5.2 Marine Use Assessment Highlights:

- The Fraser River South Arm supports a variety of marine uses, including deep sea and domestic shipping, materials handling, log storage, sorting and booming, as well as commercial, recreational, and Aboriginal fishing activities. In addition, recreational boating, supported by marinas and a rowing club located in Deas Slough, take place in the vicinity of the Project.
- The proposed clear span crossing of the Fraser River will avoid impacts to marine use and the existing three span Deas Slough Bridge will be replaced with a clear span, improving navigation in and out of the slough.
- Project-related effects on marine use may include temporary constraints on access and use of sections of the Fraser River South Arm and Deas Slough during construction.
- Working with Aboriginal Groups and key stakeholders to develop a Marine Access Management Plan will mitigate temporary impacts to marine use associated with Project construction.
- Key mitigation considerations to ensure marine use activities can continue in a safe manner during Project construction include:
  - Communications protocols to establish and advise of in-stream construction activities.
  - Lighting and marking for safe navigation.
  - Establishing navigation protection zones during construction to avoid or minimize impacts on marine use.

5.2 Marine Use

This section presents the assessment of potential effects of the Project on marine use and includes a description of existing conditions, potential Project-related effects including proposed mitigation measures, and an evaluation of residual Project-related and cumulative effects.

5.2.1 Context and Boundaries

This section describes the context for assessment of Project-related effects on marine use in terms of Project setting, and defines the spatial, temporal, administrative, and technical assessment boundaries. Rationale for selecting the assessment boundaries as defined is also provided.

5.2.1.1 Assessment Context

The Fraser River South Arm supports a variety of marine uses, including international and domestic shipping; commercial, recreational and Aboriginal (CRA) fishing; and recreational boating and moorage. Two recreational boat marinas and a rowing club are located along the south and east shorelines of Deas Slough with year-round water access.

Maintaining waterway navigation needs and access is important to the provincial and federal economies, Aboriginal Groups, many businesses, and the general public. In addition, the public's right to navigate the Fraser River South Arm is protected by the *Navigation Protection Act (NPA)*, R.S.C. 1987, c. N-22.

The Project will involve construction activities in the Fraser River South Arm and Deas Slough that may temporarily affect navigation, CRA fisheries, and other recreational boating. The Fraser River South Arm in the vicinity of the Project supports a variety of marine uses, and activities associated with Project construction may result in temporary changes to access and navigability in the vicinity of the Project.

Consultation with the public, Aboriginal Groups, and marine users informed the selection of Marine Use as a Valued Component (VC) for the assessment of potential effects of the Project. Changes in marine use and marine access were raised as areas of interest to local industry located along the Fraser River including port-related businesses that rely on marine access, Aboriginal Groups, and the general public during consultation. Additional information supporting the selection of marine use as VC is provided in **Section 3.1 Issues Scoping and Selection of Valued Components**.

5.2.1.2 Methodology

The assessment of marine use follows the general methodology described in **Section 3.0 Assessment Methodology** and is applied to all VCs. Building on this approach, the assessment of marine use focuses on the following sub-components:

- Commercial navigation
- Navigation for CRA fisheries
- Recreational navigation

Changes in access to, and within, the South Arm of the Fraser and changes in marine traffic (i.e., frequency and volume) that could affect navigability were selected as indicators to assess trends in marine use and to evaluate potential Project-related effects on commercial navigation, CRA fisheries, and recreational navigation.

Access to waterways is evaluated in terms of potential change in vessel access to or within the Fraser River South Arm as a result of construction or operation of the Project. Marine traffic frequency and volume is evaluated in terms of potential for increase in the number of vessels or equipment within the Project area that are directly associated with the Project. Evaluation of this indicator is therefore limited to the Project construction phase.

5.2.1.3 Assessment Boundaries

Spatial, temporal, administrative, and technical boundaries identified for the assessment of Project-related effects on marine use, and the rationale for selecting them are discussed below.

Spatial Boundaries

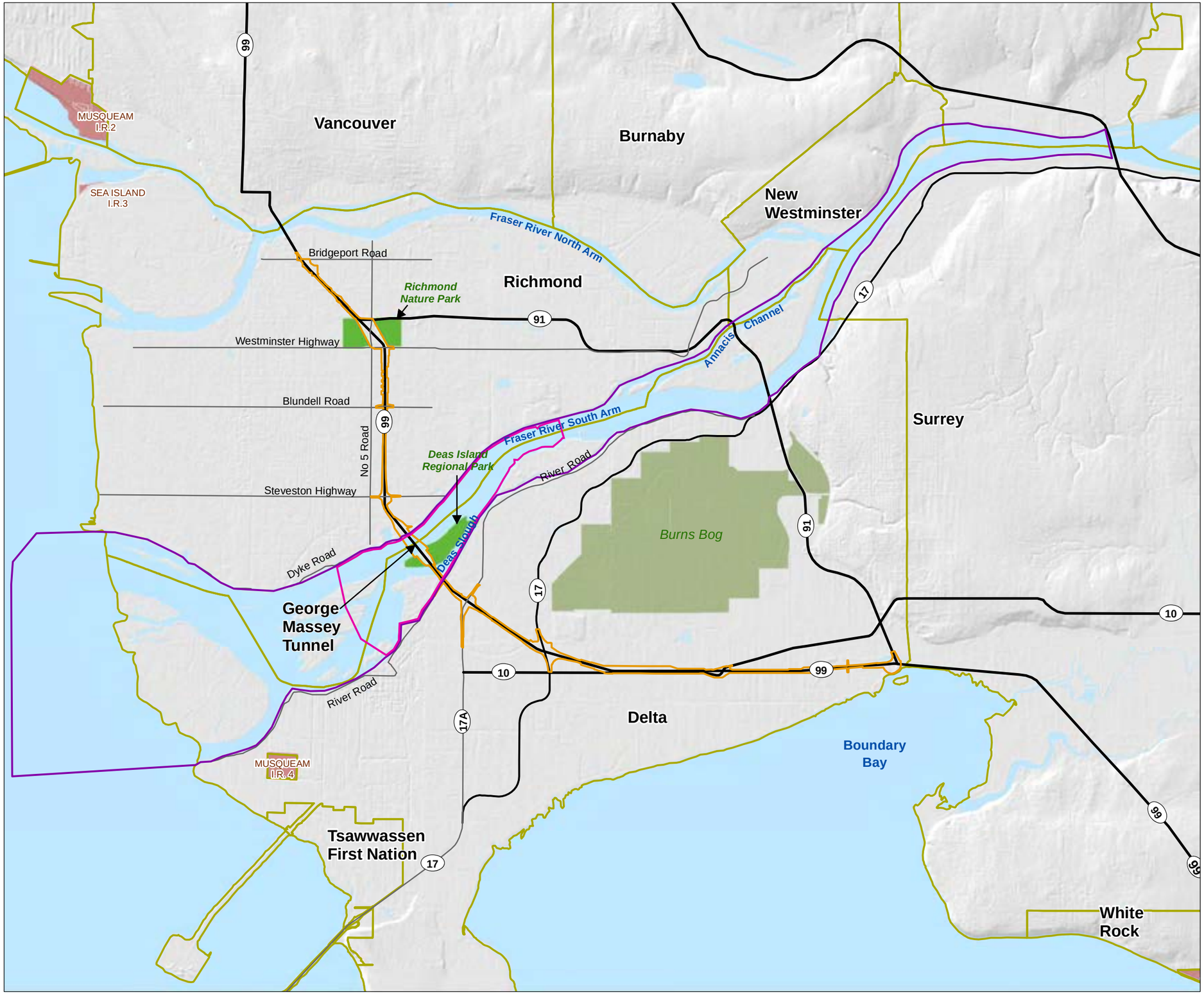
The local assessment area (LAA) and regional assessment area (RAA) for marine use are defined in **Table 5.2-1** and shown in **Figure 5.2-1**. The boundaries of the assessment area take into account the scale and spatial extent of potential environmental effects that are appropriate for the three marine use sub-components.

Table 5.2-1 Spatial Boundary for Marine Use Assessment

Spatial Boundary	Description of Assessment Area
Local assessment area (LAA)	2.5 km downstream and 5 km upstream of the Tunnel, in the Fraser River South Arm main channel, and 500 m on either side of the existing Deas Slough Bridge.
Regional assessment area (RAA)	Vancouver Fraser Port Authority (VFPA) Land Use Planning Area 5 (Fraser River Central, from approximately three kilometers southwest of the Alex Fraser Bridge) and Planning Area 7 (including only Fraser River South Arm, from approximately three kilometres southwest of the Alex Fraser Bridge to the river mouth).

The LAA for marine use was established to encompass the area within which the Project is most likely to interact and potentially affect marine use. In determining the LAA boundary, consideration was given to the nature and characteristics of marine use, potential exposure to various influences (e.g., changes in river hydraulics and morphology following Tunnel removal), and the maximum extent of potential Project-related effects on marine use.

The RAA includes most of VFPA's Land Use Planning Area 5 and 7 (further discussed as a part of the administrative boundary below) and was established to provide a regional context in terms of marine use in nearby marine planning areas.



