

4.2.6.5.2 Pacific Herring

Pacific herring are small pelagic fish found along the West Coast of North America from Baja California to the Beaufort Sea, along the coast of Asia from the Yellow Sea to the Bering Sea and along the Eurasian Arctic coast from the Bering Sea to northeast Europe (DFO 2013f, Laakkonen *et al.* 2013). They have a maximum weight of about 550 g and reach a maximum length of about 33 cm, and a life span of over 15 years (DFO 2013f, Ware 1985). Herring are targeted in commercial, recreational and Aboriginal fisheries in BC. They are also considered to be an ecologically important species as they are important forage fish for many species of fish, birds, and marine mammals, including Pacific salmon and killer whales (Gustafson *et al.* 2006, Livingston 1993, Saulitis *et al.* 2000).

Adult Pacific herring form large schools in the water column from the surface to depths of 400 m (National Oceanic and Atmospheric Administration [NOAA] 2012). In southern BC, most Pacific herring populations migrate offshore to feeding grounds located off southwest Vancouver Island during the summer months and begin migrating to inshore spawning areas through Juan de Fuca Strait in November and December (DFO 2013f, Taylor 1964). Small populations in the Strait of Georgia are known to be non-migratory and reside year-round in the inside waters near their spawning grounds (Taylor 1964, Therriault *et al.* 2009). Upon reaching deeper channels near their spawning sites, Pacific herring will school for several weeks before transitioning to sheltered, shallower areas such as bays or estuaries where they spawn in mass aggregations (DFO 2013f).

In the Strait of Georgia, Pacific herring spawn in late winter between January and June, with the peak spawning period occurring in March (DFO 2013f, Hart 1973, Hay 1985, Hay and McCarter 2012). Spawning occurs along the shoreline in the intertidal to shallow subtidal zones between high tide and depths of 11 m (Hart 1973, Rooper *et al.* 1999). The eggs are very sticky and once deposited, adhere in large masses to a variety of substrates, including rocks, pilings, debris and marine vegetation (Hart 1973, Taylor 1964). The dominant substrates are eelgrass (*Zostera marina*) and surfgrass (*Phyllospadix scoulerii*) in sheltered bays and along sandy beaches, rockweed (*Fucus gardneri*) along rocky shores, and kelp (*Laminaria* sp.) in shallow subtidal areas (Hart 1973, Taylor 1964).

Pacific herring will spawn every year after reaching maturity, and each female may deposit as many as 20,000 eggs (Hay 1985, DFO 2013f). However, the rate of spawn mortality is high with estimates ranging from 56 to 100 per cent depending on the spawning location (Rooper *et al.* 1999, Taylor 1964). Major causes of spawn mortality are predation by birds and the degree of exposure to wave action and to the air (Taylor 1964). The mortality rate attributed to predation by birds is estimated to be 30 to 55 per cent (Taylor 1964).

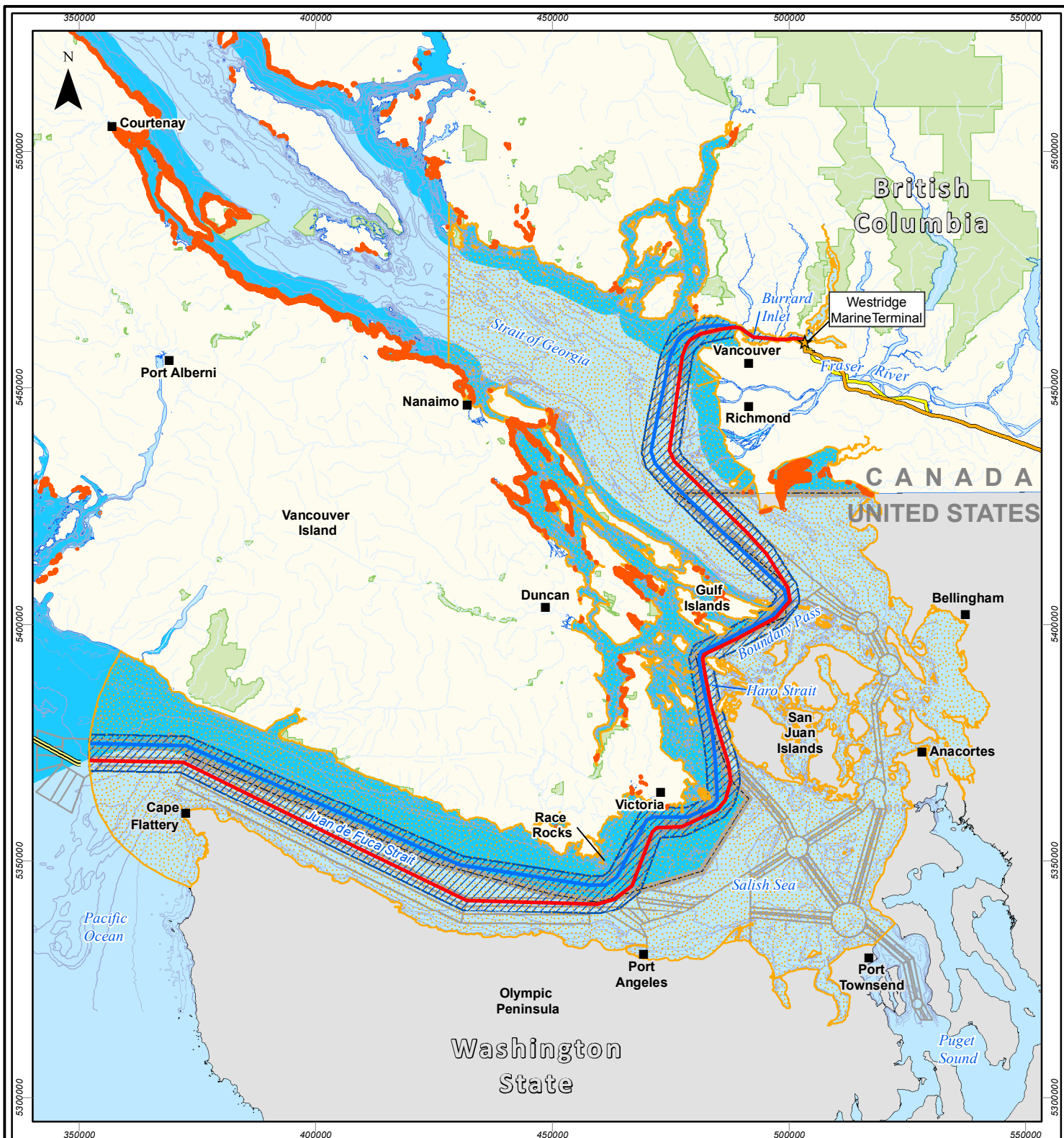
When spawning is followed by poor weather and increased wave action, marine vegetation can become dislodged or the eggs themselves can break loose and wash up on shore (Hart 1973). Studies on spawn mortality due to wave action during storm events have estimated resulting mortality rates of 26 to 74 per cent (Hart and Tester 1934, Hay and Miller 1982, Rooper 1996). Rooper *et al.* (1999) studied a variety of habitat factors controlling egg loss in Prince William Sound, Alaska including depth of spawn, wave exposure, substrate type, and vegetation type, among others. They found that the depth of spawn was the primary factor determining egg loss. Analysis of wave exposure at spawning sites found that egg loss was consistently higher in protected areas than in exposed areas; however, the factors driving this trend were not known. Substrate type and vegetation type were not found to be major contributors in rates of egg loss. Taylor (1955) notes that spawn survival is highest near zero tide level and in locations partially

protected from wave action, and survival is reduced in both exposed and well-protected localities. This suggests that a moderate amount of wave action may improve hatching success (Gustafson *et al.* 2006). According to Hay and Miller (1982), most of the Pacific herring spawn in BC waters is deposited in the subtidal zone and, therefore, is relatively protected from wave action.

Although there is inter-annual variation in specific spawning locations, general spawning areas are relatively consistent from one year to the next (Hay 1985), and Pacific herring spawn over large areas of the Strait of Georgia. Spawning areas and DFO Important Areas for Pacific herring in the Marine RSA are shown in Figure 4.2.20. DFO Important Areas are considered relevant to a species in terms of uniqueness, aggregation and/or fitness (DFO 2013f). According to Therriault *et al.* (2009) and Hay and McCarter (2012), the most important spawning areas are located in Boundary Bay and along the east side of Vancouver Island, especially near Denman Island. Since the 1980s, the spawning distribution of Pacific herring in the Strait of Georgia has shifted to the northwest, with reduced concentrations of spawning activity in the south and east (Therriault *et al.* 2009). The causes of this shift are unknown; however, they may be related to changing climate conditions in the Salish Sea (Therriault *et al.* 2009).

In BC waters, herring eggs incubate for about three weeks before hatching (Hay and Fulton 1983). After hatching, larvae will feed and develop in sheltered nearshore waters near the spawning grounds for two to three months (NOAA 2012). Juveniles form schools in shallow waters where they feed until the fall, when they migrate to deep waters where they spend two to three years before they begin returning to inshore waters as adults to spawn (NOAA 2012). Once spawning is complete, adult Pacific herring will return to offshore feeding areas (NOAA 2012). The diet of Pacific herring changes as they develop. Young herring feed primarily on small crustaceans, decapod larvae, mollusk larvae, and other zooplankton and phytoplankton. Adults typically prey on small fish and crustaceans (NOAA 2012).

Since 1993, Pacific herring stocks in the Strait of Georgia have been managed by DFO as the Strait of Georgia Stock Assessment Region, one of five such assessment regions in BC (Martell *et al.* 2011). DFO regularly assesses the status of these stocks to inform management of the fishery. In the Strait of Georgia, Pacific herring abundance increased through the 1980s, reaching a historical high in 2003, then declined between 2004 and 2008 before increasing again in 2009 and stabilizing in 2010 (Cleary *et al.* 2009, Cleary and Schweigert 2011, Johannesen and McCarter 2010, Schweigert and Haist 2007, Therriault *et al.* 2009). Changes in herring abundance are largely driven by variation in juvenile survival, which is influenced by a number of factors including ocean conditions (*e.g.*, temperature and salinity), prey availability, predation pressure and anthropogenic stressors (Johannesen and McCarter 2010).



- ★ Westridge Marine Terminal
- Town / City
- Marine Vessel
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- Territorial Boundary
- Bathymetry
- Watercourse
- Existing Trans Mountain Pipeline
- Trans Mountain Expansion
- Proposed Pipeline Corridor
- Waterbody
- Provincial Park
- Traffic Separation Scheme
- Land of British Columbia
- Land of Washington State
- Marine Fish and Fish Habitat LSA (Transportation)
- Marine RSA (Transportation)
- Pacific Herring Spawning Areas
- DFO Important Areas for Pacific Herring



TRANS MOUNTAIN

FIGURE: 4.2-20

**PACIFIC HERRING SPAWNING
AREAS AND DFO IMPORTANT
AREAS FOR PACIFIC HERRING
IN THE MARINE RSA**

**TRANS MOUNTAIN
EXPANSION PROJECT**

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MAP NUMBER	10494_EA_TRANS_MAR_04_02_20	PAGE	SHEET 1 OF 1
DATE	Dec 2013	REF.	7894
SCALE	1:1,150,000	PAGE SIZE	8.5x11
DRAWN	SS	CHECKED	DP
REVISION	0	DISCIPLINE	SD
DESIGN	SD		

Projection: UTM Zone 10N; Marine Vessel Inbound Shipping Lane: Moffatt & Nichol, 2013a; Marine Vessel Outbound Shipping Lane: Moffatt & Nichol, 2013b; International Border: British Columbia Ministry of Energy and Mines, 2013; Canadian 12 Nautical Mile Territorial Boundary and Traffic Separation Scheme: Canadian Hydrographic Service, 2013; Bathymetry: Canadian Hydrographic Service, 2011; Watercourse: National Hydro Network, 2007; Existing Pipeline: Kinder Morgan Canada, 2012; Trans Mountain Expansion Proposed Pipeline Corridor: Universal Pegasus International, 2013; Provincial Park: BC MFLNRO, 2008a; Land of British Columbia: National Topographic Data Base, 2007; Land of Washington State: Washington State Department of Ecology, 1994; Pacific Herring Spawning Areas: Hay and McCarter, 2012; DFO Important Areas for Pacific Herring: DFO 2012a.

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4.2.6.5.3 Pacific Salmon

Pacific salmon belong to the family Salmonidae, which includes whitefishes, graylings, salmon, trout and char. There are five species of Pacific salmon in Canada belonging to the genus *Oncorhynchus*, including pink (*O. gorbuscha*), chum (*O. keta*), sockeye (*O. nerka*), coho (*O. kisutch*) and Chinook (*O. tshawytscha*). Steelhead trout (*O. mykiss*) are also closely related to Pacific salmon. Pacific salmon are considered to be an ecologically important species as they support marine, estuarine, freshwater and terrestrial food webs by providing nutrients to the ecosystem during their migration from the Pacific Ocean to rivers and streams to spawn (DFO 2013b, Hart 1973). They also have great socio-economic importance in BC and are targeted in commercial, recreational and Aboriginal fisheries.

The physical characteristics, life histories, spawning habits, distribution and abundance of Pacific salmon vary from species to species. An overview of this information is provided here. More detailed information about each species of Pacific salmon is presented in the Marine Resources – Marine Transportation Technical Report (Volume 8B, TR 8B-1).

