYGON 2 FIELD DATA

Polygon ID	2
Ecological Community	Douglas-fir/Grand fir—Oregon grape
Classification	CDFmm/04, with some rural land use
Structural Stage:	5—Young Forest
Status (BC List)	Red Listed
Photopoint (s):	PP2
Ecological Community Description:	Mixed age young Douglas fir/Western redcedar forest. Polygon slopes southwest toward Taylor Bay Road. The understorey is dominated by dull Oregon-grape, with some sword fern, and Oregon beaked moss. This polygon was observed from the road due to land ownership uncertainties.
Disturbance Notes:	The polygon is being used for rural residential purposes. The road edge contains weed species including bull thistle (<i>Cirsium vulgare</i>) at high densities, and low densities of Scotch broom, Canada thistle (<i>Cirsium arvense</i>), annual sow-thistle (<i>Sonchus oleraceus</i>), scentless mayweed (<i>Tripleurospermum inodorum</i>), hairy cat's ear (<i>Hypochaeris radicata</i>) and orchardgrass (<i>Dactylis glomerata</i>).
Anticipated Change/Succession:	Deer grazing and soil disturbance may restrict recruitment of understorey species.
Wildlife observations:	na



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix C Field Results and Description of Mapped Polygons
March 29, 2019

Vegetation Species	Percent Cover (%)						Notes
	Main Canopy	Secondary Canopy	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
<i>Thuja plicata</i> (western redcedar)							Visual plot— no % covers
<i>Pseudotsuga menziesii</i> (Douglas-fir)							
<i>Gaultheria shallon</i> (salal)							
<i>Mahonia nervosa</i> (dull Oregon-grape)							
<i>Cytisus scoparius</i> (Scotch broom)						*	documented outside plot along roadside
<i>Polystichum munitum</i> (sword fern)							
Poaceae (grass species)							Lacked flowering parts for species ID
<i>Cirsium vulgare</i> (bull thistle)						*	documented outside plot along roadside
<i>Cirsium arvense</i> (Canada thistle)						*	documented outside plot along roadside
<i>Tripleurospermum inodorum</i> (scentless mayweed)						*	documented outside plot along roadside
<i>Sonchus oleraceus</i> (annual sow-thistle)						*	documented outside plot along roadside
<i>Hypochaeris radicata</i> (hairy cat's ear)						*	documented outside plot along roadside
<i>Dactylis glomerata</i> (orchardgrass)						*	documented outside plot along roadside
<i>Eurhynchium oreganum</i> (Oregon beaked moss)							



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix C Field Results and Description of Mapped Polygons

March 29, 2019

C.3 POLYGON 3 FIELD DATA

Polygon ID	3
Ecological Community	Douglas-fir—salal
Classification	CDFmm/01, with some rural land use
Structural Stage:	5—Young Forest, with some 3—Shrub stage
Status (BC List)	Red Listed
Photopoint (s):	PP3
Ecological Community Description:	Young Douglas fir/Western redcedar forest. The polygon is located above North Road. The understorey is dominated by salal, with some evergreen huckleberry (<i>Vaccinium ovatum</i>). Its moss layer is composed primarily of Oregon beaked moss and step moss (<i>Hylocomium splendens</i>). The polygon has shallow, coarse soils.
Disturbance Notes:	The polygon has several clearings and trails.
Anticipated Change/Succession:	na
Wildlife observations:	na

Vegetation Species	Percent Cover (%)						Notes
	Main Canopy	Secondary Canopy+	Shrub Layer**	Herb Layer++	Moss, Lichen Layer+	Non-natives ^	
<i>Thuja plicata</i> (western redcedar)	40						
<i>Pseudotsuga menziesii</i> (Douglas-fir)	10						
<i>Gaultheria shallon</i> (salal)			40				
<i>Vaccinium ovatum</i> (evergreen huckleberry)			10				
<i>Vaccinium parvifolium</i> (red huckleberry)			1				
<i>Mahonia nervosa</i> (dull Oregon-grape)			1				
<i>Polystichum munitum</i> (sword fern)				0.1			
Poaceae (grass species)				0.1			Lacked flowering parts for species ID
<i>Eurhynchium oreganum</i> (Oregon beaked moss)					10		
<i>Hycomium splendens</i> (step moss)					40		



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix C Field Results and Description of Mapped Polygons