Legend

- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Project Alignment
- First Nation Reserve
- Municipal Boundaries
- Burns Bog Ecological Conservancy Area
- Waterbody
- Canada - U.S. Border
- Highway
- Arterial/Collector Road

SOURCES

Parks and Protected Lands, First Nations Reserves from GeoBC, United States basemap data courtesy of USGS. Burns Bog courtesy of The Corporation of Delta and based on the Metro Vancouver Burns Bog Ecological Conservancy Area Management Plan - May 2007, all other data courtesy of Canvec - GeoGratis.

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GEORGE MASSEY TUNNEL REPLACEMENT PROJECT

MARINE USE
LOCAL AND REGIONAL ASSESSMENT AREAS

Figure 5.2-1	17/05/2016

B.C. on the Move

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Temporal Boundaries

The temporal boundaries established for the assessment of adverse Project effects on marine use encompass the existing conditions, the Project construction phase (including decommissioning of the Tunnel and Deas Slough Bridge), and the Project operations phase (i.e., the new bridge and improvements in operation). Temporal characteristics of the Project's construction phase are defined in **Section 1.1 Description of Proposed Project.**

Administrative Boundaries

The assessment areas for the Project were selected based on the spatial extent of potential Project-related effects on marine use. The LAA and the RAA include the following administrative boundaries:

- The LAA overlaps two Fisheries and Oceans Canada (DFO) sub-areas in the Pacific Fisheries Management Area (PFMA) 29 (i.e., sub-areas 13 and 14). The RAA overlaps four sub-areas in PFMA 29 (i.e., sub-areas 9, 13, 14, and 17).
    - Sub-area 29-13 consists of the Fraser River South Arm from Steveston Island upstream to the Pattullo Bridge.
    - Sub-area 29-14 is south of sub-area 29-13 and consists of the waters south of the Woodward Island training structure from Reifel Island upstream to Deas Slough.
    - Sub-area 29-9 is downstream from sub-areas 29-13 and 29-14 and extends from the mouth of the Fraser River South Arm upstream to Reifel Island.
    - Sub-area 29-17 is upstream of sub-area 29-13 and consists of the Fraser River South Arm from the Pattullo Bridge to the Alex Fraser Bridge.
- The LAA is located within the VFPA Land Use Planning Area 7.
- The RAA is located within VFPA Land Use Planning Areas 5 and 7.
    - Planning Area 7 extends from the North Arm Jetty and Sturgeon Bank to the north end of Boundary Road in New Westminster, and from the Sand Heads to just east of Tilbury Island.
    - Planning Area 5 is upstream from Planning Area 7 and extends from approximately three kilometres southwest of the Alex Fraser Bridge on the south reach to west of the Port Mann Bridge.

Technical Boundaries

There were some limitations in availability of historic data on fisheries use and vessel activity as discussed in **5.2.2.1 Baseline Data Collection**; however, the Ministry's ongoing engagement with commercial, aboriginal, and recreational marine users has provided information to address such data gaps prior to undertaking the assessment of Project-related effects.

No other constraints such as accessibility or gaps in data that could limit the ability to predict the effects of the Project on marine use have been identified; therefore no technical boundaries were defined.

5.2.2 Existing Conditions

This section provides an overview of the methodology for collecting baseline data, and describes the existing conditions of marine use within the assessment areas. An overview of the regulatory context for management of marine use as relevant to the Project is also provided.

5.2.2.1 Baseline Data Collection

In 2014, the Ministry initiated a desktop review of marine use to support Project planning and assessment. Building on available information, the review was designed to address known data gaps, as summarized in **Table 5.2-2**, and described in further detail below.

Table 5.2-2 Marine Use Studies

Study Name	Purpose of Study
Desktop Review	Understand the existing information available about marine use near the Project through a review of background information including reports and data.
Preliminary Consultation	Meet with key marine and water-based land users and agencies to discuss potential effects of the Project and understand interests.

Desktop Review

Existing background information relevant to the Project, including the following, was assembled and reviewed:

- Relevant discussion on marine use issues, effects and mitigation from previous environmental assessment reports.
- Navigation and river use information, including:
  - Physical characteristics and navigability of the lower Fraser River and smaller channels
  - Marine and water-dependent land uses (e.g., deep sea berths, marinas, and vessel moorage)
  - Frequency of vessel use and vessel types navigating the lower Fraser River

- Publicly available fisheries information, including
  - Fraser River fisheries information (DFO 2013*a*), notices (DFO 2015), and First Nations catch reports (DFO 2014*a*)
  - Other sources of information (e.g., DFO harvesting statistics and fisheries management plans, VFPA Land Use Plan 2014) with respect to marine use within the LAA and RAA
  - Port of Vancouver's Fraser River Tanker Traffic Study (DNV 2012)
- Relevant information regarding current and traditional fishing activities gathered from Traditional Use Studies and information provided by Aboriginal Groups during pre-Application consultation

Preliminary Consultation

Aboriginal Groups

Consultation with Schedule B Aboriginal Groups with respect to marine use began during the Initial Consultation Phase, is ongoing, and described in **Section 10.1.2 Consultation Activities.**

Schedule B Aboriginal Groups have raised concerns related to marine access during construction, including Tunnel decommissioning, and the Ministry is continuing to work with these groups to better understand how they would like to participate in the development and implementation of mitigation measures. For further analysis on potential Project-related effects on Aboriginal access, including fishing access, refer to **Section 10.1.3 Aboriginal Interests Assessment.**

Commercial/recreational marine users

Between May 2014 and June 2015, the Ministry met with key representatives of commercial and recreational marine users, and other stakeholders with specific interest in the Project and its potential influence on marine activity. Individuals and organizations likely to have a potential interest were identified based on the Ministry's experience in consulting with marine user groups during planning and implementation of projects such as the Port Mann Highway 1 Improvement Project and the Pitt River Bridge & Mary Hill Interchange Project, and issues/interests identified during general consultation on these projects.

A total of four meetings, two each with specific focus on commercial use and recreational use, were held to review Project components and discuss potential effects of the Project.

Initial meetings, on May 26, 2014 and May 21, 2015, were held with marine users and other stakeholders with a specific interest in the use of the river and sloughs for commercial purposes. A total of 68 participants, representing 29 marine businesses: one terminal, a rescue group, a community group, BC Coast Pilots, Fish Safe BC, the Council of Marine Carriers (CMC, which represents over 25 local marine businesses), VFPA, and Transport Canada, were invited to, and attended, each meeting. Eighteen individuals attended the May 26, 2014 meeting, representing eight marine businesses, BC Coast Pilots, the terminal, Fish Safe BC, CMC, VFPA, and Transport Canada. Twenty-four participants attended the May 21, 2015 meeting, representing 13 marine businesses, BC Coast Pilots, the terminal, Fish Safe BC, CMC, VFPA, and Transport Canada.

A Project overview, including consultation to date, technical work underway, existing marine traffic patterns, Tunnel removal options, vertical and horizontal clearances, river hydraulics and next steps, was provided at each meeting. A question and answer session took place after each Project update, which included further discussion on Tunnel removal, bridge clearances, interchange replacements, time frames, river hydraulics and morphology, and current marine traffic information. The need for an established forum (Marine Users Group) for communications between marine users during construction was a key outcome of these preliminary meetings.

Meetings with recreational marine users and stakeholders were held on June 25, 2014 and May 21, 2015. A total of twenty individuals representing seven recreational businesses, six recreational groups, one rescue group, one community group and Transport Canada, were invited to both meetings. The June 25, 2014 meeting was attended by five individuals who represented one recreational business, one recreational group, the rescue group, and Transport Canada. Two individuals, both representing one recreational group, attended the May 21, 2015 meeting.

An overall Project update was provided at each meeting, followed by a question and answer session where the following aspects were discussed: height of the bridge over Deas Slough; importance of effective communication during construction, specifically in the context of regattas in Deas Slough; potential noise impacts and mitigation; influence on the Millennium Trail; and Captain's Cove Marina's new housing development and marine enlargement (250 to 350 dock slips). Participants expressed a key interest in waterway closures, equipment in the water, and safety.

Data Limitations

Fisheries Data

Fisheries and Oceans Canada's reporting structure of fishing vessel activity data presents certain limitations for analysis within the LAA and RAA. Fish harvesting data is publicly reported at the PFMA and PFMA sub-area levels. However, the PFMAs are relatively large; PFMA 29, which overlaps with the LAA, includes areas of commercial fishing activity (e.g., Roberts and Sturgeon banks, southeastern Strait of Georgia) other than the LAA, so data reported at this level have limits for interpreting existing conditions in the LAA. The PFMA sub-areas, however, are sufficiently small, such that LAA fishing activity can be reasonably determined from reviewing data reported at this level.

The marine use LAA traverses PFMA sub-areas 29-13 and 29-14. Although the boundaries of these PFMA sub-areas do not coincide with the LAA boundaries, they portray with reasonable accuracy fishing activity within the marine use LAA. Fisheries and Oceans Canada does not make the data collected on harvest activity publicly available when there are fewer than three vessels active on an annual basis in a PFMA sub-area.

Data on guided sport fishing activity is limited. Recreational fishing data from DFO are only available for areas larger than the PFMA sub-areas, and primarily reflect self-directed recreational fishing.

With respect to Aboriginal fisheries, publicly available information sources generally only listed the broad areas where fishing occurs (e.g., "below Port Mann Bridge"). For more specific information regarding Aboriginal fishing, particularly for domestic or food, social and ceremonial (FSC) purposes, see **Section 10.1.3 Aboriginal Interests Assessment**.