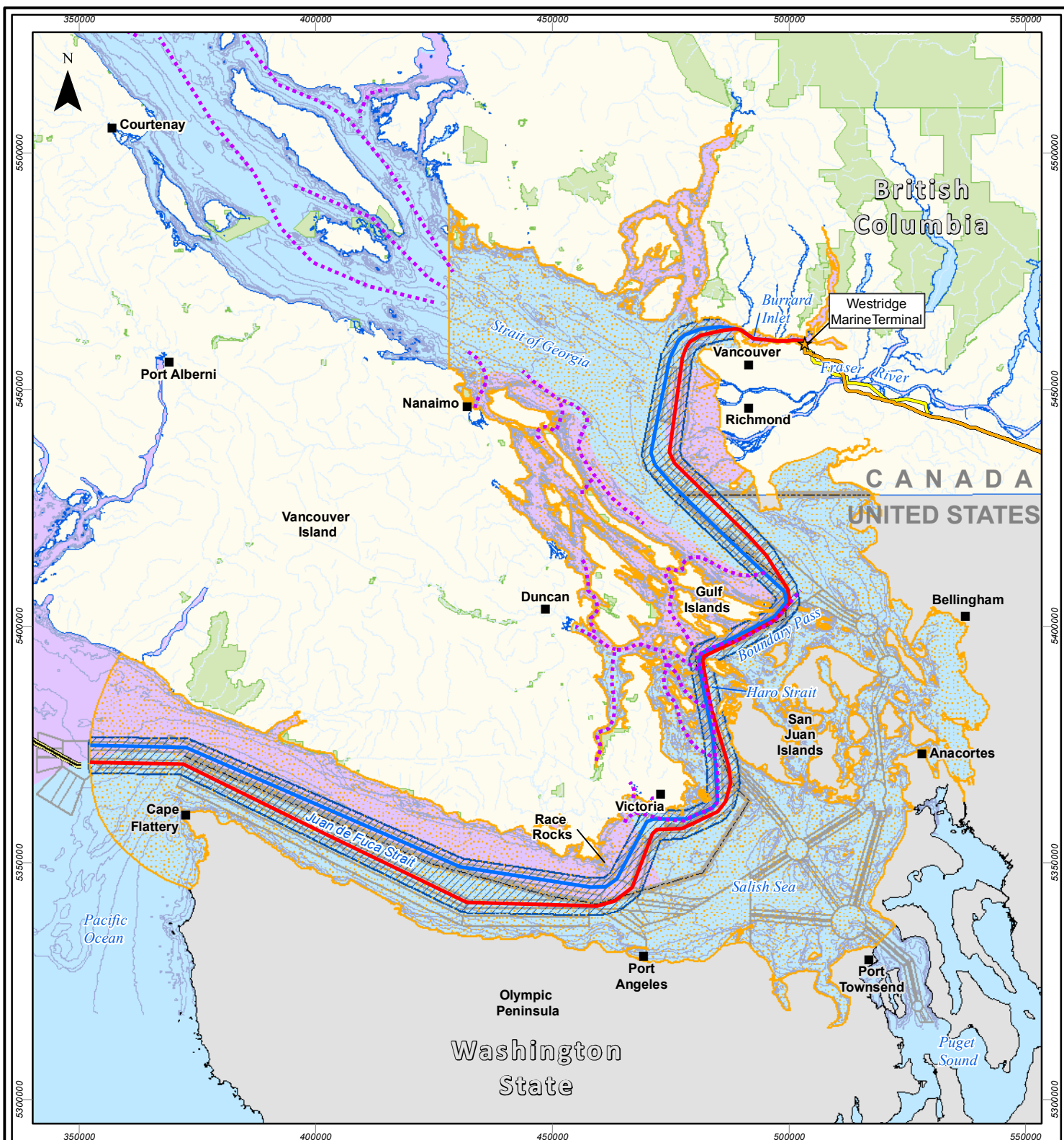
The average adult weights of Pacific salmon range from 1 to 3 kg for pink salmon and up to 6 to 18 kg for Chinook salmon (DFO 2013b). Chinook salmon are known to reach very large sizes. The largest recorded Chinook salmon weighed 57.27 kg (DFO 2013b). The life span of Pacific salmon ranges from 2 years for pink salmon to 7 years for sockeye and Chinook salmon (DFO 2001, 2013b).

Pacific salmon are anadromous, which means that they spawn in fresh water yet spend the majority of their lives in marine waters where they feed until maturity (DFO 2013b). Depending on the species, salmon will spend one to seven years in marine waters before returning to their natal streams to spawn from spring to fall (DFO 2001, 2013b). Spawning female salmon seek out stream beds with gravel substrate to deposit their eggs. The eggs hatch into alevins in mid-winter and emerge as fry in spring, and they remain in freshwater streams and lakes for periods ranging from one week to two years, depending on the species (DFO 2013b). All Pacific salmon are semelparous, meaning that individual fish spawn once in their lifetime and then die. In the ocean, Pacific salmon feed primarily on plankton and crustaceans such as tiny shrimp, while Chinook and coho salmon also eat smaller fish, such as herring (DFO 2013b).

The range of Pacific salmon includes the North Pacific Ocean, Bering Strait, southwestern Beaufort Sea and surrounding freshwater rivers and streams (DFO 2013b). Pacific salmon occur in an estimated 1,300 to 1,500 rivers and streams in BC and the Yukon (DFO 2013b). The most important rivers for Pacific salmon in BC include the Skeena and Nass rivers in the north and the Fraser River in the south, which account for 75 per cent of the salmon population in the province (DFO 2013b). The Fraser River system, which drains into the Marine RSA, is considered the largest single salmon production system in the world (Northcote and Larkin 1989) and accounts for, on average, about 50 per cent of salmon production in BC (Henderson and Graham 1998). The locations of salmon migration routes and DFO Important Areas for Pacific salmon in the Marine RSA are shown in Figure 4.2.21 (Jamieson and Levesque 2012a,b). DFO Important Areas are considered relevant to a species in terms of uniqueness, aggregation and/or fitness (DFO 2013b).

Pacific salmon are sensitive to changes in both marine and freshwater ecosystems (DFO 2013b). Fishing pressure and loss of habitat from human activities such as logging and agriculture are the key threats to Pacific salmon populations (COSEWIC 2002, 2003a,b, 2006; DFO 2001, 2013b). There are four populations of Pacific salmon that have been designated as Species of Conservation Concern by COSEWIC, including one coho population, one Chinook

population, and two sockeye populations (see Table 4.2.6.1). No Pacific salmon populations are currently listed under *SARA*. DFO's 2013 salmon outlook identified a number of Pacific salmon stocks of conservation concern in southern BC, including the West Coast of Vancouver Island Chinook stock, the south coast coho stock, Fraser River Chinook stocks, the lower Strait of Georgia Chinook stock and the North Vancouver Island/Johnstone Strait Chinook stock (DFO 2013b).



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- Marine Fish and Fish Habitat LSA (Transportation)
- Marine RSA (Transportation)
- DFO Important Areas for Pacific Salmon
- Pacific Salmon Migration Routes



TRANS MOUNTAIN

FIGURE: 4.2-21

**PACIFIC SALMON MIGRATION
ROUTES AND DFO IMPORTANT
AREAS FOR PACIFIC SALMON
IN THE MARINE RSA**

**TRANS MOUNTAIN
EXPANSION PROJECT**

<p>SCALE: 1:1,150,000</p> <p>0 10 20 30 40 km</p> <p>ALL LOCATIONS APPROXIMATE</p> <p>This document is provided by Kinder Morgan Canada Inc. (KMC) for use by the intended recipient only. This information is confidential and proprietary to KMC and is not to be provided to any other recipient without the written consent of KMC. It is not to be used for legal, engineering or surveying purposes, nor for doing any work on or around KMC's pipelines and facilities, all of which require KMC's prior written approval.</p>			
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4.2.6.6 *Aboriginal Traditional Knowledge*

Marine fish, invertebrates and algae have been traditionally harvested by coastal Aboriginal communities throughout southern BC, including Burrard Inlet, Strait of Georgia, Gulf Islands and Juan de Fuca Strait. Pacific salmon are of particular importance to the coastal Aboriginal communities for sustenance as well as for social, economic and ceremonial purposes. Sockeye, pink, chum, coho and Chinook salmon can all be found within the Lower Fraser River as well as in marine waters throughout the area. The Fraser River system is used by over 100 Aboriginal communities, including those along Juan de Fuca and Johnstone straits (Canadian Environmental Assessment Agency 2006). The Fraser Canyon, located outside the Marine RSA, is an area where Pacific salmon are most abundant, and conditions for preparing the meat (*i.e.*, wind-drying) are ideal (Carlson 2001).

Available literature indicates that Aboriginal people traditionally harvested at least 71 animal species on the southern coast of BC (Burrard Inlet Environmental Action Program [BIEAP] 2011, 2012; Gardner 2009). Important fish species include: salmon; eulachon; sturgeon; lingcod; Pacific cod; halibut; skate; black cod; dogfish; shiners; herring; flounder; and trout (Esquimalt Nation 2010a, Hul'qumi'num Treaty Group 2005). Important invertebrate species include: barnacles; mussels; butter, horse, littleneck, manila and cockle clams; geoduck; northern abalone; giant red chiton; oysters; scallops; red and green sea urchin; sea cucumber; Dungeness and red rock crab; prawns; and octopus (Esquimalt Nation 2010a, Hul'qumi'num Treaty Group 2005). Numerous species of seaweed have also been traditionally harvested by Aboriginal people, including: kelp; rockweed; sea lettuce; and other green, brown and red algae species. Kelp and eelgrass beds are especially important harvesting areas as they serve as a key habitat for other major food species (Esquimalt Nation 2010b).

4.2.6.7 *US Waters*

The US portion of the Marine RSA includes southern portions of the Strait of Georgia and Juan de Fuca Strait along the coast of Washington.

4.2.6.7.1 **Intertidal Habitat**

Intertidal habitat in the US and Canadian portions of the Marine RSA has very similar biophysical characteristics. The Washington State Department of Ecology adopted the BC Biophysical Shore-Zone Mapping System and has mapped the various shore types along the state's shoreline (Washington State Department of Ecology 2006). The distribution of shore types in the US portion of the Marine RSA is shown in Figure 4.2.19. The length and relative abundance of shore types in the US portion of the Marine LSA and Marine RSA are shown in Table 4.2.6.3. A discussion of shore types in the Canadian portion of the Marine RSA is provided in Section 4.2.6.5.

TABLE 4.2.6.3

**LENGTH AND RELATIVE ABUNDANCE OF SHORE TYPES IN THE US PORTION
OF THE MARINE LSA AND MARINE RSA**

Shore Type	Marine LSA - Length (km)	Marine LSA - % Total Length	Marine RSA - Length (km)	Marine RSA - % Total Length
Channel	0.0	0.0	0.2	0.0
Estuary, marsh or lagoon	0.0	0.0	104.9	6.8
Gravel beach	0.2	1.8	29.7	1.9
Gravel flat	0.0	0.0	2.7	0.2

TABLE 4.2.6.3

**LENGTH AND RELATIVE ABUNDANCE OF SHORE TYPES IN THE US PORTION
OF THE MARINE LSA AND MARINE RSA (continued)**

Shore Type	Marine LSA - Length (km)	Marine LSA - % Total Length	Marine RSA - Length (km)	Marine RSA - % Total Length
Man-made	0.0	0.0	86.8	5.6
Mud flat	0.0	0.0	76.7	5.0
Rock cliff	8.7	88.8	312.2	20.2
Rock platform	0.0	0.0	37.9	2.5
Rock with gravel beach	0.0	0.0	77.7	5.0
Rock, sand and gravel beach	0.6	5.8	143.3	9.3
Rock with sand beach	0.0	0.0	59.2	3.8
Sand and gravel beach	0.2	1.7	263.9	17.1
Sand and gravel flat	0.0	0.0	112.1	7.3
Sand beach	0.2	2.0	80.9	5.2
Sand flat	0.0	0.0	157.7	10.2
Total	9.8	100.0	1,545.9	100.0

A total of 15 different shore types have been identified within the Marine RSA in the US. The total length of shoreline in the US portion of the Marine RSA is approximately 1,546 km. “Rock cliff” is the most common shore type in the Marine RSA covering approximately 312 km and 20.2 per cent of the shoreline (Washington State Department of Ecology 2006). “Sand and gravel beach” and “sand flat” shore types are the second and third most common covering 17.1 per cent and 10.2 per cent of the shoreline, respectively (Washington State Department of Ecology 2006).

The total length of shoreline in the US portion of the Marine LSA is about 10 km, along which a total of five different shore types have been identified (Washington State Department of Ecology 2006). “Rock cliff” is by far the most common shore type in the Marine LSA covering approximately 9 km or 90 per cent of the total shoreline (Washington State Department of Ecology 2006).

4.2.6.7.2 Pacific Herring

The range of Pacific herring populations in the Marine RSA includes both Canadian and US waters, and the border has no biological significance. Pacific herring populations in the Marine RSA are managed by the US National Marine Fisheries Service’s Georgia Basin Pacific herring distinct population segment (DPS), which extends from the southern end of Puget Sound proper to the northern end of the Strait of Georgia near Discovery Passage in Canadian waters and westward to Cape Flattery (Gustafson *et al.* 2006, Stout *et al.* 2001). As a whole, the Georgia Basin Pacific DPS demonstrated a trend of increasing abundance between 1990 and 2004 (Gustafson *et al.* 2006). Herring spawning areas within the US portion of the Marine RSA include: Discovery Bay and Dungeness Bay in Juan de Fuca Strait; Semiahmoo Bay; Cherry Point; Samish-Portage Bay; Fidalgo Bay and the northwest San Juan Islands; and the interior San Juan Islands in North Puget Sound/southern Strait of Georgia (Gustafson *et al.* 2006, Stout *et al.* 2001).

In 2004, the US stocks in the Marine RSA, including the northwest San Juan Islands, Cherry Point, and Discovery Bay stocks, were in severe decline. The Fidalgo, Dungeness and Semiahmoo Bays and Interior San Juan Islands stocks had experienced moderate declines, while the Samish-Portage Bay stock was considered healthy (Gustafson *et al.* 2006, Stout *et al.* 2001). In the 2008 stock assessment (the most recent assessment conducted), spawner abundance in all stocks in the US portion of the Marine RSA remained largely unchanged from 2004. The Cherry Point, Discovery Bay and Dungeness Bay stocks were reported to be in critical condition. The Fidalgo Bay and Interior San Juan Island stocks were reported to be depressed. The Semiahmoo Bay stock was reported to be moderately healthy, and the Samish-Portage Bay stock was considered to be healthy (Stick and Lindquist 2009). The exception was the Northwest San Juan Islands stock, which was reported to have disappeared following five years of no observable spawn (Stick and Lindquist 2009).