March 29, 2019

C.4 POLYGON 4 FIELD DATA

Polygon ID	4
Ecological Community	Douglas-fir—salal
Classification	CDFmm/01
Structural Stage:	3—Shrub stage
Status (BC List)	Red Listed
Photopoint (s):	n/a
Ecological Community Description:	Heavily disturbed patch of forest, shrub stage Douglas fir/Western redcedar, with occasional arbutus (<i>Arbutus menziesii</i>) on rock cliffs overlooking North Road. The understorey is dominated by salal. The polygon has shallow, coarse soils and was observed from the road.
Disturbance Notes:	The roadside contains occasional Daphne, as well as hairy cat's ear (<i>Hypochaeris radicata</i>) and orchardgrass (<i>Dactylis glomerata</i>).
Anticipated Change/Succession:	na
Wildlife observations:	na
NOTE: Quick visual plot, no species list.	

C.5 POLYGON 5 FIELD DATA

Polygon ID	5
Ecological Community	Rural residential and industrial use
Classification	CDFmm/00
Structural Stage:	varies from unvegetated to small, fragmented patches of mature trees
Status (BC List)	n/a
Photopoint (s):	none
Ecological Community Description:	n/a
Disturbance Notes:	Heavy disturbance and fragmentation due to residential and industrial uses.
Anticipated Change/Succession:	na
Wildlife observations:	na



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix C Field Results and Description of Mapped Polygons

March 29, 2019

C.6 POLYGON 6 FIELD DATA

Polygon ID	6
Ecological Community	Armoured rip-rap bank
Classification	CDFmm/00
Structural Stage:	n/a
Status (BC List)	n/a
Photopoint (s):	PP4, PP5
Ecological Community Description:	Rip-rap armoured bank immediately adjacent to Gabriola ferry loading area and parking lot. One notable Arbutus tree beside Descanso Bay. Area between parking lot and rip rap armoured bank has a large patch of Himalayan blackberry.
Disturbance Notes:	A mix of native and invasive species. Himalayan blackberry in several large patches, with some Scotch broom, bull thistle, hairy cat's ear (<i>Hypochaeris radicata</i>) and orchardgrass (<i>Dactylis glomerata</i>) also observed.
Anticipated Change/Succession:	No succession likely as long as rip-rap bank is maintained.
Wildlife observations:	na

Vegetation Species	Percent Cover (%)						Notes
	Main Canopy	Secondary Canopy	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
<i>Arbutus menziesii</i> (arbutus)							
<i>Rubus armeniacus</i> (Himalayan blackberry)						*	
<i>Cytisus scoparius</i> (Scotch broom)						*	
<i>Symphoricarpos albus</i> (common snowberry)							
<i>Mahonia nervosa</i> (dull Oregon-grape)							
<i>Cirsium vulgare</i> (bull thistle)						*	
<i>Hypochaeris radicata</i> (hairy cat's-ear)						*	
<i>Dactylis glomerata</i> (orchard grass)						*	
NOTE: Rip-rap mostly unvegetated							



APPENDIX D

PHOTOGRAPHS

Appendix D PHOTOGRAPHS



**Photo 1 Polygon 1 Photo—Mature Douglas Fir/Grand Fir—
Oregon Grape Community (Red-Listed)**



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix D Photographs
March 29, 2019



Photo 2 **Polygon 2 Photo—Young Douglas Fir/Grand Fir—
Oregon Grape Community (Red-Listed)**



Photo 3 **Polygon 3 Photo—Young Douglas Fir/Salal Community (Red-Listed)**



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix D Photographs
March 29, 2019



Photo 4 **Polygon 6 Photo—Rip-Rap Vegetation**



Photo 5 **Himalayan Blackberry in Polygon 6 Between Parking Lot and Rip-Rap**



Appendix D Photographs
March 29, 2019



Photo 6 Veteran Douglas Fir Wildlife Tree in Polygon 1



Appendix D Photographs
March 29, 2019



Photo 7 Seasonal Watercourse in Polygon 1



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix D Photographs
March 29, 2019



Photo 8 **Culvert in Polygon 1**



Photo 9 **Holly Patch in Polygon 1**



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix D Photographs
March 29, 2019



Photo 10 **Daphne in Polygon 1**



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix D Photographs
March 29, 2019



Photo 11 Bull Thistle by Polygon 2 Roadside



Photo 12 Cave in Polygon 3



BIOPHYSICAL INVENTORY—GABRIOLA ISLAND BC FERRY TERMINAL REZONING

Appendix D Photographs
March 29, 2019



Photo 13 **Low-use Wildlife Trail in Polygon 3**