Vessel Movement Data

Vessel movement data may not fully account for all vessel traffic through the LAA. It is not mandatory for commercial vessels less than 20 m or pleasure yachts under 30 m to either participate in the Canadian Coast Guard vessel traffic services or install a satellite automatic identification system; therefore, small vessels may not be fully captured in the available vessel movement data.

5.2.2.2 Regulatory Context

Federal

Transport Canada

The *NPA,* administered by Transport Canada, protects the public's right to navigate waters of Canada, and regulates construction work on navigable waters. The Act requires an authorization to permit the construction or placement of work (i.e., structure, device, or thing, temporary or permanent, made by humans) in, on, over, under, through, or across scheduled navigable waterways. The Fraser River is a scheduled navigable waterway. Under the Act, a Notice to the Minister of Transport is required if the Project is "likely to substantially interfere" (Section 4, 6, 8, and 9 of the Act) with marine use. An approval must be obtained before construction of marine infrastructure associated with the Project. Approval will be subject to review of the final design, and may include stipulations for navigational safety.

VFPA maintains navigational jurisdiction in the Fraser River South Arm and is responsible for the maintenance of deep sea and domestic channels for navigation. Further, the VFPA has developed harbour operations, practices, and procedures pursuant to Section 56 of the *Canada Marine Act,* which apply to vessels in Port jurisdiction, including small craft vessels, as well as other users of the Port.

As the Project is not located on VFPA-administered federal land, it will not undergo a separate review under the VFPA's Project and Environmental Review (PER) process. VFPA will consider potential effects of the Project through participation in the Technical Working Group.

Fisheries and Oceans Canada

Regulation and management of CRA fisheries occurs through the *Fisheries Act*, which protects the ongoing productivity and sustainability of CRA fisheries. The lower Fraser River supports CRA fisheries, of which Pacific salmon and eulachon are managed by Fisheries and Oceans Canada (DFO). Licensing and regulation of fisheries authorized under the *Fisheries Act* are regulated by:

- *Fishery (General) Regulations*
- *Pacific Fishery Regulations, 1993*
- *Aboriginal Communal Fishing Licenses Regulations*
- *British Columbia Sport Fishing Regulations, 1996*
- *Pacific Fishery Management Area Regulations, 2007*

Pacific Pilotage Authority and the B.C. Coast Pilots

The Pacific Pilotage Authority's and the B.C. Coast Pilots' mandate is to provide safe, reliable and efficient marine pilotage and related services in the Coastal waters of B.C., including the Fraser River. Under the *Pilotage Act* every commercial vessel over 350 gross registered tonnes is required to utilize the services of a qualified and licensed marine pilot when entering B.C. waters. The Fraser River Pilots, responsible for piloting vessel traffic in the Fraser River, provide expert local knowledge and handling ability on the river.

Canada Shipping Act

Transport Canada administers the *Canada Shipping Act S.C. 2001 c. 26*, which is intended to promote safe marine transportation and recreational boating, protects the marine environment from damage due to navigation and shipping activities, ensures that Canada meets international obligations under bilateral and multilateral agreements with respect to navigation and shipping, and establishes an inspection and enforcement program. With respect to the Project, this Act applies to Canadian and foreign vessels navigating the Fraser River, with the exception of Canadian Forces vessels.

5.2.2.3 Existing Conditions

The existing conditions of the study area are described for each sub-component in the following sections.

Commercial Navigation

Hydrodynamic Conditions of the Fraser River

Navigation in the Fraser River South Arm is affected by river flow conditions. Water levels and tides, among others, are factors considered by Fraser River pilots when determining a vessel's passage plan through the Fraser River. Water levels and tides are affected by freshwater discharge; mainly snowmelt. Discharge typically rises in April, peaks between May and July during freshet, and recedes during autumn and winter.

Tides at the Fraser River mouth are mixed semi-diurnal with two highs and two lows per day, with a large diurnal inequality during spring tides. During the low flow months (i.e., September through April), the tides create alternating flood and ebb flows at the lower reach of the Fraser River. During freshet, flows are predominantly seaward, but can be checked or reversed by the flood tide.

Additional information on the hydrodynamic conditions in the Fraser River is described in **Section 4.1 River Hydraulics and River Morphology**.

Fraser River South Arm Navigation

The Fraser River South Arm is navigable by marine vessels from its mouth to Yale, approximately 175 km upstream; however, river depth limits the draft of marine vessels capable of navigating upstream of New Westminster and channel geometry limit the length of vessel that can practically be used on the Fraser River. The lower reaches of the Fraser River South Arm are dredged annually to maintain, with tidal aid, a water draft of 11.5 m for at least two hours per day, every day of the year, from the river mouth to Fraser Surrey Docks, approximately 30 km upstream.

Navigation channels are classified into three official channel types and one unofficial channel type known as a channel reserve. The officially designated channels have design parameters based on the types of vessels transiting the channels as well as the goods being transported through each navigation channel, specifically:

- Deep sea channel: a 200-m wide navigation channel maintained to service ocean going vessels
- Domestic channel: a navigation channel maintained to service barge and towboat industry, or the local coastal community
- Local channel: the portion of the waterway that is neither a deep sea channel nor a domestic channel, but is used by a variety of smaller operators

The deep sea channel is 322 m wide, comprising a 200-m navigation channel, and two 61-m safety zones on either side of the navigation channel. The VFPA maintains an 11.5-m water draft in the channel for two hours per day.

Deas Slough Navigation

Deas Slough is a local navigation channel approximately 50 m wide, with an average depth of 5 m. At the Deas Slough Bridge, vertical clearance of Deas Slough is approximately 2.5 metres at high water datum. Infrequent and localized dredging takes place to maintain access to small craft harbours and moorage (PMV 2015c).

Land Use Supporting Commercial Navigation Requirements

Approximately four per cent of upland waterfront sites along the shoreline of the Fraser River South Arm are administered by VFPA, while the bordering municipalities of Richmond, Delta, Surrey, and New Westminster regulate the remaining sites. Within these municipalities,

industrial lands along the Fraser River shoreline have access to the river and the deep sea channel. The VFPA has identified long-term trends in maritime commercial navigation including containerization and bulk shipping, and continues to focus on maintaining and growing commercial marine use. Existing land use along the Fraser River is supported by deep sea terminals, coastal shipping, port services and industry, water lots, and moorage.

There are three deep sea terminals operating along the Fraser River South Arm:

- Fraser Surrey Docks, located approximately 14 km upstream of the Project, is primarily a break bulk terminal that can also handle containers with six freight sheds, and six deep sea terminals. Principle exported commodities include pulp, paper, and lumber, while steel and general cargo are principle imports.
- Annacis Auto Terminals, located on Annacis Island approximately 14 km upstream of the Project, services auto transport. It includes two deep sea berths, and intermodal rail and truck loading facilities.
- Fraser Wharves, located on Lulu Island approximately 1.5 km upstream of the Project, also services auto transport. It includes one deep sea berth, and an intermodal rail truck loading facility.

Future land use planning in the RAA has been identified in the VFPA's 2014 Land Use Plan (PMV 2014*c*). VFPA holds a number of upland properties, and leases water lots to support trade activities within Planning Area 7 (which includes the LAA). Future use of these lands is likely to be similar to those now present, although more intensive use of the sites can be anticipated to support trade growth. Planning Area 5, located upstream of the Project, represents the main location of port activity in the Fraser River and includes Fraser Surrey Docks and Annacis Auto Terminals. This area will continue to be the main hub of shipping and goods movement in the Fraser River with anticipated intensification of use and growth in sectors including bulk, break-bulk, liquid bulk, and other commodities.

Marine Traffic and Activity

Over 170,000 reported vessel movements occur annually in the Strait of Georgia between the Strait of Juan de Fuca to the south and Ballenas Island to the north. The majority of vessel movements in B.C.'s coastal waters are passenger traffic and tug-and-barge traffic, representing approximately 56% and 29% or overall vessel traffic, respectively (B.C. MOE 2006). Deep-sea cargo vessel movements (i.e., tanker vessels, bulk cargo carriers, container ships) account for approximately eight per cent, and the remaining are fishing and other vessel traffic (B.C. MOE 2006).

Commercial marine activities are extensive in the lower Fraser River. In 2014, cargo tonnage handled exceeded 140 million metric tonnes, and included general cargo, aggregate, logs, wood chips, hog fuel, paper, steel, cement, and automobiles (PMV 2014*a*).

Thousands of vessels transit the Fraser River South Arm annually. Vessel traffic in the Fraser River South Arm was examined by Det Norske Veritas (DNV) as part of the VFPA's Fraser River Tanker Traffic Study (DNV 2012). The study divided traffic in the Fraser River South Arm into nine segments between the mouth of the Fraser to Patullo Bridge. The Project lies within the segment which extends from approximately the western end of Kirkland Island, near the outlet of Finn Slough, to the northern end of Deas Island. Vessel traffic counts for this study were collected from Automatic Information System data.

Table 5.2-3 shows that there were an estimated 12,716 vessel movements (up and down river) on the Fraser River South Arm through the LAA between July 2010 and June 2011 (DNV 2012). Tug-and-barge and cargo ferries were the most frequent vessel movements, accounting for 48% and 36% of total traffic volume, respectively.