4.2.6.7.3 Pacific Salmon

While Pacific salmon stocks spawn in rivers and streams on either side of the Canada-US border, they may use all marine waters in the Marine RSA as habitat for migration and foraging. Chinook and coho salmon stocks that spawn in the US portion of the Marine RSA are managed by the Pacific Fishery Management Council as part of the Washington coastal Chinook/coho stocks and the Puget Sound Chinook/coho stocks. The Washington coastal Chinook/coho stocks include Chinook and coho populations from coastal streams north of the Columbia River through the western Juan de Fuca Strait. The Puget Sound Chinook/coho stocks include Chinook and coho populations from tributaries in Puget Sound through the eastern Juan de Fuca Strait (Pacific Fishery Management Council 2012).

Many Pacific salmon stocks along the US West Coast have declined substantially and are now at a fraction of their historical abundance (National Marine Fisheries Service [NMFS] 2011). Contributing factors to these declines include: overfishing; loss of freshwater and estuarine habitat; hydropower development; and poor ocean conditions and hatchery practices (NMFS 2011). In the US, a total of 28 salmon and steelhead stocks along the West Coast have been listed under the Federal *Endangered Species Act*, including the Puget Sound Chinook salmon DPS and the Hood Canal summer chum salmon DPS, which have been classified as Threatened and whose range includes portions of the Marine RSA (NMFS 2011).

4.2.7 Marine Mammals

This subsection provides an overview of the marine mammals that use habitat along the marine shipping lanes, from the Westridge Marine Terminal to the 12 nautical mile limit of Canada's territorial sea (shown in Figure 4.2.1). More detailed technical information pertaining to marine mammals is presented in the Marine Resources – Marine Transportation Technical Report (Volume 8B, TR 8B-1).

Aboriginal traditional knowledge pertaining to marine mammals is summarized in Section 4.2.7.7. Information pertaining to marine mammals in US waters can be found in Section 4.2.7.8. A discussion of the potential effects of the increased Project-related marine vessel traffic and associated mitigation as well as a discussion of the spatial boundaries for marine mammals are located in Section 4.3.7.

4.2.7.1 General Information

The marine waters of BC are used year-round by a broad range of marine mammal species, including cetaceans (whales, dolphins and porpoises), pinnipeds (seals and sea lions) and sea

otters. The productive straits and sounds of southern BC provide important habitat for marine mammal foraging, breeding, socializing and migration. While many species of marine mammal can be observed in the waters along the shipping lanes year-round and, consequently, depend on this environment for all aspects of their life history, other species are predominantly seasonal in their presence, coming to feed for a season or simply passing through during migration.

4.2.7.2 *Field Data Collection*

Information on marine mammal resources within the region is readily available in published literature and on government and research group websites and is deemed to be sufficient for the assessment of potential effects of the increased Project-related marine vessel traffic on marine mammals. Therefore, Project-specific field studies for this aspect of data gathering were not considered necessary.

4.2.7.3 *Database and Information Gathering*

The marine mammal knowledge base is derived from a review of relevant scientific literature, publications, and technical reports as well as local and regional data including;

- DFO Canadian Science Advisory Secretariat (CSAS) reports;
- COSEWIC assessments and status reports;
- BC Cetacean Sightings Network (BC CSN) data;
- the BC CDC; and
- the BC MCA.

The collection of information from these sources focused on marine mammal life history, broad habitat use, distribution, abundance and effects of underwater noise.

4.2.7.4 *Conservation Status*

Based on a review of the COSEWIC reports and SARA public registry list (Schedule 1) and the BC CDC Red and Blue lists, nine species of marine mammals of conservation concern have been identified as potentially occurring within the Marine RSA (BC CDC 2013). This includes regular sightings of southern resident and Bigg's (or transient) killer whales, humpback whales, harbour porpoises and Steller sea lions as well as occasional sightings of fin and grey whales, northern fur seals and sea otters.

Table 4.2.7.1 provides an overview of the 33 species (or ecotypes) of marine mammal found in BC, their conservation status and their relative likelihood of occurrence and predicted use of the Marine RSA. Of the eight listed species identified on Schedule 1 of SARA, one is Endangered (*i.e.*, southern resident killer whale), three are Threatened (*i.e.*, humpback whale, fin whale and Bigg's killer whale) and four are of Special Concern (*i.e.*, grey whale, harbour porpoise, Steller sea lion, and sea otter). Additionally, northern fur seals are listed as Threatened by COSEWIC; however, they have no status under SARA. Many species of marine mammals are wide-ranging, and the categorization of "predicted occurrence" in Table 4.2.7.1 is meant to qualitatively reflect the standard distribution of most species, although specific occurrence within the Marine RSA fluctuates and, therefore, is uncertain at any given time.

TABLE 4.2.7.1

MARINE MAMMALS OF BC, THEIR CONSERVATION STATUS AND PREDICTED OCCURRENCE IN AND USE OF THE MARINE RSA

Species Name	Status			Predicted Occurrence In and Use of the Marine RSA
	COSEWIC ¹	SARA ¹	BC List ¹	
Baleen Whales – Best Represented in the RSA by Humpback Whale Indicator				
Humpback whale <i>Megaptera novaeangliae</i>	Special Concern	Threatened Schedule 1	Blue	Relatively common and abundant, especially during summer and fall. Some presence year-round. The western-most portion of the Marine RSA overlaps critical habitat for this species. Use area primarily for foraging. Individuals may remain resident for several months while others migrate through. Numbers have been increasing in this area in recent years.
Blue whale <i>Balaenoptera musculus</i>	Endangered	Endangered Schedule 1	Red	No recorded presence. Unlikely, given understood historical distribution and preferred habitat (<i>i.e.</i> , primarily offshore).
Fin whale <i>Balaenoptera physalus</i>	Threatened	Threatened Schedule 1	Red	Rare sightings in Juan de Fuca Strait. May occasionally use western portion of Marine RSA for foraging. Understood historical distribution and preferred habitat is primarily offshore.
Sei whale <i>Balaenoptera borealis</i>	Endangered	Endangered Schedule 1	Red	No recorded presence. Unlikely, given understood historical distribution and preferred habitat (<i>i.e.</i> , primarily offshore). Now extremely rare throughout BC waters due to historical over-exploitation.
Minke whale <i>Balaenoptera acutorostrata</i>	Not at Risk	Not listed	Yellow	Fairly common but not generally abundant. Likely a year-round resident. Most frequently found in nearshore waters and passages around Haro Strait.
Grey whale <i>Eschrichtius robustus</i>	Special Concern	Special Concern Schedule 1	Blue	Fairly common but not generally abundant. Most common to western Vancouver Island, some whales remain resident throughout summer to forage. May also be observed at other times of year during migration.
North Pacific Right whale <i>Eubalaena japonica</i>	Endangered	Endangered Schedule 1	Red	One recent sighting in off western portion of Marine RSA; otherwise, no recorded presence. Unlikely, given understood historical distribution and preferred habitat (<i>i.e.</i> , primarily offshore). Now extremely rare throughout BC waters due to historical over-exploitation.

TABLE 4.2.7.1

MARINE MAMMALS OF BC, THEIR CONSERVATION STATUS AND PREDICTED OCCURRENCE IN AND USE OF THE MARINE RSA (continued)

Species Name	Status			Predicted Occurrence In and Use of the Marine RSA
	COSEWIC ¹	SARA ¹	BC List ¹	
Toothed Whales – Best Represented in the Marine RSA by Southern Resident Killer Whale Indicator				
Killer whale – southern resident ecotype <i>Orcinus orca</i>	Endangered	Endangered Schedule 1	Red	Common and regular sightings, particularly during summer and fall, but some presence in all months. Marine RSA overlaps the majority of the identified critical habitat for this species (100% of critical habitat within Canadian waters).
Killer whale – northern resident ecotype <i>Orcinus orca</i>	Threatened	Threatened Schedule 1	Red	Occasional visitors, particularly in western extent of Marine RSA; however, less common than southern resident killer whales given this population’s generally more northern BC distribution.
Killer whale – Bigg’s (previously west coast transient) ecotype <i>Orcinus orca</i>	Threatened	Threatened Schedule 1	Red	Regular sightings; however, less predictable than southern resident killer whales. Present year-round primarily for hunting. Wide-ranging, hunt and breed throughout large area.
Killer whale – offshore <i>Orcinus orca</i>	Threatened	Threatened Schedule 1	Red	Not well understood. May be occasional visitors; however, uncommon given generally more offshore distribution.
Sperm whale <i>Physeter macrocephalus</i>	Not at Risk	No Status No Schedule	Blue	Rare sightings. Unlikely, given understood historical distribution and preferred habitat (i.e., primarily offshore). Males move further inshore in summer to feed. Calving may occur offshore.
Pacific white-sided dolphin <i>Lagenorhynchus obliquidens</i>	Not at Risk	No Status No Schedule	Yellow	Regular sightings in Strait of Georgia. Likely use area for foraging. When observed, often in large schools.
Dall’s porpoise <i>Phocoenoides dalli</i>	Not at Risk	No Status No Schedule	Yellow	Common, use area for foraging and calving. Likely year-round residents.
Harbour porpoise <i>Phocoena phocoena</i>	Special Concern	Special Concern Schedule 1	Blue	Common, use area for foraging and calving. Likely year-round residents. Most commonly found in shallow (< 200 m) nearshore areas.
Striped dolphin <i>Stenella coeruleoalba</i>	Not at Risk	No Status No Schedule	Yellow	No recorded presence. Unlikely – generally an offshore species and only a rare visitor to BC.
Common dolphin (short-beaked) <i>Delphinus delphis</i>	Not at Risk	No Status No Schedule	Accidental	No recorded presence. Unlikely – generally an offshore species and only a rare visitor to BC.
Risso’s dolphin <i>Grampus griseus</i>	Not at Risk	No Status No Schedule	Yellow	Rare sightings. Unlikely - generally an offshore species.
Northern right whale dolphin <i>Lissodelphis borealis</i>	Not at Risk	No Status No Schedule	Yellow	Rare sightings. Unlikely - generally an offshore species.

TABLE 4.2.7.1

MARINE MAMMALS OF BC, THEIR CONSERVATION STATUS AND PREDICTED OCCURRENCE IN AND USE OF THE MARINE RSA (continued)

Species Name	Status			Predicted Occurrence In and Use of the Marine RSA
	COSEWIC ¹	SARA ¹	BC List ¹	
Short-finned pilot whale <i>Globicephala macrorhynchus</i>	Not at Risk	No Status No Schedule	Yellow	Rare sightings. Unlikely – generally an offshore species and only a rare visitor to BC.
False killer whale <i>Pseudorca crassidens</i>	Not at Risk	No Status No Schedule	Accidental	Rare sightings. Unlikely – generally a more tropical/subtropical species and only a rare visitor to BC.
Baird's beaked whale <i>Berardius bairdii</i>	Not at Risk	No Status No Schedule	Unknown	No recorded presence. Unlikely – generally an offshore species.
Stejneger's beaked whale <i>Mesoplodon stejnegeri</i>	Not at Risk	No Status No Schedule	Unknown	No recorded presence. Unlikely – generally an offshore species.
Hubbs' beaked whale <i>Mesoplodon carlhubbsi</i>	Not at Risk	No Status No Schedule	Unknown	No recorded presence. Unlikely – generally an offshore species.
Cuvier's beaked whale <i>Ziphius cavirostris</i>	Not at Risk	No Status No Schedule	Yellow	No recorded presence. Unlikely – generally an offshore species.
Pygmy sperm whale <i>Kogia breviceps</i>	Not at Risk	No Status No Schedule	Accidental	No recorded presence. Unlikely – generally an offshore species.
Dwarf sperm whale <i>Kogia simus</i>	Data Deficient	No Status No Schedule	Accidental	No recorded presence. Unlikely – generally an offshore species.
Pinnipeds – Best represented in the Marine RSA by Steller Sea Lion Indicator				
Steller sea lion <i>Eumetopias jubatus monteriensis</i>	Special Concern	Special Concern Schedule 1	Blue	Common. Year-round presence. Peak numbers in Marine RSA during fall and winter. No rookeries (pupping areas) in Marine RSA. One major year-round haulout (<i>i.e.</i> , Carmanah Point) and numerous major winter haulouts, including one at Race Rocks, which is protected within an MPA. Use area to forage and haul out (<i>e.g.</i> , to rest, socialize).
California sea lion <i>Zalophus californianus</i>	Not at Risk	No Status No Schedule	Yellow	Not abundant, but regular sightings off Victoria and at Race Rocks. More common than Steller sea lion in Washington waters. Most likely from September through May when males and sub-adults migrate north while females remain near rookeries off California and Mexico.
Harbour seal <i>Phoca vitulina richardsi</i>	Not at Risk	No Status No Schedule	Yellow	Common and abundant. Ubiquitous throughout BC. Year-round resident. Use area to forage and breed.

TABLE 4.2.7.1

MARINE MAMMALS OF BC, THEIR CONSERVATION STATUS AND PREDICTED OCCURRENCE IN AND USE OF THE MARINE RSA (continued)

Species Name	Status			Predicted Occurrence In and Use of the Marine RSA
	COSEWIC ¹	SARA ¹	BC List ¹	
Northern elephant seal <i>Mirounga angustirostris</i>	Not at Risk	No Status No Schedule	Yellow	Uncommon. Recent sightings of small numbers at Race Rocks and other locations in the Marine RSA. Foraging occurs offshore in northern waters – individuals may be seen hauled out within Marine RSA during migration. Winter breeding rookeries and moulting sites in Mexico and California.
Northern fur seal <i>Callorhinus ursinus</i>	Threatened	No status No schedule	Red	Uncommon. Occasional sightings in Marine RSA. Historical distribution overlaps western-most portion of Marine RSA. Summer is spent at rookeries in Alaska. Winter is spent in the open water off continental shelf and shelf break though some overwinter up inlets.
Other – Not Assessed Explicitly as an Indicator				
Sea otter <i>Enhydra lutris</i>	Special Concern	Special Concern Schedule 1	Blue	Occasional. Most likely in western-most portion of Marine RSA. Year-round residents of central- and northwestern Vancouver Island. Washington population has known sightings around Tatoosh and Waadah Islands.

Sources: Species list taken from Heise *et al.* 2007. Principle sources of information include: COSEWIC Status Reports, DFO Recovery Strategies, Management Plans, and CSAS Reports, the BC CSN, the BC CDC, DFO, NMFS, and WDFW government websites and reports, and professional judgment of the Discipline Lead. List was last updated on November 25, 2013.

Note: 1 See Section 4.2.1.3 for definitions of COSEWIC, SARA and BC List status.

4.2.7.5 Critical Habitat and Important Areas

Critical habitat for southern resident killer whales has been officially designated for the trans-boundary waters of Haro Strait, Boundary Pass, the eastern portion of Juan de Fuca Strait and the southern portion of the Strait of Georgia (DFO 2009b; see Figure 4.2.22). The area designated as critical habitat under SARA is legally protected, and human activities that could potentially destroy the geophysical attributes of critical habitat are prohibited (DFO 2008, 2011). Ecosystem features, such as availability of prey and environmental quality are important to killer whale recovery, and according to DFO (2008), “a variety of legislative and policy tools are available to manage and mitigate threats to these functions of the Resident Killer Whale critical habitat, to individuals and to populations”. Legislative and policy tools include (however, are not limited to) use of the:

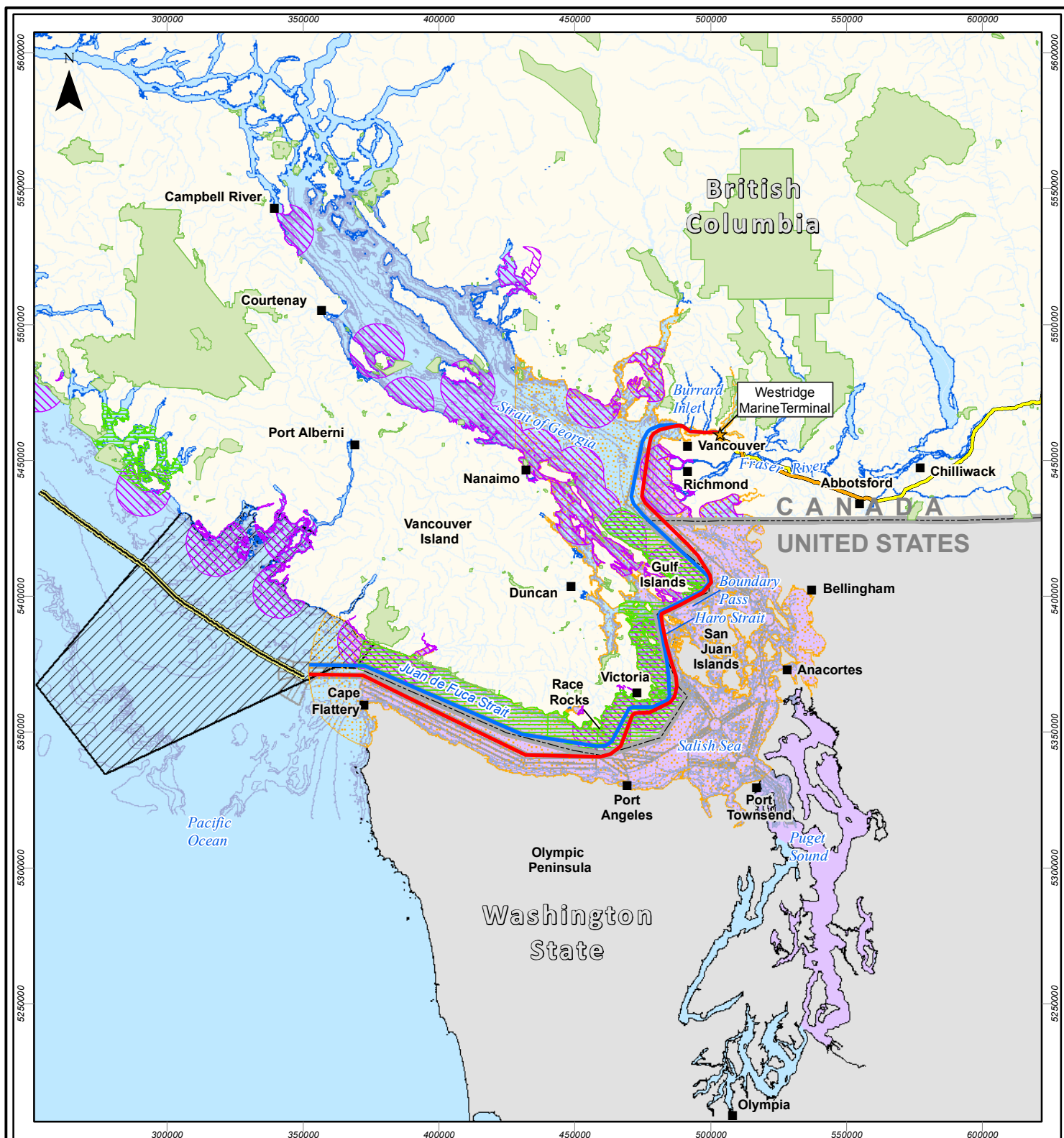
- *Fisheries Act*, 1985;
- Marine Mammal Regulations;
- Whale Watching Guidelines (Wild Whales 2006);

- Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment (DFO 2013g);
- CEPA, 1999;
- Wild Salmon Policy (DFO 2005); and
- Integrated Fisheries Management Plans (DFO 2012b).

Critical habitat has also been identified in DFO's 2013 *Recovery Strategy for the North Pacific Humpback Whale (Megaptera novaeangliae) in Canada* (DFO 2013h). While not all potential critical habitat in BC has yet been identified for humpback whales, one of the identified areas includes Swiftsure Bank, southwest Vancouver Island. The western-most portion of the Marine RSA overlaps this critical habitat (see Figure 4.2.22), which has been identified as an area of importance for a potentially distinct sub-population of humpback whales that occupies southern BC and northern Washington waters (DFO 2013h).

DFO Important Areas have been identified for harbour porpoises and harbour seals in the Marine RSA and are also shown in Figure 4.2.22.

There is a major year-round haulout site for Steller sea lions on Carmanah Point and a number of major winter haulouts; however, no rookeries (*i.e.*, breeding colonies) within the Marine RSA (Figure 4.2.22).



SCALE: 1:2,000,000
0 10 20 30 40 km
ALL LOCATIONS APPROXIMATE

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MAP NUMBER	10494_EA_TRANS_MAR_04_02_22	PAGE	SHEET 1 OF 1
DATE	Nov 2013	REF.	7894
SCALE	1:2,000,000	REVISION	0
DRAWN	SS	PAGE SIZE	8.5x11
CHECKED	DP	DISCIPLINE	SD
DESIGN	SD		

- ★ Westridge Marine Terminal
- Town / City
- Marine Vessel Inbound Shipping Lane
- Marine Vessel Outbound Shipping Lane
- International Border
- Canadian 12 Nautical Mile Territorial Boundary
- Bathymetry
- Watercourse
- Existing Trans Mountain Pipeline
- Trans Mountain Expansion Proposed Pipeline Corridor
- Waterbody
- Provincial Park
- Traffic Separation Scheme
- Land of British Columbia
- Land of Washington State
- Marine RSA (Transportation)
- Humpback Whale Critical Habitat
- Southern Resident Killer Whale Critical Habitat
- DFO Important Areas for Harbour Seal
- DFO Important Areas for Harbour Porpoise

Projection: UTM Zone 10N; Marine Vessel Inbound Shipping Lane: Moffatt & Nichol, 2013a; Marine Vessel Outbound Shipping Lane: Moffatt & Nichol, 2013b; International Border: British Columbia Ministry of Energy and Mines, 2013; Canadian 12 Nautical Mile Territorial Boundary and Traffic Separation Scheme: Canadian Hydrographic Service, 2013; Bathymetry: Canadian Hydrographic Service, 2011; Watercourse: National Hydro Network, 2007; Existing Pipeline: Kinder Morgan Canada, 2012; Trans Mountain Expansion Proposed Pipeline Corridor: Universal Pegasus International, 2013; Provincial Park: BC MFLNDO, 2008a; Land of British Columbia: National Topographic Data Base, 2007; Land of Washington State: Washington State Department of Ecology, 1994; Humpback Whale Critical Habitat: DFO, 2013b; Critical Habitat for Southern Resident Killer Whale: DFO, 2011; DFO Important Areas for Harbour Seal: Oleisuk, P. (pers. comm.) in DFO, 2013a; DFO Important Areas for and Harbour Porpoise: Hall, A.H., 2004; DFO, 2013a.

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TRANS MOUNTAIN

FIGURE: 4.2-22

CRITICAL HABITAT AND DFO IMPORTANT AREAS FOR MARINE MAMMALS IN THE MARINE RSA

TRANS MOUNTAIN EXPANSION PROJECT

4.2.7.6 Indicator Species

Three indicator species were selected to assess potential effects of the increased Project-related marine traffic on marine mammals: southern resident killer whale; humpback whale; and Steller sea lion (see Table 4.2.7.2). These species are intended to broadly represent the overall diversity of life history strategies displayed by the various marine mammal species using the habitats present within the Marine RSA boundaries. All of these species are highly mobile and are, at times, widely distributed throughout the Marine RSA. See Section 4.3 for more information regarding indicators.

TABLE 4.2.7.2

SUMMARY OF SELECTED MARINE MAMMALS INDICATORS

Common Name	Scientific Name	SARA (Schedule 1 Status) ¹	COSEWIC Status ¹	BC List Status ¹
Southern resident killer whale	<i>Orcinus orca</i>	Endangered Schedule 1	Endangered	Red
Humpback whale	<i>Megaptera novaeangliae</i>	Threatened Schedule 1	Special Concern	Blue
Steller sea lion	<i>Eumetopias jubatus monteriensis</i>	Special Concern Schedule 1	Special Concern	Blue

Note: 1 See Section 4.2.1.3 for definitions of COSEWIC, SARA and BC List status

4.2.7.6.1 Southern Resident Killer Whale

Killer whales are toothed whales (Odontocetes) and the largest member of the dolphin family (Delphinidae) (DFO 2011a). They have a distinctive black and white colouration and recognizable dorsal fin (COSEWIC 2008, Ford *et al.* 2000). Individual killer whales can be distinguished and identified based on the unique shape of their dorsal fin and the pattern of their saddle patch (*i.e.*, a grey to white coloured area at the base of their dorsal fin) (Ford *et al.* 2000).

Killer whales inhabit all of the world's oceans. In BC, they have been seen in almost all marine waters including long inlets, narrow channels, and deep embayments (DFO 2011a). In the Canadian Pacific waters, there are three sympatric population assemblages of killer whales: Bigg's killer whales (previously known as West Coast transients); residents; and offshores (COSEWIC 2008, Ford *et al.* 2000). While their ranges may overlap, there are morphological and genetic differences between these three assemblages as well as differences in acoustics, preferred prey and social structure (Barrett-Lennard and Ellis 2001, Ford *et al.* 1998, 2000). Resident killer whales are further subdivided into a northern and southern population, which are also recognized as separate designatable units, and which do not associate and rarely, if ever, interbreed (Barrett-Lennard and Ellis 2001, COSEWIC 2008).

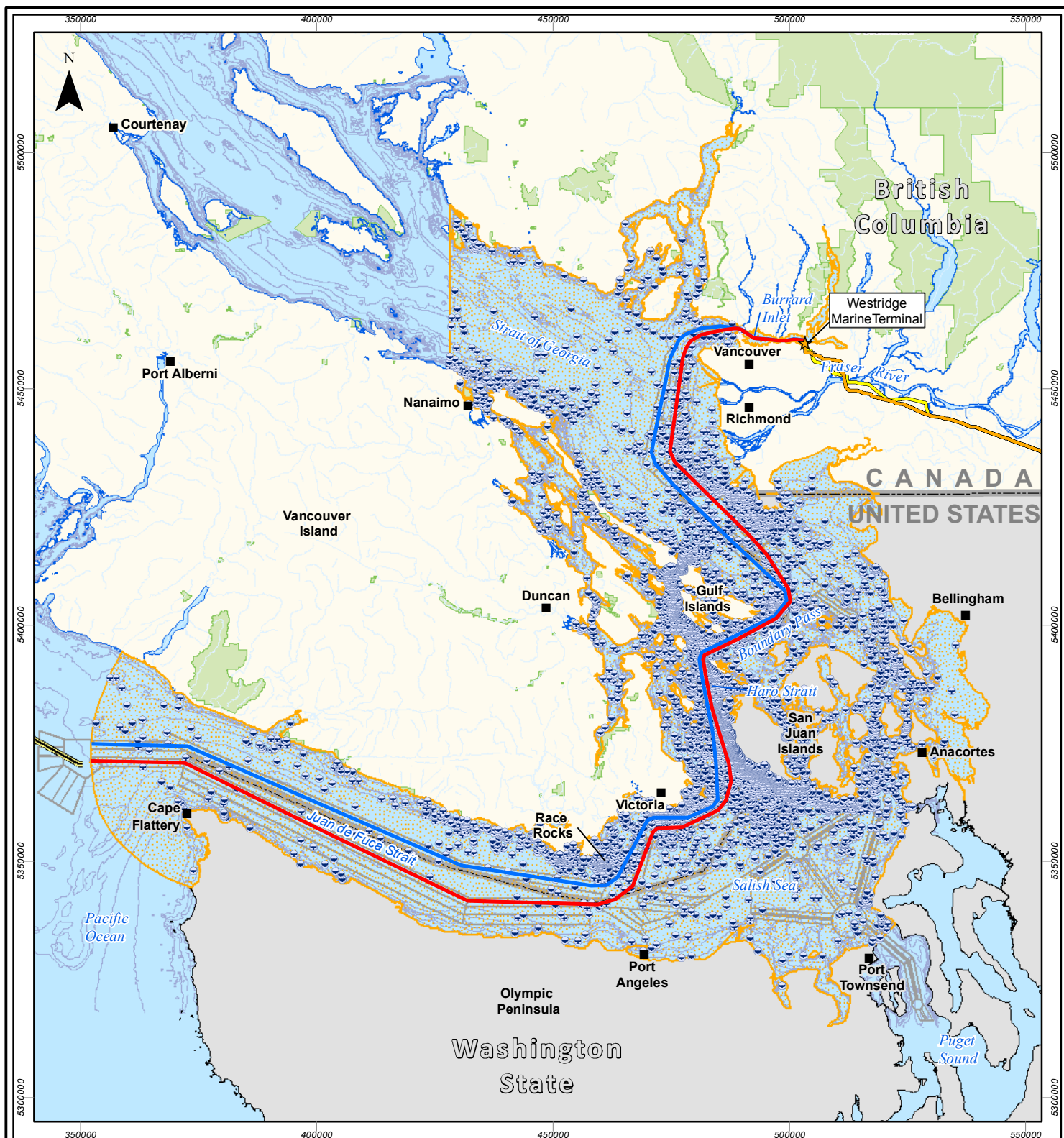
Resident killer whales have a complex social structure, composed of matriline, pods and clans (Ford 1991, Ford *et al.* 2000). The basic social unit is the matriline – a stable, long-term maternally-related kin group composed of an older female (*i.e.*, matriarch), her sons and daughters and her daughters' offspring. Typical matrilines are composed of two to four generations of whales; whales tend to mate outside their matrilines. The term “pod” is assigned to collections of matrilines that spend most of their time together. The southern resident killer whale population has 3 pods: J, K and L. While northern residents are divided into different clans, based on related vocal dialects, southern residents all belong to the same clan.