As shown in **Table 5.2-3**, within the LAA deep water vessel traffic accounted for 1,076 annual vessel movements up and down river. These vessel movements consisted of the following cargo types and associated number of vessel movements (DNV 2012):

- Auto carrier vessels carrying cars - 564 vessel movements
- Container vessels carrying mixed cargo - 240 vessel movements
- Break bulk vessels carrying steel and lumber - 200 vessel movements
- Dry bulk vessels carrying grain - 74 vessel movements

Table 5.2-3 Vessel Movements through the LAA (July 2010 to June 2011)

Vessel Type	Number of Vessels Movements Up and Down River	Percentage of Movements (Number of Movements ÷Total Traffic)
Deep Water Vessel	1,076	8%
Cargo Ferry	4,576	36%
Dredger	678	5%
Fishing	50	<1%
Passenger	48	<1%
Pilot Vessel	2	<1%
Pleasure	102	1%
Sailing Vessel	4	<1%

Vessel Type	Number of Vessels Movements Up and Down River	Percentage of Movements (Number of Movements ÷Total Traffic)
Search and Rescue	130	1%
Tug-and-Barge	6,046	48%
Unspecified	4	<1%
Total Vessel Movements	12,716	100%

Note: Summary of upriver and downriver data modified from DNV 2012.

Future vessel traffic in the LAA has been identified in DNV's Tanker Traffic Study (DNV 2012). With the exception of tug-and-barge traffic, the majority of the vessel traffic in the Fraser River South Arm is not anticipated to increase over the next ten years (DNV 2012). Tug-and-barge traffic is expected to increase at a nominal rate of 3% per year (DNV 2012).

Since the DNV 2012 report was completed, the estimate for anticipated vessel traffic in the LAA has been updated an now reflects an approximately 10% increase in deep water vessels and a less than 1% increase in barge traffic over the 2012 values.

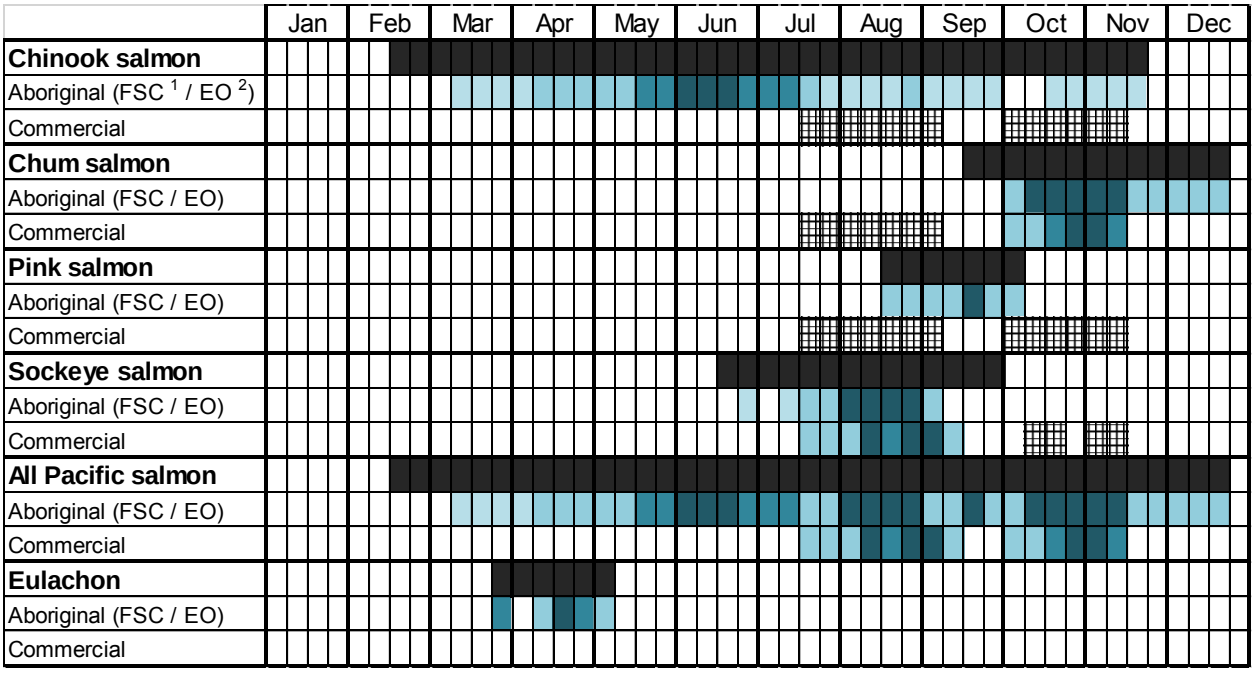
Commercial, Recreational, and Aboriginal (CRA) Fisheries

Overview of Fisheries

Fraser River fisheries contribute significantly to the economic activity along the river (Richmond Chamber of Commerce and D.E. Park and Associates Ltd. 2014). The Steveston Harbour, approximately nine kilometres downstream of the Project, is the largest commercial fishing harbour in Canada, home to more than 350 commercial fishing vessels. Between 13 and 30 million kg of fish and seafood are unloaded at Steveston annually (Kiesman 2013).

Lower Fraser River fisheries openings are summarized in **Table 5.2-4**, and are discussed in the following sections. Data on commercial (including Aboriginal) fisheries openings is summarized for the period between 2004 and 2014 (DFO 2014*a*, 2015). Data for Aboriginal FSC fisheries openings (downstream of the Port Mann Bridge to the river mouth) is summarized for the period of 2004 to 2009, and the year 2013, and includes communal licences, communal licences with limited participation, and communal licences with allowance for sale (DFO 2014*a*). Coho salmon is not included in **Table 5.2-4**, reflecting non-retention and non-possession currently in effect for Fraser River fisheries (DFO 2012). Data on fisheries openings is expressed in number of hours per week and does not represent fishing effort or catch levels.

Table 5.2-4 Species Run Timings and Aboriginal and Commercial Fisheries Openings (in Number of Hours) in the Lower Fraser River (Sources: DFO 2014*a*, 2015)



Notes: Dark grey cells denote run timings for Pacific salmon and eulachon. Data shown for pink salmon represents odd years.

Fishery openings are expressed in number of hours with a shading gradient transitioning from dark blue (representing greater number of hours) to light blue (representing fewer hours) per week.

Crosshatched cells represent non-targeted fisheries (i.e., retention of a species is allowed during fisheries targeting another species).

[1] FSC: Food, social, and ceremonial Aboriginal fisheries; [2] EO: Economic opportunity Aboriginal fisheries

Commercial Fisheries

Commercial salmon fisheries within the LAA (i.e., within PFMA sub-areas 29-13 and 29-14) are conducted primarily with gill nets (i.e., under DFO Salmon Area E Gillnet licences). Salmon gill net fisheries openings are relatively short, depending on run strength determined in-season (**Table 5.2-4**). Specific commercial management areas (Salmon Area E Gillnet, Salmon Area H Troll, and Salmon Area B Seine) apply to commercial salmon fishing activities in the lower Fraser River and are specified within fishing permits. These licences apply to all of Area 29 (as well as to PFMA areas beyond Area 29); however, within the Fraser River, these fisheries typically occur from the Port Mann Bridge downstream to the river mouth, and therefore overlap the Project area. Openings typically last from 3 to 24 hours, and may begin in mid-July through to mid-September and again in mid-October through to mid-November (**Table 5.2-4**). The number of gill net openings varies annually, typically between two and four openings per year,

with as many as 10 openings during years with peak salmon runs (DFO 2015). Commercial gill net fisheries target sockeye and chum salmon, but permit the retention of pink and chinook (DFO 2015).

Aboriginal Groups participate in commercial salmon fisheries in the lower Fraser River, both in the general commercial fishery and under communal commercial licences, deriving economic benefits from fishery revenues and employment-generated income. Aboriginal commercial harvest opportunities under communal commercial licences are managed using rules that are similar to those applied to general commercial fisheries (DFO 2014*b*). Schedule B Aboriginal Groups hold Salmon Area E Gillnet licences, and some are in the process of acquiring additional licences.. Commercial licences and businesses owned by Schedule B Aboriginal Groups are identified in **Section 10.0 Aboriginal Consultation** and includes information provided by Aboriginal Groups as well as that collected through publicly available sources.

The Musqueam Indian Band is involved in commercial fisheries through Salish Seas Limited Partnership, a business owned jointly with the Tsleil-Waututh Nation and Sliammon First Nation. Species harvested commercially through this enterprise include crab, prawn, halibut, and herring. Individual Musqueam members also hold commercial licences (PMV 2015). In 2013, 2014, and 2015, Musqueam were licenced to harvest crab (targeting Dungeness, graceful and red rock) within the Musqueam Crab Area and prawn in PFMA sub-areas 29-2, 29-3, and 29-4 throughout the year (DFO 2016). Musqueam have noted that they have over 60 registered fishing vessels that are used to exercise their fishing rights.

The Project area lies within Tsawwassen Territory, and is situated in or near several harvesting areas defined in the Tsawwassen First Nation Final Agreement relating to fishing. The Tsawwassen First Nation Harvest Agreement provides for an annual commercial allocation of Fraser River sockeye, chum, and pink salmon (odd years only). These commercial allocations vary with the size of the Canadian Commercial Total Allowable Catch (TAC) for sockeye and pink salmon and the Terminal Commercial Catch for chum salmon (TFN 2015). In 2013, there were seven openings for these purposes for pink salmon in September, and two openings for chum salmon in late October. In 2014, there were nine commercial openings for sockeye salmon in August and September, and two openings for chum salmon in late October. There were also two commercial openings for chum salmon in late October 2015 (DFO 2016). The Tsawwassen First Nation Harvest Agreement is also supported by the Tsawwassen Commercial Fish Fund and Tsawwassen Commercial Crab Fund, the monies from which are used to secure general commercial licences for salmon or crab for conversion to Tsawwassen First Nation Harvest Agreement licences (PMV 2015a).

The Hul'qumi'num Fisheries Limited Partnership (HFLP) is a commercial fishing business in which Cowichan Tribes, Halalt First Nation, Penelakut Tribe, Stz'uminus First Nation, Lake Cowichan First Nation and Lyackson First Nation are affiliated. Species harvested through this enterprise are crab (one Area H licence), prawn (two local / coast wide licences), halibut (one licence and annual TAC quota), herring (13 gillnet and 1 seine), rockfish (two Area Inside licences, targeting yelloweye, quillback, copper, china, and tiger), sablefish (annual TAC quota), and salmon (five Area E gillnet licences) (HFLP 2014). Commercial fisheries for halibut and sablefish are generally undertaken off the west coast of Vancouver Island (PMV 2015, LFN 2016).

As recently as 2014, Katzie and other Lower Fraser First Nations, participated in an economic opportunity fishery for sockeye, of which Katzie are said to have had a share of 10,000 sockeye that could be sold (Melnychuk 2014).

Until the early 1990s, no directed net fisheries on coho or chinook were conducted in the Fraser River; however, these species, as well as steelhead, were harvested incidentally in the sockeye, pink, and chum salmon fisheries (B.C. MELP and DFO 1998).

A commercial eulachon fishery in the Fraser River was suspended in 1997 due to conservation concerns for the status of the stock and the inability to control fishing effort (DFO 2013*b*). Only a very small Aboriginal ceremonial fishery continues to the present (Schweigert et al. 2012).

Since 1994 a commercial sturgeon fishery in the lower Fraser River no longer exists, but until 1994, white sturgeon were retained as bycatch (caught unintentionally) in the salmon gill net fishery and sold commercially. Since 1994, commercial gill net fisheries are no longer permitted to take sturgeon, and Aboriginal Groups are discouraged from taking sturgeon (Fraser River White Sturgeon Working Group 2009).

Recreational Fisheries

Recreational fishing occurs within the lower Fraser River to provide food for personal use, as a leisure activity, or both. Recreational fishing is undertaken with a sport fishing licence. Fishing techniques within the lower Fraser River include trolling, mooching, and casting from boats, piers, or the shore, using bait, lures, or artificial flies. Casting from shore appears to be most prevalent. Recreational fisheries primarily target salmon (typically retention fisheries), and sturgeon (catch and release). Access to fishing along the lower Fraser River shoreline is possible from recreational parks (e.g., Deas Island Regional Park in the vicinity of the Project), piers, floating docks, boat launches (e.g., Ladner boat launch at the mouth of Deas Slough), and private and public marinas (e.g., Captain's Cove and the River House marinas in Deas Slough).

In the immediate vicinity of the Project, fishing from the river's riprap shoreline for pink salmon (during odd years) using hook and line is a popular recreational activity. The lower Fraser River, especially the river mouth, is a guided sport fishing destination, particularly during sockeye salmon runs. No recreational salmon catch data is available for the Fraser River South Arm in the vicinity of the Project.

Aboriginal Fisheries

Aboriginal Groups participate in domestic and FSC fisheries in the lower Fraser River in the vicinity of the Project. In general, DFO manages Aboriginal fisheries to provide access for food, social, and ceremonial (FSC) purposes. Aboriginal Groups that participate in domestic and FSC fisheries in the lower Fraser River in the vicinity of the Project are described in detail in **Section 10.1.3**. **Aboriginal Interests Assessment**. Information on relevant past, present, or desired future marine activities, including fishing access and methods have been gathered through consultation activities and publicly available sources and therefore may not necessarily reflect all current or desired future commercial, domestic, or FSC fisheries uses of all Schedule B Aboriginal Groups. More detail on traditional, historical, and current fishing and Aboriginal Interests within the Fraser River South Arm is provided in **Section 10.1.3 Aboriginal Interests Assessment**

FSC fisheries take priority over other uses, including other fisheries, after conservation targets have been met. The primary method of fishing for FSC purposes in the Fraser River is by use of drift gill nets.

Salmon fisheries for domestic or FSC purposes target all five species of Pacific salmon and occur throughout the lower Fraser River, primarily using drift gill nets. Aboriginal drift gill net fisheries are normally conducted on weekends from Friday through Sunday. Openings range from two hours to multiple days, between early March and late December, with peak efforts coinciding with the run timing of targeted species. In general, periods with the most openings occur during June, August, and October through November (**Table 5.2-4**; DFO 2013*a*).

Aboriginal harvesting of eulachon for domestic or FSC purposes in the lower Fraser River is authorized by communal licenses, issued for small amounts of eulachon on a case by case basis. Due to the limited nature of this fishery, fishing times are restricted to one day per year for each communal licence, and participants are required to report catches to DFO (DFO 2013*c*).

Cowichan Nation Alliance

Cowichan Nation Alliance historically harvested sockeye and pink salmon, sturgeon, shellfish, and marine mammals within the South Arm of the Fraser River. Cowichan Nation Alliance has previously reported that now filled-in sloughs and streams in or near Highway 99 once supported coho and eulachon, which were also harvested while they were resident on the Fraser River. *Tl'uqtinus* was used seasonally for harvesting purposes. Areas within the wider Fraser River estuary were also utilized by *Hul'q'umi'num'*-speaking peoples for fishing salmon, sturgeon, groundfish, and other marine resources on the foreshore (e.g., Tsawwassen, Point Roberts, Boundary Bay). Certain species (e.g., sockeye and pink salmon, sturgeon, eulachon, trout, flounder) could only be obtained in, or were preferred to be taken at, Fraser River-based locations. Member First Nations of the Cowichan Nation Alliance have been attempting to restore former fisheries within the Fraser River through Fisheries and Oceans Canada (DFO). Access to sockeye for member First Nations is said to be provided by DFO annually in Johnstone Strait and "off the mouth of the Fraser River". In the vicinity of the Project area, however, access has been subject to negotiations with First Nations local to the lower Fraser River, and has been limited, occurring only in 2005, 2006, and 2008. In those years, the specific locations in the South Arm in which member First Nations of the Hul'qumi'num Treaty Group fished for food, social, and ceremonial (FSC) purposes under communal licences was below the Port Mann Bridge generally, as well as specifically, on some occasions, below the easterly point of Kirkland Island (i.e., downstream of the Project area). The Cowichan Nation Alliance has stated that it is in ongoing, active litigation over its asserted fishing rights on the South Arm of the Fraser River.

Katzie First Nation

Currently, Katzie are among the numerous First Nations involved in the Lower Fraser River salmon fishery under food, social and ceremonial (FSC) licences issued by Fisheries and Oceans Canada (DFO). Of the 570 registered members of Katzie, roughly one third of those members is reportedly licenced to fish during openings on the Fraser River, and an estimated 120 Katzie vessels use the Fraser River to harvest fish annually. Their fishing area is in the vicinity of their communities. Since 2004, Katzie appear to have been licensed to fish in this area for Chinook, sockeye, and chum salmon, steelhead, and eulachon, as well as for chum salmon specifically in the Pitt River, although the targeted species, timing, and frequency have varied year over year.In 2015, Kwantlen had opportunities to harvest salmon from the Fraser River under FSC communal licences, limited participation (i.e., ceremonial) licences, and economic opportunity licences. Communal licences appear to have been issued only for Chinook salmon, over three days in September, while limited participation licences were

issued for Chinook and chum salmon for a portion of one day each, in April and November, respectively, and eulachon on four occasions in April. Kwantlen consider the vitality of the Fraser River and its resources to be an important element of their culture. Salmon was and remains a primary resource and is the basis of Kwantlen's economy.

Kwantlen First Nation

Kwantlen First Nation consider the vitality of the Fraser River and its resources to be an important element of Kwantlen culture. Salmon was and remains a primary resource and is the basis of Kwantlen's economy. Kwantlen are among the numerous First Nations involved in the Lower Fraser River salmon fishery under food, social and ceremonial (FSC) licences issued by Fisheries and Oceans Canada (DFO). Kwantlen are typically licenced to fish for FSC purposes in the stretch of the Fraser River between the Port Mann Bridge and Mission, using both drift and set nets (DFO 2016); and appear to fish in this area for Chinook, sockeye, and chum salmon and eulachon.

Lake Cowichan First Nation

Lake Cowichan followed a seasonal round of resource use and regional settlement. Within this round, the Fraser River estuary has been described as the "most important economically". Species harvested historically on the South Arm of the Fraser River included salmon, sturgeon, eulachon, shellfish, and marine mammals (particularly seals). Access to sockeye for Hul'qumi'num Treaty Group member nations for food, social, and ceremonial (FSC) purposes is said to be provided annually by Fisheries and Oceans Canada (DFO) in Johnstone Strait and "off the mouth of the Fraser River". In the vicinity of the Project area, however, access has been subject to negotiations with First Nations local to the lower Fraser River, and has been limited, occurring only in 2005, 2006, and 2008.