The range of the southern resident population extends from Haida Gwaii, BC to Monterey Bay, CA (COSEWIC 2008). The principal prey of southern resident killer whales is Chinook and chum salmon, and their distribution during summer and fall is closely linked to that of the Chinook salmon (Ford and Ellis 2006). Their diet in the winter and spring is largely unknown (DFO 2011a). Killer whales in BC do not migrate to specific breeding or calving areas that are separate from their feeding grounds.

The southern resident population is listed as Endangered under Schedule 1 of *SARA*. This is due in large part to its small population, which was reduced in the 1960s and 70s due to capture for display in aquaria. This population increased from 70 whales in 1973 to 96 whales by 1996, before declining again by 4.4 per cent between 1997 and 2006 (COSEWIC 2008). As of July 1, 2013, there are 82 individuals in the southern resident population (*i.e.*, J Pod = 26, K Pod = 19 and L Pod = 37) (Center for Whale Research 2013). Key threats to the southern resident population include: reductions in the availability or quality of prey (primarily Chinook salmon); physical and acoustic disturbance; and chemical and biological contaminants (COSEWIC 2008, DFO 2011a).

The transboundary area between BC and Washington, which includes the southern portion of the Strait of Georgia, the Southern Gulf Islands, Boundary Pass, Haro Strait and Juan de Fuca Strait, has been designated as critical habitat under *SARA* (DFO 2008, 2009b, 2011a) (see Figure 4.2.22). This is based on consistent and prolonged seasonal occupancy of southern resident killer whales in this area (DFO 2011a). Based on a dataset maintained by the Whale Museum going back to 1976 (Osborne 1999, Osborne *et al.* 2001), on average, J Pod spends some of its time in the Marine RSA during every month of the year. L and K pods are less common in March and April; however, are commonly observed in every other month (the Whale Museum 2011). Opportunistic killer whale sightings in the Marine RSA, compiled by the BC CSN for the period of 1975 to 2013, are shown in Figure 4.2.23 (note that sightings presented on this map do not differentiate between potential killer whale populations). Data obtained from the BC Cetacean Sightings Network were collected opportunistically with limited knowledge of the temporal or spatial distribution of observer effort. As a result, absence of sightings at any location does not demonstrate absence of cetaceans. Killer whales are frequently observed in or within close proximity to the marine shipping lanes.

Further information on killer whales and other toothed whales in the Marine RSA is presented in the Marine Resources – Marine Transportation Technical Report (Volume 8B, TR 8B-1).



SCALE: 1:1,150,000
0 10 20 30 40 km
ALL LOCATIONS APPROXIMATE

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MAP NUMBER 10494_EA_TRANS_MAR_04_02_23		PAGE SHEET 1 OF 1
DATE Nov 2013	REF. 7894	REVISION 0
SCALE 1:1,150,000	PAGE SIZE 8.5x11	DISCIPLINE SD
DRAWN SS	CHECKED DP	DESIGN SD

- ★ Westridge Marine Terminal
- Town / City
- Marine Vessel
- Inbound Shipping Lane
- Marine Vessel
- Outbound Shipping Lane
- International Border
- Canadian 12 Nautical Mile
- Territorial Boundary
- Bathymetry
- Watercourse
- Existing Trans Mountain Pipeline
- Trans Mountain Expansion
- Proposed Pipeline Corridor
- Waterbody
- Provincial Park
- Traffic Separation Scheme
- Land of British Columbia
- Land of Washington State
- Marine RSA (Transportation)
- Killer Whale Sighting

Note: Sightings data supplied by the BC Cetacean Sightings Network. Sightings are opportunistic and not corrected for effort. A sighting may be a single or multiple individuals.

Projection: UTM Zone 10N; Marine Vessel Inbound Shipping Lane: Moffatt & Nichol, 2013a; Marine Vessel Outbound Shipping Lane: Moffatt & Nichol, 2013b; International Border: British Columbia Ministry of Energy and Mines, 2013; Canadian 12 Nautical Mile Territorial Boundary and Traffic Separation Scheme: Canadian Hydrographic Service, 2013; Bathymetry: Canadian Hydrographic Service, 2011; Watercourse: National Hydro Network, 2007; Existing Pipeline: Kinder Morgan Canada, 2012; Trans Mountain Expansion Proposed Pipeline Corridor: Universal Pegasus International, 2013; Provincial Park: BC MFLNRO, 2008a; Land of British Columbia: National Topographic Data Base, 2007; Land of Washington State: Washington State Department of Ecology, 1994; Killer Whale Sightings: BC Cetacean Sightings Network, 2013.

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TRANS MOUNTAIN

FIGURE: 4.2-23

BC CSN OPPORTUNISTIC
KILLER WHALE SIGHTINGS
IN THE MARINE RSA
1975 TO 2013

TRANS MOUNTAIN
EXPANSION PROJECT

4.2.7.6.2 Humpback Whale

Humpback whales are large baleen whales (Mysticetes) belonging to the family Balaenopteridae. They have a variable dark grey to black colouration, a short, stubby dorsal fin and white on the undersides of their long pectoral flippers (COSEWIC 2011, Shore 2011). They often raise their tail flukes while diving, and the shape, scars and colour patterns of their flukes can be used to identify individuals. Humpbacks are surprisingly acrobatic for a large whale and common behaviours include breaching, fin and tail slapping.

Their diet is highly variable, consisting of zooplankton (primarily euphausiids and copepods), cephalopods and small schooling fish such as Pacific herring, capelin, sandlance, Pacific sardine, juvenile salmon, Pacific cod, mackerel and anchovy (COSEWIC 2011). Many of these species are abundant in BC waters during the summer and fall, attracting humpback whales to the region to feed.

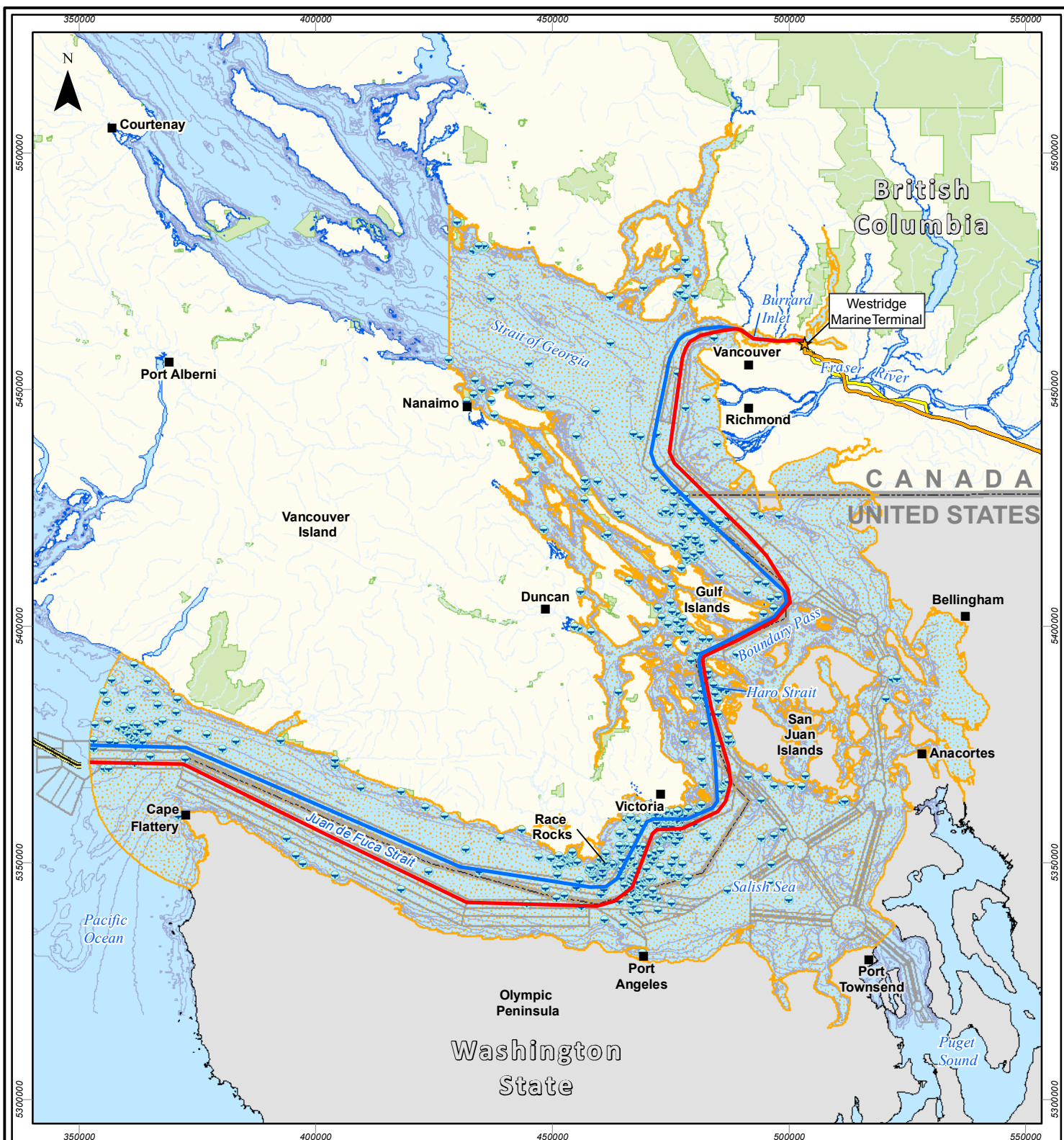
Humpback whales are widely distributed and are found in tropical, temperate and sub-polar waters of the world's oceans. Humpback whales undertake long migrations from breeding to feeding grounds. They breed and calf between November and May near Hawaii, Mexico, Central America, Japan and the Philippines (COSEWIC 2011). In Canadian Pacific waters, humpback whales range the length of the BC coast including both offshore and inshore waters and are most common from May through October. Small numbers may feed in these areas throughout the year (COSEWIC 2011, Dalla Rosa *et al.* 2012, Ford *et al.* 2009, Williams and Thomas 2007). Individual whales show considerable fidelity to feeding sites, where they return annually (COSEWIC 2011, Ford *et al.* 2009, Rambeau 2008).

Humpback whales are among the most commonly observed large cetaceans in BC (COSEWIC 2011, Ford *et al.* 2010, Williams and Thomas 2007). Concentrations of humpback whales have been observed during summer in the area east of Barkley Canyon and between La Pérouse Bank and Nitinat Canyon, and on the shelf edge near the southern portion of Juan de Fuca Canyon (Ford *et al.* 2010). Humpback whales appear to be present in most of the Marine RSA in a comparatively lower density than some other areas of BC (DFO 2013h). DFO has identified portions of humpback whale critical habitat in BC, one of which overlaps with the western-most portion of the Marine RSA off southwest Vancouver Island (DFO 2013h) (see Figure 4.2.22). Opportunistic humpback whale sightings in the Marine RSA, compiled by the BC CSN for the period of 1975 to 2013, are shown in Figure 4.2.24. Humpback whales are regularly observed in or within close proximity to the marine shipping lanes.

Humpback whales in the North Pacific Ocean appear to be recovering from previous heavy exploitation during commercial whaling (Cascadia Research 2008, COSEWIC 2011, Williams and Thomas 2007). The SPLASH project (Structure of Populations, Levels of Abundance and Status of Humpback Whales in the North Pacific) provided the most recent (2006) population size estimate for adult humpback whales in the North Pacific of 18,302 individuals, suggesting an annual increase of about 4.9 per cent since 1993 (Cascadia Research 2008). Regional estimates from SPLASH suggest seasonal (summer/fall) abundances of 3,000 to 5,000 humpback whales in northern BC and southeast Alaska (combined) and 200 to 400 individuals in southern BC and northern Washington (Cascadia Research 2008). Williams and Thomas (2007) estimated a 2005 population size for BC's inner waters of approximately 1,310 humpback whales, based on line transect surveys. A photo-identification study conducted by DFO suggests a 2006 estimate for humpback whales throughout BC waters of around 2,145 individuals (COSEWIC 2011, DFO 2009c, DFO 2013h, Ford *et al.* 2009, Ford *et al.* 2010, Rambeau 2008). Over the period of 1992 to 2006, the BC humpback population is estimated to

have grown at an annual rate of approximately 4.1 per cent, which is a reasonable growth rate for a population that is recovering from previous heavy exploitation (COSEWIC 2011, DFO 2009c, DFO 2013h, Ford *et al.* 2009, Ford *et al.* 2010, Rambeau 2008).

In 2011, COSEWIC down-listed the humpback whale from Threatened (in the 2003 assessment) to Special Concern (COSEWIC 2011); however, on the recommendation of the Minister of the Environment, this assessment has recently been referred back to COSEWIC, and the humpback whale remains listed as Threatened under Schedule 1 of SARA (Her Majesty the Queen in Right of Canada 2013). Key threats to the eastern North Pacific humpback whale include: noise disturbance; habitat degradation; entanglement in fishing gear and debris, and ship strikes (COSEWIC 2011). Activities identified by DFO as “likely to destroy or degrade critical habitat” include vessel traffic, toxic spills, overfishing, seismic exploration, sonar, and pile driving (DFO 2013h).



SCALE: 1:1,150,000

0 10 20 30 40 km
ALL LOCATIONS APPROXIMATE

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MAP NUMBER	10494_EA_TRANS_MAR_04_02_24	PAGE	SHEET 1 OF 1
DATE	Nov 2013	REF.	7894
SCALE	1:1,150,000	REVISION	0
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DESIGN	SD		

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- Town / City
- Marine Vessel
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- Marine Vessel
- Outbound Shipping Lane
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- Bathymetry
- Watercourse
- Existing Trans Mountain Pipeline
- Trans Mountain Expansion
- Proposed Pipeline Corridor
- Waterbody
- Provincial Park
- Traffic Separation Scheme
- Land of British Columbia
- Land of Washington State
- Marine RSA (Transportation)
- Humpback Whale Sighting

Note: Sightings data supplied by the BC Cetacean Sightings Network. Sightings are opportunistic and not corrected for effort. A sighting may be a single or multiple individuals.

Projection: UTM Zone 10N; Marine Vessel Inbound Shipping Lane: Moffatt & Nichol, 2013a; Marine Vessel Outbound Shipping Lane: Moffatt & Nichol, 2013b; International Border: British Columbia Ministry of Energy and Mines, 2013; Canadian 12 Nautical Mile Territorial Boundary and Traffic Separation Scheme: Canadian Hydrographic Service, 2013; Bathymetry: Canadian Hydrographic Service, 2011; Watercourse: National Hydro Network, 2007; Existing Pipeline: Kinder Morgan Canada, 2012; Trans Mountain Expansion Proposed Pipeline Corridor: Universal Pegasus International, 2013; Provincial Park: BC MFLNRO, 2008a; Land of British Columbia: National Topographic Data Base, 2007; Land of Washington State: Washington State Department of Ecology, 1994; Humpback Whale Sightings: BC Cetacean Sightings Network, 2013.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.



TRANS MOUNTAIN

FIGURE: 4.2-24

**BC CSN OPPORTUNISTIC
HUMPBACK WHALE SIGHTINGS
IN THE MARINE RSA
1975 TO 2013**

**TRANS MOUNTAIN
EXPANSION PROJECT**

Further information on humpback whales and other baleen whales in the Marine RSA is presented in the Marine Resources – Marine Transportation Technical Report (Volume 8B, TR 8B-1).

4.2.7.6.3 Steller Sea Lion

Steller sea lions are pinnipeds belonging to the family Otariidae (*i.e.*, the eared seals). They inhabit cool temperate and subarctic coastal waters from southern California north to the Bering Strait and south along the Asian coastline of the North Pacific Ocean (COSEWIC 2003c). Pinnipeds spend a considerable amount of time on land at haulouts and rookeries.

Steller sea lions in BC belong to the eastern Pacific stock. In 2009, Phillips *et al.* argued for subspecies designation between the western and eastern stocks of Steller sea lion. In 2012, the Society for Marine Mammalogy Ad-Hoc Committee on Taxonomy recognized these two subspecies of *Eumetopias jubatus* as: the western Steller sea lion (*E. j. jubatus*) and the Loughlin's northern sea lion (*E. j. monteriensis*). It is the latter subspecies that is found in BC. However, since the use of "Loughlin's northern sea lion" is relatively new, and at the time of writing of this document, the term "Steller sea lion" is still used by COSEWIC, the SARA registry, and the BC CDC, the more common "Steller sea lion" has been used throughout the application.

Sexually mature individuals use rookeries during the summer, with dispersal to non-breeding areas beginning in late August (DFO 2010a). Female Steller sea lions exhibit strong site fidelity, returning to the rookery where they were born or to a nearby adjacent rookery, to mate and give birth (COSEWIC 2003c). There are four Steller sea lion breeding areas along the coast of BC: the Scott Islands off northwest Vancouver Island (which support 33 per cent of the total eastern population); Cape St. James off the southern tip of Haida Gwaii; the Sea Otter Group off the Central Mainland coast; and off Banks Island on the North Mainland coast (DFO 2010a).

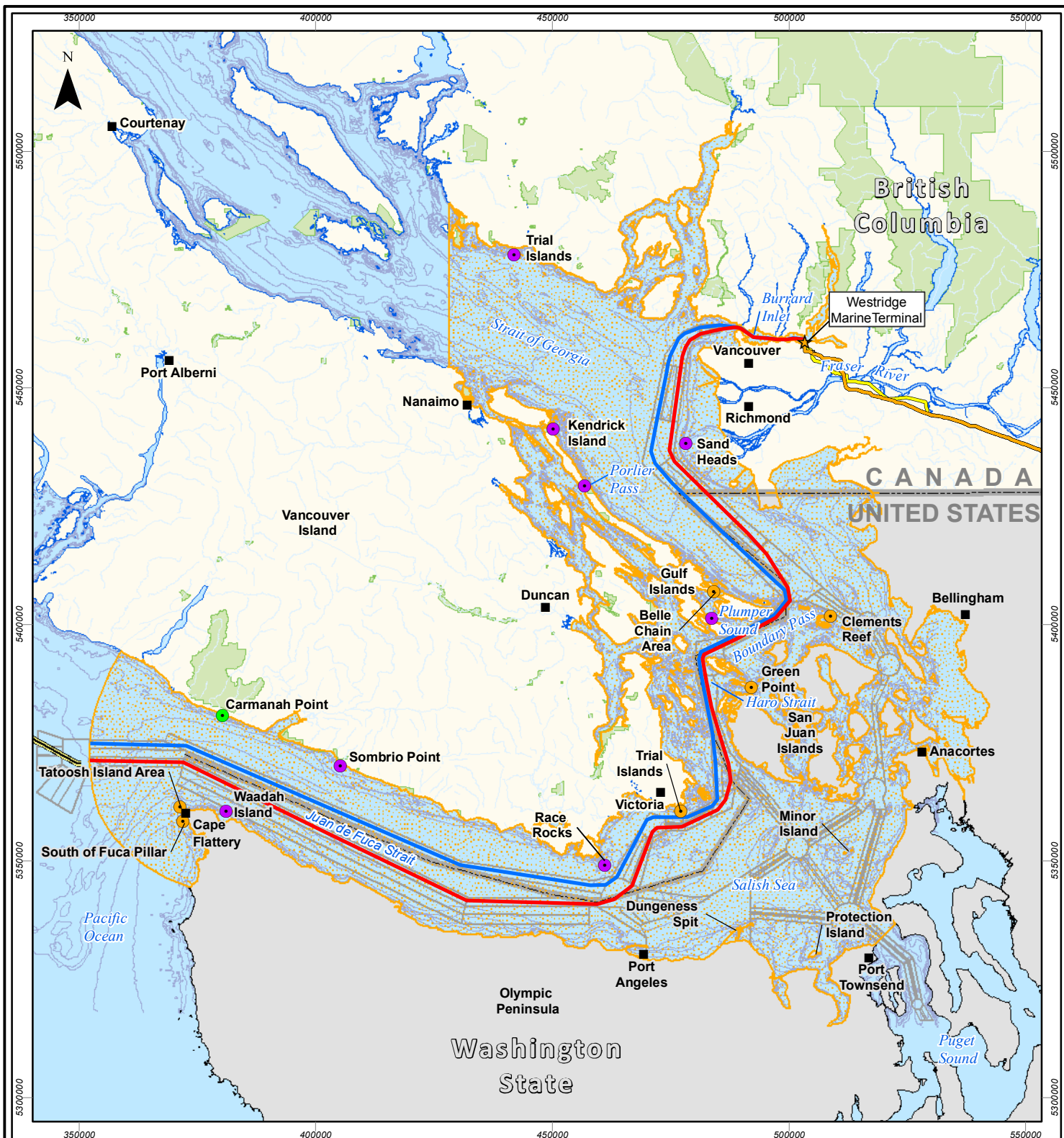
None of the four Canadian breeding areas discussed above is located within the Marine RSA, and the closest rookeries in US waters are in southern Oregon (Allen and Angliss 2012, Jeffries *et al.* 2000). In addition to rookeries, there are at least 23 year-round haulouts in BC and multiple major winter haulouts (DFO 2010a). Both male and female Steller sea lions are present year-round in the Marine RSA. In addition to one year-round haulout at Carmanah Point, and several major winter haulouts, there are several minor haulouts located in the Marine RSA (major year-round and winter haulouts near the Marine RSA are shown in Figure 4.2.25).

The Steller sea lion is listed as Special Concern under Schedule 1 of SARA and is the only pinniped species at risk likely to occur on a regular basis in the Marine RSA. Since receiving protection from hunting under the *Fisheries Act* in 1970, the population of Steller sea lions in BC has increased several-fold (DFO 2010a). The *Oceans Act* of 1996 allowed for the creation of a MPA at Race Rocks, which protected an important winter haulout site within the Marine RSA (COSEWIC 2003c) (see Figure 4.2.25). The maximum number of Steller sea lions observed at one time on Race Rocks increased from 7 individuals in 1965 to 680 individuals in 2009 (Edgell and Demarchi 2012).

Threats to Steller sea lions include:

- degradation of or displacement from essential habitat;
- acoustic disturbance in aquatic habitat;

- disturbance on and around terrestrial habitat;
- reproductive impairment from environmental contaminants;
- toxic spills;
- predator control at fish farms;
- incidental mortality from fishing gear and other sources; and
- shifts in prey abundance and distribution (COSEWIC 2003c, DFO 2010a).



- ★ Westridge Marine Terminal
- Town / City
- Marine Vessel
- Inbound Shipping Lane
- Marine Vessel
- Outbound Shipping Lane
- International Border
- Canadian 12 Nautical Mile Territorial Boundary
- Bathymetry
- Watercourse
- Existing Trans Mountain Pipeline
- Trans Mountain Expansion
- Proposed Pipeline Corridor
- Waterbody
- Provincial Park
- Traffic Separation Scheme
- Land of British Columbia
- Land of Washington State
- Marine RSA (Transportation)
- Steller Sea Lion Haulouts
- Major Winter Haulouts
- Year-round Haulout
- Haulouts with Timing Unknown



TRANS MOUNTAIN

FIGURE: 4.2-25

MAJOR STELLER
SEA LION HAULOUTS
IN THE MARINE RSA

TRANS MOUNTAIN
EXPANSION PROJECT

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MAP NUMBER	10494_EA_TRANS_MAR_04_02_25	PAGE	SHEET 1 OF 1
DATE	Nov 2013	REF.	7894
SCALE	1:1,150,000	PAGE SIZE	8.5x11
DRAWN	SS	CHECKED	DP
REVISION	0	DISCIPLINE	SD
DESIGN	SD		

Projection: UTM Zone 10N; Marine Vessel Inbound Shipping Lane: Moffatt & Nichol, 2013a; Marine Vessel Outbound Shipping Lane: Moffatt & Nichol, 2013b; International Border: British Columbia Ministry of Energy and Mines, 2013; Canadian 12 Nautical Mile Territorial Boundary and Traffic Separation Scheme: Canadian Hydrographic Service, 2013; Bathymetry: Canadian Hydrographic Service, 2011; Watercourse: National Hydro Network, 2007; Existing Pipeline: Kinder Morgan Canada, 2012; Trans Mountain Expansion Proposed Pipeline Corridor: Universal Pegasus International, 2013; Provincial Park: BC MFLNRO, 2008a; Land of British Columbia: National Topographic Data Base, 2007; Land of Washington State: Washington State Department of Ecology, 1994; Steller Sea Lion Haulouts: Biggs, 1985; Edgell and Demarchi, 2012; DFO, 2010; Jeffries et al., 2000; NOAA Fisheries Service, 2012.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

Further information on Steller sea lions and other pinnipeds in the Marine RSA is presented in the Marine Resources – Marine Transportation Technical Report (Volume 8B, TR 8B-1).

4.2.7.7 *Aboriginal Traditional Knowledge*

The literature review indicates that marine resource extraction was, and continues to be, an important activity for coastal Aboriginal communities in the Marine RSA. Marine mammals have traditionally been harvested at the intersection of the Fraser River and the Pacific Ocean, throughout the Gulf Islands, in the Strait of Georgia and along the southern coast. Traditionally hunted marine mammal species included grey whales, Steller sea lions, Pacific white-sided dolphins, killer whales, harbour seals and porpoises (BC Transmission Corporation 2006, Canadian Environmental Assessment Agency 2006, Simonsen *et al.* 1995).

4.2.7.8 *US Waters*

Since the Marine RSA straddles the international border between Canada and the US, the literature search also included a review of US sources for local marine mammal research, such as the Center for Whale Research, the Whale Museum, Orca Network, Cascadia Research Collective, and NMFS. Baseline information regarding marine mammals in US waters is expected to be consistent with baseline information in Canadian waters. Further detail on marine mammal sightings and research conducted in US waters is presented in the Marine Resources – Marine Transportation Technical Report (Volume 8B, TR 8B-1).