Lyackson First Nation

The Fraser River, from its mouth up to Seabird Island (east of Chilliwack), has been described as a key fish and shellfish harvesting area for Lyackson, with Canoe Passage (*Hwlhits'um*) identified as particularly important for salmon fishing. Areas within the wider Fraser River estuary were also utilized by *Hul'q'umi'num'*-speaking peoples for fishing salmon, sturgeon, groundfish, halibut, and other marine resources on the foreshore. Lyackson First Nation has said that the mouth and South Arm of the Fraser River is currently the source of over 50% of their current subsistence salmon catch; however, they say fishing in the Fraser River area has become largely unavailable to them due in part to low present-day fish populations and the cost of boats and technology.

Musqueam Indian Band

Musqueam has an established right to fish for food, social, and ceremonial purposes in the area of Canoe Pass on the South Arm of the Fraser River pursuant to *R. v. Sparrow* [1990], 1 S.C.R. 1075 (SCC 1990). The Project area lies immediately upstream of this area, and within the area where this right is considered by the Ministry to be asserted. Musqueam also assert an Aboriginal right to fish for food, social and ceremonial purposes in a broader area that includes, but is not limited to, all waters of the Fraser River – including its North Arm, Middle Arm, and South Arm – downstream of the Port Mann Bridge to the Strait of Georgia. All five species of Pacific salmon, steelhead, rockfish (rock cod, red snapper), herring and herring spawn, smelt, halibut, eulachon, trout, and sturgeon were fished historically by the Musqueam in their traditional territory, and all were important economically. The most commonly harvested marine mammals included harbour seal, sea lion, and porpoise; harvesting areas included the Fraser River estuary. At productive beaches within Musqueam traditional territory, abalone, barnacles, clams, chitons, cockles, mussels, crabs, crayfish, octopus, oysters, prawn, scallops, sea urchins, sea cucumber, shrimp, and seaweed were harvested and set aside for winter supplies; however, clams were the most abundant and heavily harvested, including at Boundary Bay. Fishing remains central to Musqueam, and they have specified that the waters outside Steveston, Canoe Passage, and the lower of the Fraser River, and Roberts Bank are their most intensive salmon harvesting areas. Salmon is a key species to the Musqueam, important for FSC and economic purposes.

Hwlitsum

Hwlitsum followed a seasonal round of resource use and regional settlement that involved spending winter on the Gulf Islands and southern part of Vancouver Island (December to February) and summer on the Lower Mainland (March to November) (HFN 2016a). While part of their salmon fishing season was also spent at *Tl'uqtinus* (BC and PMV 2012), all species of salmon, cutthroat, Dolly Varden, dogfish, flounder, steelhead, smelt oysters, crab, sturgeon, eulachon, and trout are or have been obtained by Hwlitsum at Canoe Pass or at nearby locations, such as Kirkland Island (salmon), Cohilakthan Slough (steelhead and salmon), Steveston (eulachon, up to the Highway 99 crossing), Ladner Reach (crab), and Roberts Bank (crab and sockeye) (HFN 2016a; PMV 2015). Salmon, steelhead, trout, and sturgeon were also taken further up the Fraser River and its tributaries. Areas within the wider Fraser River estuary were also reportedly utilized by Hwlitsum for fishing salmon, sturgeon, groundfish, and other marine resources (e.g., Tsawwassen, Point Roberts, Boundary Bay) (HFN 2016a). Hwlitsum have said that access to and use of Fraser River resources has and remains aided by physical presence, including "a set of houses, two wharves and two net sheds" on or near Canoe Pass,

as well as through kinship ties with other First Nations (HFN 2016a); however, other sources suggest that Hwlitsum do not currently have a communal licence to fish in the Fraser River for food, social and ceremonial (FSC) purposes, and that their access to their FSC allocation must be gained through negotiations with First Nations with a communal licence (Cohen Commission 2011).Hwlitsum harvest crab and bivalve species such as clams (i.e., butter, manila, and littleneck), cockles, mussels, oysters, and abalone in the Gulf Islands. Shrimp are generally harvested throughout the Strait of Georgia (between the Gulf Islands and the Lower Mainland), as well as immediately west of the existing Roberts Bank terminals, with targeted shrimp harvesting at Sturgeon Bank. Other marine invertebrates taken include red and green sea urchin, octopus, squid and sea cucumber, all harvested on the western side of the Strait of Georgia (PMV 2015).

Semiahmoo First Nation

Semiahmoo has reported that they once fished for salmon, sturgeon, halibut, eulachon, herring, smelts, sea mammals (including hair seals, sea lions, and porpoises), and a range of beach foods. Semiahmoo said that they practiced their fishing rights in the Fraser River in the summer season at *Tl'ektines*, in the vicinity of the north end of the George Massey Tunnel. Shellfish were also important to the Semiahmoo, and Boundary Bay has been characterized as formerly one of the most productive shellfish harvesting locations on the Pacific coast. Semiahmoo reports that sturgeon and eulachon once served as an important substitute for other fisheries; however, current conservation measures prohibit retention of these species.

Squamish Nation

While Squamish Nation territory reportedly extends south as far the South Arm of the Fraser River, Squamish Nation do not currently fish directly in the Fraser River for food, social or ceremonial (FSC) purposes based on information previously reported by Squamish Nation (SN 2014) and a review of Fisheries and Oceans Canada (DFO) records regarding "Lower Fraser River Fisheries" from the last few years (DFO 2016).

Tsawwassen First Nation

Tsawwassen report that they actively fish in the South Arm of the Fraser River and within the Project area, and that portions of the Project occur within the two subareas 29-13 (Canoe Pass to Deas Island) and 29-14 (Steveston to Pattullo Bridge) (TFN 2015). Canoe Pass and the waters in and around Rose-Kirkland Island (i.e., Ladner Reach, Woodward Reach), which lie about 1 km downstream of the Project area, have been previously described as particularly important fishing areas (VAFFC 2011, BC and PMV 2012). The right to harvest fish allows

designated members of the Tsawwassen First Nation to exercise the right for domestic purposes and to trade or barter those fish among themselves or with other Aboriginal people resident in BC (TFN et al. 2009a, Chapter 9). Domestic allocations for sockeye, chum, pink, chinook, and coho salmon, which are centrally important to the Tsawwassen First Nation, are calculated using formulas described in the TFNFA; generally, set at 625 Chinook, 15,226 sockeye, 2,500 pink (odd years only), 500 coho, and 2,576 chum (TFN et al. 2009b, Appendix J-2).

In 2015, Tsawwassen First Nation fished under communal licence for chinook, sockeye, and chum salmon. Fraser River eulachon are fished in Canoe Passage in limited quantities (up to 50 lbs (23 kg) on average) for specific domestic purposes, typically in April and May, and only after conservation goals have been met. Tsawwassen report that eulachon, once very abundant, in particular in Canoe Passage, is now only available for distribution to Elders.

Canoe Passage was once a key sturgeon harvesting area, but now sturgeon cannot be kept due to conservation concerns. Groundfish may also be harvested year-round for domestic purposes under the TFNFA, but this harvest has not occurred since the TFNFA came into effect. Since the TFNFA came into effect, four to five licences have been issued for the domestic crab harvest, targeting Dungeness, graceful, and red rock species; domestic harvests of crab are currently not subject to allocation limits and are permitted throughout the year.

Tsleil-Waututh Nation

Marine resources were and remain central to Tsleil-Waututh for subsistence and cultural life. Salmon was a food staple, supported by the harvest of the full range of shellfish, including bivalves and crustaceans, sturgeon, a variety of groundfish, eulachon, herring, and smelt, as well as aquatic plants, such as seaweeds. Seals, porpoises, and sea lions were also harvested. Tsleil-Waututh report they hold a close cultural and spiritual connection to salmon (TWN 2015). Tsleil-Waututh reports that they have an extensive Fraser River sockeye fishery each year. The largest fishing effort occurs in August. Tsleil-Waututh has also participated in, and continues to "reserve the right," to a limited participation fishery for ceremonial purposes outside of the regular Tsleil-Waututh sockeye fishing season (TWN 2016).

Fraser River sockeye remain a primary traditional food source for Tsleil-Waututh families, and salmon, herring, and crab are among the species that still contribute to the contemporary economy of Coast Salish peoples (TWN 2015). Sturgeon, due to its decline, is no longer a component of Tsleil-Waututh diet. It is Tsleil-Waututh's goal to participate in the recovery of these species and their habitats for future generations (TWN 2015).

Tsleil-Waututh may fish for FSC purposes under communal licences issued by DFO. In addition to communal licences issued by DFO, Tsleil-Waututh report that they may access food fish through other means, such as through cultural protocols and kinship ties with neighbouring communities, when DFO communal licences are unavailable to Tsleil-Waututh.

PFMA subareas to TWN FSC licences currently apply include 28-11, 28-12, 28-13, 28-14, 29-3, 29-4, 29-6, 29-7, 29-9, 29-10, 29-11, 29-12, 29-13, 29-14, and 29-17 (DFO and TWN 2013). Subareas within PFMA 28 apply to eastern Burrard Inlet and Indian Arm; the other subareas within PFMA 29 cover the Fraser River downstream of the Port Mann Bridge and into the Strait of Georgia (DFO 2016). Subareas 29-13 and 29-14 overlap the Project corridor. Tsleil-Waututh also report having access to PFMA 29 for communal crab licences, and have been working with DFO through an access request process to recognize the entirety of PFMA 28 and PFMA 29 for prawn and crab communal fisheries in the Tsleil-Waututh Nation's CFA (TWN 2016). TWN's access to Fraser River salmon extend beyond sockeye and include pink, chum, chinook, and coho (incidental).In addition to communal FSC access, TWN holds 10 to 15 Allocation Transfer Program (ATP) communal commercial fishing licenses. This includes two crab, 4 to 9 herring gill net licenses, one prawn, and three salmon gill net licenses.

TWN is also involved in commercial fisheries through Salish Seas Limited Partnership, a business owned jointly with Musqueam Indian Band and Sliammon First Nation. Species harvested commercially through this enterprise include halibut, sablefish, prawn, crab, herring, and salmon.

Recreational Navigation

The Fraser River is important for a wide range of water-based recreation (Environment Canada 1994), with the type of activity varying by location. Activities undertaken within the Fraser River include fishing, waterskiing, motor-boating, canoeing, sailing, windsurfing, river rafting, and kayaking.

Recreational boating is prevalent throughout the LAA. Marine use in Deas Slough is dominated by recreational vessels with recreational water-sports including pleasure boating, paddle sports (kayaks, dragon boats, rowing shells, canoes), and waterskiing. Metro Vancouver manages recreational use of the slough year-round to ensure that paddle sports use the slough at separate times from water skiers by establishing a recreational uses schedule (Metro Vancouver 2016).

Two marinas (i.e., River House marina and Captain's Cove marina) occupy approximately one-third of the shore of the slough's south bank. River House marina is located north of Deas Slough Bridge and has 140 boat slips. Captain's Cove marina is located south of Deas Slough Bridge and has 350 boat slips. Boat slips are used year-round, however, usage increases in summer and decreases in winter.

In addition to the two marinas, the Delta Deas Rowing Club is located along the shoreline at the upstream end of slough, near the north end of Deas Island, within Deas Island Regional Park. Rowing from this club takes place within Deas Slough and the rowing club operates year-round.

A boat ramp, operated by the Corporation of Delta Parks and Recreation Department, provides public access to Deas Slough and the Fraser River South Arm. The boat ramp is located at the northern end of Ferry Road, immediately west of Captain's Cove marina. Dredging was initiated in February 2014 in lower Deas Slough to re-establish the depth and width of the local channel, and to remove materials around the Ferry Road boat ramp that had been affecting recreational boating activity (PMV 2014*b*).

5.2.3 Potential Effects

This section discusses potential interactions of Project components and activities with marine use, and potential effects of such interactions on commercial navigation, CRA fisheries, and recreational navigation. Changes in marine use are of interest to local industry located along the Fraser River including port-related businesses that rely on marine access, Aboriginal Groups, and the general public. Potential effects on marine use have been identified through consultation with potentially affected marine users, publicly available information sources, and experience gained by the Ministry in addressing marine use considerations on other projects (i.e., construction of the new Port Mann Bridge). Information on mitigation of potential effects, including Project design measures to avoid adverse effects, is provided in **Section 5.2.4**. Potential residual effects (i.e., effects remaining following the implementation of mitigation measures) are described in **Section 5.2.4**. A discussion of potential cumulative effects on marine use is presented in **Section 5.2.6**.

For further analysis of potential Project-related effects on Aboriginal Interests, including fishing, and measures to address those potential effects, see **Section 10.1.3 Aboriginal Interests Assessment**.

5.2.3.1 Project Interactions

An overview of potential interactions between Project activities and marine use during the construction and operation of Project components is provided in **Appendix A**. A preliminary evaluation of the potential effects of Project interactions on marine use, intended to focus the assessment on those interactions of greatest importance, is presented below. Interactions rated as having no effect are not considered further in the assessment.

Project-related construction activities in the Fraser River South Arm that have the potential to affect access to waterways include marine-based equipment working in or transiting the Project area and marine-based construction activities including Tunnel decommissioning.

Project-related construction activities that have the potential to affect the frequency and volume of marine traffic in the Project area include marine-based equipment working within the Fraser River South Arm or Deas Slough and marine-based equipment transiting through the Fraser River Sough Arm or Deas Slough. **Construction:** Construction of the new clear span bridge and Tunnel decommissioning has the potential to temporarily affect marine use in the Fraser River South Arm, including commercial navigation, navigation for CRA fisheries, and recreational navigation. Marine-based equipment will transit the Project area and, in some cases, will remain in the Project area in order to undertake construction activities including bridge construction and Tunnel decommissioning. Both the transit of marine-based equipment and the presence of such equipment to support construction activities could affect marine use during Project construction and Tunnel decommissioning activities.

Marine-based equipment is expected to include tug and barges used to support transporting construction materials including bridge components as well as Tunnel segments. More detail on the Project components and associated construction activities is provided in **Section 1.1 Description of Proposed Project** of the Application. Project construction is also assumed to require marine-based equipment to support localized instream work along the edge of Deas Slough and removal of Deas Slough Bridge and in-stream works associated with Tunnel decommissioning. Project-related construction activities in Deas Slough that have the potential to affect access to marine use include bridge foundation installation in localized areas along Deas Slough, overhead construction of the clear span over Deas Slough and removal of the Deas Slough Bridge. These activities could temporarily affect navigation for CRA fisheries and recreational navigation. Activities associated with decommissioning of Tunnel are expected to result in temporary impacts to CRA fisheries and recreational navigation.

Operation: The new crossing will be a clear span bridge, with support towers located on land, thereby avoiding effects on the river mainstem. Navigation clearances associated with the new bridge have been established with VFPA taking into account long-term marine use considerations and Transport Canada requirements. Interactions between the Project and marine use in the Fraser River South Arm during operation are not anticipated.

Removal of the Deas Slough Bridge will eliminate structures in the slough that currently infringe on the local navigation channel. The current available air draft of approximately 2.5 metres will be increased to approximately 20 m The existing three span bridge will be replaced by a single, longer span structure. Interactions between the new bridge and marine use in Deas Slough during operations are anticipated to be positive.

5.2.3.2 Potential Effects

Construction:

During the construction of the new bridge, decommissioning of the Tunnel, foundation construction along the edge of Deas Slough and removal of the existing Deas Slough Bridge, interaction between the Project and marine use will be managed to ensure safety and to maintain the navigation needs and marine use of the river and Deas Slough.

As described in **Section 1.1.7 Project Activities by Phase**, construction of the new bridge is assumed to involve lifting of pre-fabricated deck segments from barges in the river followed by the sequential connection of each segment to cables suspended from the land-based towers. When the central segments of the bridge deck need to be installed, a temporary, one-directional navigation would allow construction and marine traffic to proceed safely. A similar approach could be used for Tunnel removal as described in **Section 1.1.7 Project Activities by Phase** when barge-based equipment will need to be located over the four central segments of the Tunnel to remove them.

Either barge or land based equipment will be required to install the stone columns and piles along the edge of Deas Slough. In addition, construction over top of Deas Slough to construct the south approaches to the new bridge and barge-based work to remove the existing Deas Slough Bridge will be required. Transiting of recreational vessels under the Deas Slough Bridge will be temporarily affected by these operations.

Commercial Navigation

Change in Access

During construction activities based within the Fraser River South Arm, some commercial navigation may be temporarily affected by the requirement to establish a temporary, one-directional navigation channel to allow construction and marine traffic to proceed safely.

This requirement may result in a temporary infringement on access for some vessels, including those requiring the maximum draft, where such vessels would have a smaller timing window during which they would be able to move through the Project area. Smaller vessels, with a reduced draft requirement, would be less affected by this restriction. Full closures of the deep water navigable zone are expected to be limited and undertaken with substantial advanced notice.

Change in Marine Traffic Volume and Frequency

While the use of marine-based equipment will be limited to the extent possible, where possible and practical, bridge construction and Tunnel decommissioning will result in temporary increases in the volume and frequency of marine-based vessels transiting the Fraser River South Arm. These anticipated increases in the volume and frequency of marine traffic may result in temporary effects on navigability within the Project area.

Commercial, Recreational, and Aboriginal (CRA) Fisheries

Change in Access

During construction activities taking place within the Fraser River South Arm, navigation for CRA fisheries may be temporarily affected by the requirement to establish a temporary, one-directional navigation channel to allow construction and marine traffic to proceed safely.

While this requirement may result in a temporary infringement on access for some vessels, including those requiring the maximum draft, it is assumed that vessels used to support CRA fisheries, which would have a reduced draft requirement compared to larger commercial vessels, would be less affected by this infringement.

In addition to temporary infringements on access to the main stem of the Fraser River South Arm, construction activities within or along Deas Slough may result in temporary infringements on access to these areas.

Full closures of the deep water navigable zone of the Fraser River South Arm and full closures of Deas Slough are expected to be limited and undertaken with substantial advanced notice.

Change in Marine Traffic Volume and Frequency

While the use of marine-based equipment will be limited to the extent possible, where possible and practical, bridge construction and Tunnel decommissioning will result in temporary increases in the volume and frequency of marine-based vessels transiting the Fraser River South Arm. These anticipated increases in the volume and frequency of marine traffic may result in effects on navigability support CRA fisheries within the Project area.

Recreational Navigation

Change in Access to Waterways

During construction activities taking place within the Fraser River South Arm, recreational navigation may be temporarily affected by the requirement to establish a temporary, one-directional navigation channel to allow construction and marine traffic to proceed safely.