4.2.8 *Marine Birds*

This subsection provides an overview of the marine bird species and habitats along the marine shipping lanes, from the Westridge Marine Terminal to the 12 nautical mile limit of Canada's territorial sea (shown in Figure 4.2.1). More detailed technical information pertaining to marine birds is presented in the Marine Birds – Marine Transportation Technical Report (Volume 8B, TR 8B-2).

Aboriginal traditional knowledge pertaining to marine birds is summarized in Section 4.2.8.7. Information pertaining to marine birds in US waters can be found in Section 4.2.8.8. A discussion of the potential effects of the increased Project-related marine vessel traffic and associated mitigation as well as a discussion of the spatial boundaries for marine birds are located in Section 4.3.8.

4.2.8.1 *Spatial Boundaries*

The existing environmental conditions for marine birds are described with regard to the Marine Birds LSA, which includes the inbound and outbound marine shipping lanes, the area between the shipping lanes where it exists and a 1 km buffer extending from the outermost edge of each shipping lane. The shipping lanes extend from the Westridge Marine Terminal in Burnaby, through Burrard Inlet, south through southern part of the Strait of Georgia, the Gulf Islands and Haro Strait, then westward past Victoria and through Juan de Fuca Strait out to the 12 nautical mile limit of Canada's territorial sea. The Marine Birds LSA is shown on Figure 4.2.2.

4.2.8.2 *General Information*

The Marine RSA falls within the Strait of Georgia, Haro Strait and Juan de Fuca Strait, all within the Salish Sea, an inland area of ocean that extends from Olympia, Washington northward to Campbell River, BC. The Salish Sea supports diverse populations of seasonally present birds, abundant marine bird breeding colonies, designated IBAs and Reserves, and seasonally

important foraging areas, such as marine upwellings, shallow open water and the continental shelf. The Marine RSA encompasses large breeding colonies and other sensitive marine bird foraging and staging areas proximate to the shipping lanes.

There are an estimated 124 marine bird species (Campbell *et al.* 1990, Stevens 1995) using coastal terrestrial habitats (above the high-water mark), foreshore (shoreline from high-water to low-water tide mark), nearshore (low-water mark to water extending 10 m seaward) and offshore areas (nearshore to the continental shelf) of the Marine RSA. Some of these species may comprise populations of tens of thousands of breeding, migrant or wintering birds. Species of conservation concern found using marine habitats within the Marine RSA include short-tailed albatross, Brandt's cormorant, double-crested cormorant, western grebe, great blue heron, common murre, horned puffin, marbled murrelet, surf scoter, red knot, long-billed curlew and peregrine falcon (Badzinski *et al.* 2008, BC CDC 2013). Breeding colonies of double-crested cormorants, pelagic cormorants, black oystercatchers, rhinoceros auklets, Cassin's auklets, tufted puffins, pigeon guillemots, great blue herons, fork-tailed and Leach's storm-petrels and glaucous-winged gulls are documented within the Salish Sea (Chatwin *et al.* 2002, Elliot *et al.* 2005, Vermeer 1983, Wahl *et al.* 1981). Substantial breeding areas in the Salish Sea are located on Protection Island, Tatoosh Island, Smith and Minor Islands in the US, and Mandarte Island and Race Rocks in Canada (Wahl *et al.* 1981). Multiple non-colonial species also breed in these areas (Wahl *et al.* 1981, Burton 2010).

In BC, marine habitats are adversely affected by recreational activities, commercial fishing, fish farms, industrial developments, timber harvesting and vessel operations, which have reduced important habitats for marine birds, with the exception of some designated conservation areas. Marine and coastal ecosystems are subject to large-scale changes and fluctuations in productivity.

4.2.8.2.1 Conservation Areas

Provincially designated conservation areas include Wildlife Management Areas, MPAs, RCAs, Ecological Reserves, and Provincial Parks (Table 4.2.8.1, Figure 4.2.3). Both pelagic and coastal waters are used seasonally by a wide variety of breeding, foraging and over-wintering marine birds especially in extensive tidal mudflats, eelgrass beds, rocky offshore islets and old-growth forest (Parks Canada 2009b). Federal protection designations include Migratory Bird Sanctuaries (CWS), DFO MPAs, National Marine Conservation Areas (Parks Canada), National Parks of Canada (Parks Canada), National Wildlife Areas (CWS) and Critical Habitat (SARA) (Figure 4.2.26).

TABLE 4.2.8.1

CONSERVATION AREAS WITHIN AND NEAR THE MARINE RSA

Conservation Area Type	Conservation Area Title
MPA	Race Rocks
Migratory Bird Sanctuary	George C. Reifel Migratory Bird Sanctuary
National Wildlife Area	Alaksen National Wildlife Area
RAMSAR	Fraser River Delta
National Marine Conservation Area Reserve	Southern Strait of Georgia National Marine Conservation Area Reserve (PROPOSED)
RCA	Mayne Island North
RCA	McCall Bank
RCA	Halibut Bank

TABLE 4.2.8.1

CONSERVATION AREAS WITHIN AND NEAR THE MARINE RSA (continued)

Conservation Area Type	Conservation Area Title
RCA	Valdes Island East
RCA	Galiano Island North
WMA	Roberts Bank WMA
WMA	Boundary Bay WMA
WMA	Sturgeon Bank WMA
WMA	South Arm Marshes WMA
Ecological Reserve	Oak Bay Islands Ecological Reserve
Ecological Reserve	Ten Mile Point Ecological Reserve
Ecological Reserve	Trial Islands Ecological Reserve
Ecological Reserve	Race Rocks Ecological Reserve
Ecological Reserve	Galiano Island Ecological Reserve
Ecological Reserve	Ballingall Islets Ecological Reserve
Ecological Reserve	Canoe Islets Ecological Reserve
Ecological Reserve	Rose Islets Ecological Reserve
Ecological Reserve	Hudson Rocks Ecological Reserve
Ecological Reserve	Satellite Channel Ecological Reserve

4.2.8.2.2 Important Bird Areas

There are 20 IBAs present within the Marine RSA (Table 4.2.8.2, Figure 4.2.2.6), which range in size from 140 ha to 153,717 ha. Detailed information on the importance of each of these IBAs was gathered from Bird Studies Canada and Nature Canada (2012) and BirdLife International (2012a).

TABLE 4.2.8.2

IMPORTANT BIRD AREAS FOUND WITHIN AND NEAR THE MARINE RSA

IBA Name	Regulatory Prov/State	Central Coordinates	Size (ha)	Details	Bird Colonies	IBA Trigger Species	Globally Significant Species	Proximity to Marine Bird LSA and Marine RSA
Active Pass (BC015)	BC	123° 18.06' W 48° 52.25' N	1,700 (4.5 km long)	<ul style="list-style-type: none">Between Galiano and Mayne Islands in the southwest of the Strait of GeorgiaApproximately 40 km south of Vancouver and 50 km north of VictoriaHigh intertidal and subtidal biodiversityRich feeding ground for fish-eating avifauna during tidal ebbs in spring, fall and winter	<ul style="list-style-type: none">None	<ul style="list-style-type: none">2,000 individual Pacific loons4,000 individual Brandt's cormorants10,000 individual Bonaparte's gulls	<ul style="list-style-type: none">Pacific loonBrandt's cormorantBonaparte's gull	Within the Marine RSA, approximately 12 km northwest of the Marine Birds LSA
Boundary Bay and Roberts Bank (BC017)	BC	123° 7.26' W 49° 9.05' N	76,000	<ul style="list-style-type: none">Encompasses Boundary Bay and the estuarine coastal wetland areas of Sturgeon Bank and Roberts Bank, the waters north and south of the south arm of the Fraser River and Point Roberts (US)Includes 3 separate areas (Boundary Bay, Roberts Sturgeon Banks) that many species move frequently betweenA variety of habitats include mudflats and intertidal marshesLow tides expose large mudflats and extensive eelgrass beds in bays	<ul style="list-style-type: none">Great blue heron	<ul style="list-style-type: none">46,700 individual snow geese4,751 individual Brants526 individual Trumpeter swans30,500 individual American wigeons20,950 individual mallards24,940 individual northern pintails2,576 individual red-necked grebes3,000 individual western grebes1,600 individual grey plovers500,000 individual western sandpipers29,000 individual dunlins19,000 individual glaucous-winged gulls	<ul style="list-style-type: none">N/A	Within the Marine RSA, adjacent (< 2 km) to the Marine Birds LSA
English Bay and Burrard Inlet (BC020)	BC	123° 5.52' W 49° 17.87' N	14,009	<ul style="list-style-type: none">Burrard Inlet is a sheltered fjord of Strait of GeorgiaIncludes False Creek and English Bay, Vancouver Harbour, Port Moody Arm and Indian ArmMost of shoreline is rocky or built up with port facilities and seawallsExtensive tidal sandflats, mudflats and saltwater marshes, inlets and coastal features	<ul style="list-style-type: none">Purple martin (nest boxes)Great blue heron	<ul style="list-style-type: none">183 breeding pairs of great blue heron	<ul style="list-style-type: none">Western grebeBarrow's goldeneyeSurf scoter	Within the Marine RSA and Marine Birds LSA near Westridge Marine Terminal
White Islets and Wilson Creek (BC025)	BC	123° 42' 43.2" W 49° 25' 4.7994" N	2,938	<ul style="list-style-type: none">Located approximately 6 km southeast of Sechart, where Wilson Creek discharges into the Strait of Georgia, the shoreline on both sides of Wilson Creek and approximately 2 km offshore in a 2 km radius around the isletsWhite Islets are small and rocky with rock crevicesWilson Creek shoreline is composed of sand and gravel substratesSub-tidal habitats are ideal feeding areas for surf scoters and harlequin ducks	<ul style="list-style-type: none">None	<ul style="list-style-type: none">490 breeding pairs of glaucous-winged gulls1,000 breeding pairs of surfbirds	<ul style="list-style-type: none">Surfbird	Within the Marine RSA, approximately 27 km northwest of the Marine Birds LSA

TABLE 4.2.8.2

IMPORTANT BIRD AREAS FOUND WITHIN AND NEAR THE MARINE RSA (continued)

IBA Name	Regulatory Prov/State	Central Coordinates	Size (ha)	Details	Bird Colonies	IBA Trigger Species	Globally Significant Species	Proximity to Marine Bird LSA and Marine RSA
Chain Islets and Great Chain Island (BC045)	BC	123° 16.16' W 48° 25.22' N	140	<ul style="list-style-type: none">Located in Oak Bay in Juan de Fuca Strait, approximately 2 km from VictoriaEncompasses a radius of approximately 700 m² of marine water18 small islets and rocks clustered within Mayor ChannelShorelines comprise steep cliff faces, rocky outcrops, boulders, crevices and small gravel beachesWaters are shallow with emerging rocky reefs	<ul style="list-style-type: none">Pelagic cormorant	<ul style="list-style-type: none">2,432 breeding pairs of glaucous-winged gulls2,000 individual Brandt's cormorants510 breeding pairs of double-crested cormorants	<ul style="list-style-type: none">Glaucous-winged gullBrandt's cormorant	Within the Marine RSA, adjacent (<2 km) to the Marine Birds LSA
Sidney Channel (BC047)	BC	123° 21' 28.8" W 48° 37' 33.59" N	8,710	<ul style="list-style-type: none">Situated along the extreme southeast shore of Vancouver Island between James Island and Sidney Island4 km wide channel that connects Haro Strait and the Strait of GeorgiaLagoon present at the northwestern end of Sidney IslandSupports large schools of sand lance in the marine substrate that provide food for marine birds in spring and summer	<ul style="list-style-type: none">None	<ul style="list-style-type: none">3,000 individual Brants20 breeding pairs of black oystercatchers900 individual Brandt's cormorants50 individual great blue herons500 individual mew gulls300 individual pigeon guillemots	<ul style="list-style-type: none">Brandt's cormorantMew gull	Within the Marine RSA, approximately 5 km east of Marine Birds LSA
Cowichan Estuary (BC048)	BC	123° 34.48' W 48° 44.35' N	1,300	<ul style="list-style-type: none">No site description	<ul style="list-style-type: none">None	<ul style="list-style-type: none">216 individual Trumpeter swans724 individual mew gulls530 individual Thayer's gulls	<ul style="list-style-type: none">N/A	Within the Marine RSA, approximately 20 km northwest of the Marine Birds LSA
Porlier Pass (BC052)	BC	123° 35' 27.59" W 49° 0' 43.2" N	1,558 (2 km long)	<ul style="list-style-type: none">Situated in the Southern Gulf Islands between the south end of Valdes Island and the north end of Galiano Island1.5 km radiusExtends along the north shoreline of Galiano Island from Alcala Point to Dionisio Point, and from Shah Point to Cardale Point on the south end of Valdes IslandStrong tidal currents surge through the pass each day causing strong upwellings in the narrow passage	<ul style="list-style-type: none">Glaucous-winged gullBlack oystercatchers	<ul style="list-style-type: none">1,000 individual mew gulls	<ul style="list-style-type: none">Mew gull	Within the Marine RSA, approximately 12 km east of the Marine Birds LSA
Snake Island (BC055)	BC	123° 53' 27.6" W 49° 12' 57.6" N	396	<ul style="list-style-type: none">Approximately 3 km northwest of Gabriola Island in the Strait of Georgia on the approach to Nanaimo HarbourEncompasses a long, narrow sandstone island surrounded by the marine waters in a 1 km radius	<ul style="list-style-type: none">Glaucous-winged gullPelagic cormorant	<ul style="list-style-type: none">673 breeding pairs of glaucous-winged gulls74 breeding pairs of pelagic cormorants	<ul style="list-style-type: none">N/A	Within the Marine RSA, approximately 35 km east of the Marine Birds LSA

TABLE 4.2.8.2

IMPORTANT BIRD AREAS FOUND WITHIN AND NEAR THE MARINE RSA (continued)

IBA Name	Regulatory Prov/State	Central Coordinates	Size (ha)	Details	Bird Colonies	IBA Trigger Species	Globally Significant Species	Proximity to Marine Bird LSA and Marine RSA
Little Qualicum Estuary to Nanoose Bay (BC056)	BC	124° 12.86' W 49° 18.37' N	17,000	<ul style="list-style-type: none">Encompasses 30 km of Vancouver Island coastline from Little Qualicum River estuary to Nanoose Harbour, and extends a few km upriver in several estuaries and into the Strait of GeorgiaIncludes some small islands off Nanoose Bay PeninsulaShoreline mostly comprised of rock and large tidal flats of sand, rock, pools, eelgrass beds and mud	<ul style="list-style-type: none">None	<ul style="list-style-type: none">5,415 individual Brant geese4,800 individual western grebes960 individual Thayer's gulls	<ul style="list-style-type: none">Brant goose	Within the Marine RSA, approximately 55 km east of the Marine Birds LSA
Amphitrite and Swiftsure Banks (BC097)	BC	125° 19.86' W 48° 43.25' N	10,800	<ul style="list-style-type: none">Two small areas of rich productive water off the West Coast of Vancouver IslandAmphitrite Bank (approximately 90 km²) is about 6 km southwest of UclueletSwiftsure Bank (18 km²) is separate and further to the south, being about 15 km southwest of the western end of Nitinat Lake	<ul style="list-style-type: none">None	<ul style="list-style-type: none">15,000 individual California gulls	<ul style="list-style-type: none">N/A	Within the Marine RSA, approximately 15 km north of the Marine Birds LSA
Western Strait of Juan de Fuca	Washington	124° 5' 59.9" W 48° 12' 0" N	153,717 (100 km long)	<ul style="list-style-type: none">Extends from Koitlah Point at the northwest corner of Neah Bay eastward to the mouth of Dry Creek, 3.5 km east of the mouth of the Elwha RiverThe entire site is within the nearshore ecological zone (i.e., < 30 m depth) except on the stretches of coast between Tongue Point and Observatory Point, and between Slip Point and Pillar Point	<ul style="list-style-type: none">None	<ul style="list-style-type: none">1,116 individual marbled murrelets	<ul style="list-style-type: none">Marbled murrelet	Within the Marine RSA, approximately 5 km southeast of the Marine Birds LSA
Port Angeles MAMU	Washington	123° 30' 43.2" W 48° 9' 43.2" N	8,729	<ul style="list-style-type: none">Located in the Puget Trough/Georgia Basin Marine EcoregionExtensive estuary with a long narrow sands spit and a large deep-water harborOlympic National Park has old-growth forests, breeding habitat for Marbled Murrelet	<ul style="list-style-type: none">None	<ul style="list-style-type: none">870 breeding individual of marbled murrelets	<ul style="list-style-type: none">N/A	Within the Marine RSA, approximately 5 km south of the Marine Birds LSA
Port Angeles Harbor/ Ediz Hook	Washington	123° 25' 58.8" W 48° 7' 58.8" N	1,364	<ul style="list-style-type: none">Includes Port Angeles Harbor, Ediz Hook, and shallow marine waters immediately north and west of Ediz HookPort Angeles Harbor is the deepest harbor on the US West Coast, with depths up to 50 mProtected from the open marine waters by Ediz Hook, a 5 km-long spit comprising about 80 ha of sand/gravel beach and rocky breakwaterHighly industrializedContains large shipping facilities, a marina and commercial net pens	<ul style="list-style-type: none">None	<ul style="list-style-type: none">400 individual Heermann's gulls	<ul style="list-style-type: none">N/A	Within the Marine RSA, approximately 5 km south of the Marine Birds LSA

TABLE 4.2.8.2

IMPORTANT BIRD AREAS FOUND WITHIN AND NEAR THE MARINE RSA (continued)

IBA Name	Regulatory Prov/State	Central Coordinates	Size (ha)	Details	Bird Colonies	IBA Trigger Species	Globally Significant Species	Proximity to Marine Bird LSA and Marine RSA
Dungeness Bay	Washington	123° 9' 0" W 48° 10' 12" N	2,203	<ul style="list-style-type: none">North shore of the Olympic Peninsula,includes intertidal and subtidal waters of Dungeness Bay, Dungeness Spit, the Dungeness River estuary and adjacent wetlandsComprises extensive sandflats and mudflatsAdjacent coastal wetlands contain fresh water, estuarine marshes and ponds maintained by a seasonally high water table	<ul style="list-style-type: none">None	<ul style="list-style-type: none">25 individual bald eagles8,000 individual Brants100 individual common loons83 individual great blue herons3 individual merlins3 individual Peregrine falcons	<ul style="list-style-type: none">N/A	Within the Marine RSA, approximately 20 km southeast of the Marine Birds LSA
Sequim Bay	Washington	123° 1' 11.9" W 48° 4' 12" N	14,950	<ul style="list-style-type: none">Includes open waters and intertidal zones of Sequim Bay, Washington Harbor, Travis Spit, Gibson Spit, the beaches and bluffs north of Gibson Spit as far north as Marlyn Nelson county park at Port Williams and the marine waters of Juan de Fuca Strait adjacent to the mouth of Sequim Bay	<ul style="list-style-type: none">None	<ul style="list-style-type: none">215 individual black-bellied plovers1,775 individual dunlins260 individual Heermann's gulls	<ul style="list-style-type: none">N/A	Within the Marine RSA, approximately 35 km southeast of the Marine Birds LSA
Protection Island	Washington	122° 54' 0" W 48° 6' 0" N	275	<ul style="list-style-type: none">No site description	<ul style="list-style-type: none">None	<ul style="list-style-type: none">300 breeding pairs of double-crested cormorantsGlaucous-winged gullPelagic cormorantPigeon guillemotRhinoceros aukletTufted puffin	<ul style="list-style-type: none">N/A	Within the Marine RSA, approximately 30 km southeast of the Marine Birds LSA
Deception Pass	Washington	122° 35' 59.9" W 48° 23' 59.9" N	300	<ul style="list-style-type: none">Marine waters in Deception Pass State Park Deception Pass Bridge past West Point to Deception Island and past Lighthouse Point to Northwest IslandNarrow and shallowHuge volumes of tidewater funnel through at speeds up to 8 knotsWater speeds decrease rapidly within 0.8 km of the passBounded by rocky shores and cliffs with a few beaches	<ul style="list-style-type: none">None	<ul style="list-style-type: none">17 individual black oystercatchers378 individual pigeon guillemots670 non-breeding individual red-throated loons	<ul style="list-style-type: none">N/A	Within the Marine RSA, approximately 35 km east of the Marine Birds LSA
Samish/Padilla Bays	Washington	122° 30' 0" W 48° 30' 0" N	59,000	<ul style="list-style-type: none">Located near AnacortesExtensive shallow bays (Similk, Fidalgo, Padilla and Samish) and associated mudflats and sloughsSheltered bays and sloughs provide critical wintering area for seabirds, ducks and geeseShelter and food for large concentrations of seabirdsSome of the most extensive eelgrass beds on the West Coast	<ul style="list-style-type: none">None	<ul style="list-style-type: none">60 non-breeding individual black oystercatchers1,130 non-breeding individual Brants11,456 non-breeding individual dunlins1,105 breeding individual great blue herons102 non-breeding individual marbled murrelets89 non-breeding individual red-necked grebes984 non-breeding individual trumpeter swans520 non-breeding individual western grebes	<ul style="list-style-type: none">BrantTrumpeter swan	Within the Marine RSA, approximately 40 km east of the Marine Birds LSA

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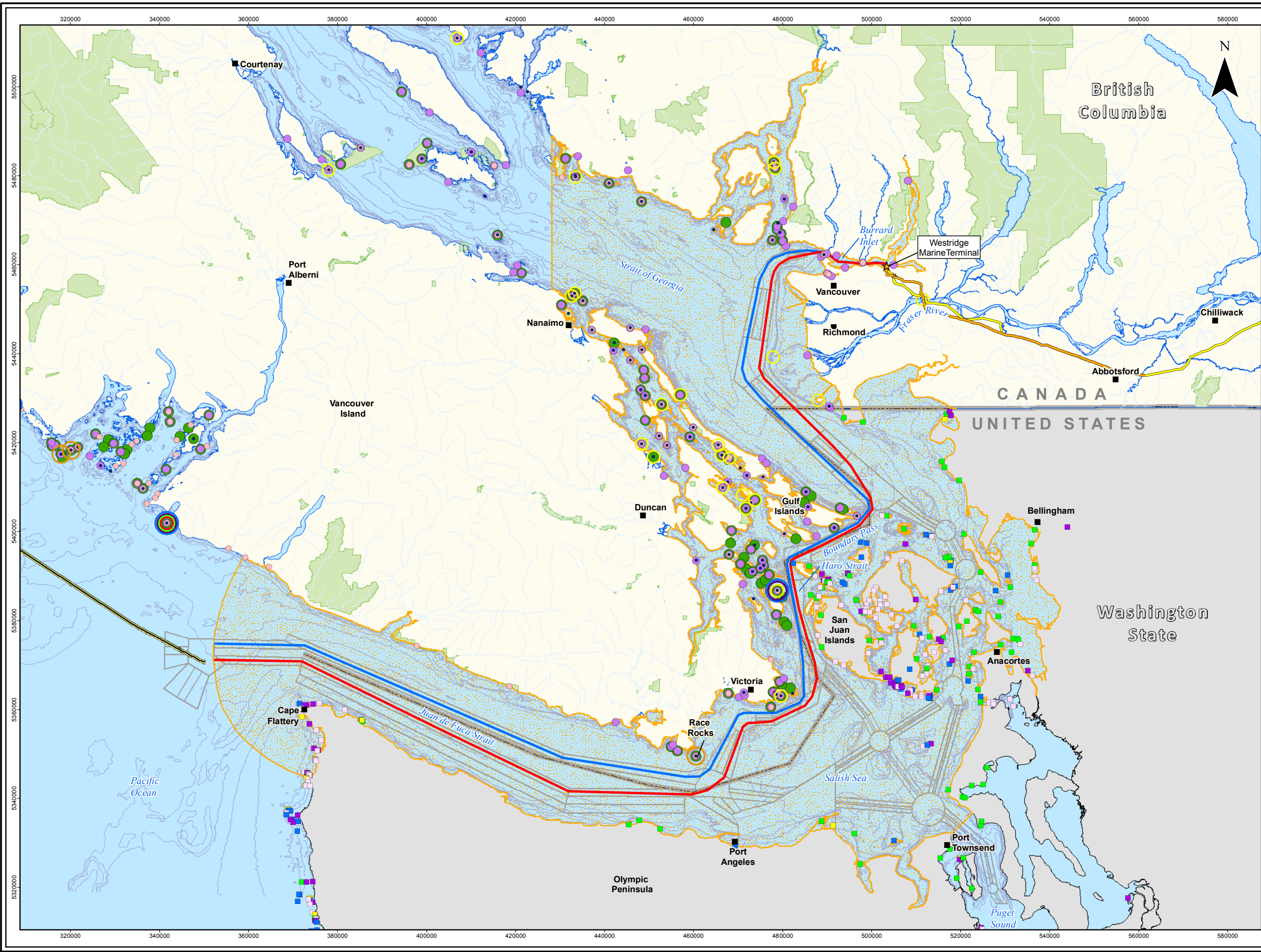




FIGURE: 4.2-26

BIRD BREEDING AREAS IN AND NEAR THE MARINE RSA

TRANS MOUNTAIN EXPANSION PROJECT

- ★ Westridge Marine Terminal
- Town / City
- Marine Vessel Inbound Shipping Lane
- Marine Vessel Outbound Shipping Lane
- International Border
- Canadian 12 Nautical Mile Territorial Boundary
- Bathymetry
- Watercourse
- Existing Trans Mountain Pipeline
- Trans Mountain Expansion Proposed Pipeline Corridor
- Waterbody
- Provincial Park
- Traffic Separation Scheme
- Land of British Columbia
- Land of Washington State
- Marine RSA (Transportation)

BC Marine Bird Colonies

- Pigeon Guillemot Colonies
- Pelagic Cormorant Colonies
- Glaucous-winged Gull Colonies
- Black Oystercatcher Breeding Areas
- Double-crested Cormorant Colonies
- Cassin's Auklet Colonies
- Brandt's Cormorant Colonies
- Rhinoceros Auklet Colonies
- Tufted Puffin Colonies
- Fork-tailed and Leach's Storm-petrels Colonies

Washington Marine Bird Colonies

- Alcids (Possibly Others)
- Commorants (Possibly Others)
- Alcids and Commorants (Possibly Others)
- Other Seabirds
- Unknown

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Projection: UTM Zone 10N; Marine Vessel Inbound Shipping Lane: Moffatt & Nichol, 2013a; Marine Vessel Outbound Shipping Lane: Moffatt & Nichol, 2013b; International Border: British Columbia Ministry of Energy and Mines, 2013; Canadian 12 Nautical Mile Territorial Boundary and Traffic Separation Scheme: Canadian Hydrographic Service, 2013; Bathymetry: Canadian Hydrographic Service, 2011; Watercourse: National Hydro Network, 2007; Existing Pipeline: Kinder Morgan Canada, 2012; Trans Mountain Expansion Proposed Pipeline Corridor: Universal Pegasus International, 2013; Provincial Park: BC MFLNRO, 2008a; Land of British Columbia: National Topographic Data Base, 2007; Land of Washington State: Washington State Department of Ecology, 1994; Bird Colonies: Environment Canada, 2008; Coastal Resource Information Management System (CRIMS), 2011; Washington State DFW, 1989.



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MAP NUMBER 10494_EA_TRANS_MAR_04_02_26		PAGE SHEET 1 OF 1	
DATE Nov 2013	TERA REF. 7894	REVISION 0	
SCALE 1:800,000	PAGE SIZE 11x17	DISCIPLINE SD	
DRAWN SS	CHECKED SD	DESIGN SD	

SCALE: 1:800,000



ALL LOCATIONS APPROXIMATE