While this requirement may result in a temporary infringement on access for some vessels, including those requiring the maximum draft, it is assumed that smaller recreational vessels, which would have a reduced draft requirement compared to larger commercial vessels, would be less affected by this infringement.

In addition to temporary infringements on access to the main stem of the Fraser River South Arm, construction activities within or along Deas Slough may result in temporary infringements on access to these areas.

Full closures of the deep water navigable zone of the Fraser River South Arm and full closures of Deas Slough are expected to be limited and undertaken with substantial advance notice.

Change in Marine Traffic Volume and Frequency

While the use of marine-based equipment will be limited to the extent possible, where possible and practical, bridge construction and Tunnel decommissioning will result in temporary increases in the volume and frequency of marine-based vessels transiting the Fraser River South Arm. These anticipated increases in the volume and frequency of marine traffic may result in effects on navigability for recreational navigation within the Project area.

Operation

Change in Access to Waterways

Given that the Reference Concept includes a clear span over the Fraser River and Deas Slough, Project-related effects to marine use in the Fraser River South Arm are not anticipated during operation. Vertical and horizontal clearance dimensions of the navigation channel of the Fraser River crossing will be similar to those at the Alex Fraser Bridge and have been established in consultation with VFPA. The Project is not expected to result in a change in marine access in the Fraser River South Arm during Project operation.

The Project will improve navigation opportunities within Deas Slough during operation. Removal of the Deas Slough Bridge, including removal of in-water piers and replacement of the existing three span bridge with a longer single span, will eliminate structures in the slough that currently constrain the local navigation channel. The current available air draft of 2.5 metres will be increased to approximately 20 m. The horizontal clearance available for navigation at Deas Slough will be increased with the provision of a clear span. This is considered to be a positive change in marine access within Deas Slough.

Change in Marine Traffic Frequency and Volume

The temporary increase in marine-based traffic associated with the Project will be limited to the construction phase (i.e., bridge construction and Tunnel decommissioning). No Project-related marine-based vessels or equipment within the Fraser River South Arm or Deas Slough during Project operation. As such, changes in marine traffic frequency and volume are not expected during Project operation.

5.2.4 Mitigation Measures

5.2.4.1 Avoidance

Navigation clearances for the new bridge have been established in consultation with the VFPA and Transport Canada and match the navigation clearance envelope provided by the upstream Alex Fraser Bridge **(Appendix 16.1 Reference Concept)**. The vertical clearance of the new bridge in the Fraser River South Arm will provide:

- 57 m above high water at 2.0 m high water datum (GSC) for a two-directional, 200-m wide channel
- 59.6 m above high water at 2.0 m high water datum (GSC) for a central, one-directional, 130-m wide channel

Horizontal clearance of the new bridge within the Fraser River South Arm will provide a 200-m navigation channel with two 61-m safety zones on either side of the navigation channel. This will support existing and future use.

The towers that will support the new clear span bridge will be land-based and will not interfere with navigation. The final design for the bridge will also take into account the lighting and marking requirements of the *NPA* for safe navigation.

In Deas Slough, vertical clearance in the local channel will be approximately 20 m above high water. The existing Deas Slough Bridge and piers will be removed to the mud line and be replaced by a longer, single span. This will support future use and will result in an improvement to marine use compared to existing conditions.

Implementation of the above measures will avoid potential effects on marine use during Project operation.

5.2.4.2 Minimization

Submission of a Notice of Works: The Ministry will submit a Notice of Works form addressing the Section 4 (a through e) requirements of the *NPA* for construction activities (i.e., construction of the new bridge and Tunnel decommissioning) that may interfere with marine use. The effects of the works, as per Section 4d of the Act, will include measures proposed by the Ministry to ensure maintenance of the navigation channel during construction. These mitigation measures will include the establishment of navigation protection zones that will be maintained during marine-based construction activities. Navigation protection zones will be established in consultation with the Marine Users Group to designate areas where navigation can occur safely during construction. These areas will be delineated by navigational aids such as lighting or signage.

Development of a Marine Access Management Plan: A Marine Access Management Plan (MAMP) will be developed (see **Section 12.0 Management Plans**) and will describe the measures to be implemented to minimize potential construction-related access effects on marine use. The MAMP will outline communications protocols to establish and advise of instream construction activities, including periods of vessel restrictions and is anticipated to include:

- An outline of all marine consultation and media-related activities being undertaken by the Project.
- Processes and procedures to inform marine users of any instream activities that may affect access to the navigation channel and other areas frequented by marine users.

- Specific information on construction phasing, work scheduling, and location of instream staging areas required for Project construction and decommissioning activities.
- Issuance and posting of notices regarding construction schedules, as well as updates on access and instream construction activities.
- Establishment of a 24-hour telephone line available to the marine community during new bridge construction and Tunnel decommissioning.
- The MAMP will be reviewed and approved by Transport Canada and will form part of the *NPA* approval for new bridge construction.
- Use BMPs and comply with regulatory requirements, including those related to construction timing windows, notifications, specific mitigation measures.

The Reference Concept for Tunnel decommissioning currently assumes that the four Tunnel elements will be removed over the course of one construction season (i.e., between freshets) and during a window where effects on fish and marine mammals can be minimized (**Section 4.4 Fish and Fish Habitat** and **Section 4.6 Marine Mammals**). The process for removing the Tunnel segments is outlined in **Table 1.1-5**. Tunnel segments will be removed sequentially starting at either the north or south side. During this time, vessel movement will be maintained although may require the establishment of a temporary, one-directional navigation channel with tug-assisted access to allow construction and marine traffic to proceed safely.

Discussion with the Marine Users Group has indicated that a closure of the deep draft navigation channel for four to six hours would not adversely impact shipping scheduling. Communication with the harbour master will minimize scheduling conflicts and ensure that the commercial navigation schedule is maintained as much as possible throughout the construction phase.

Engagement with Marine Users: As discussed in Section 5.2.2.1, the Ministry has continued to engage with commercial and recreational users of the Fraser River South Arm and Deas Slough since March 2014. A marine users group has been established and includes marine stakeholders (e.g., VFPA, Transport Canada, Canadian Coast Guard); marine users potentially affected by Project construction; commercial, recreational, and Aboriginal marine users; Ministry representatives; construction contractors; and representatives of marine communications and traffic services. Ongoing consultation with the marine users group, will support the development and implementation of the MAMP and will help further refine the mitigation measures to be implemented to facilitate construction of the Project while maintaining commercial navigation, navigation for CRA fisheries, and recreational navigation within the Project area.

The marine users group will meet regularly prior to and during Project construction to identify potential access conflicts. The group will also participate in the establishment of processes and procedures to avoid potential conflicts such as construction phasing and scheduling, communications protocol, and frequency of notices. Consultation with the Marine Users Group will continue throughout Project construction.

Implementation of the above measures will minimize potential effects on commercial navigation, navigation for CRA fisheries, and recreational navigation as a result of temporary interruptions of passage through, use of, or access to a section of the Fraser River South Arm and Deas Slough during Project construction.

Timing:

Tunnel decommissioning: Decommissioning of the Tunnel is proposed to occur between July 16 and February 28, the least-risk timing window for the protection of juvenile salmon and eulachon (FREMP 2006), and may occur over two seasons. Adherence to this timing window will allow the navigation channel to be fully open from March 1 to July 15 each year.

Deas Slough Bridge removal: To limit restrictions to navigation within Deas Slough as much as possible, removal of the Deas Slough Bridge is proposed to occur primarily at night. In order for works to proceed safely, this may require temporary full closures of Deas Slough. It is assumed that the majority of Deas Slough use would be daytime and this will have a minimal effect on marine use within Deas Slough.

Aboriginal Group Consultation: Maintaining fishing opportunities for Aboriginal Groups to exercise cultural, economic, and social fishing rights during construction is a key objective of the Marine Access Management Plan that will be developed to support ongoing use of the Fraser River South Arm by all interests throughout the Project construction phase. As discussed in **Section 5.2.2.1** and **Section 10.1.3 Aboriginal Interests Assessment**, the Ministry is continuing to work with Schedule B Aboriginal Groups to facilitate participation in the development and implementation of mitigation measures to avoid, reduce, or otherwise manage potential Project-related effects on Aboriginal Interests, including Aboriginal fisheries activities.

5.2.5 Residual Effects and their Significance

Residual effects on marine use were characterized by qualitatively assessing the direction, magnitude, geographic extent, duration, frequency, and reversibility of the effects. Definitions for the ratings applied to the residual effect are presented in **Table 5.2-5**. These ratings were developed with specific reference to marine use in the LAA and RAA, and reflect the importance

of commercial navigation, CRA fisheries navigation and recreational navigation within the Fraser River South Arm and Deas Slough. Context for the characterization of residual effects, i.e. sensitivity/resilience of marine use in the Fraser River South Arm and Deas Slough to potential Project-related effects, based on existing conditions, has been taken into account in characterizing the residual effects.

Table 5.2-5 Criteria Used to Characterize Residual Effects on Commercial Navigation, Navigation for CRA Fisheries, and Recreational Navigation

Criteria	Description	Definition of Rating	
Direction	Overall nature of the residual effect	Adverse	Measureable negative effect on marine use
		Positive	Measureable positive effect on marine use
		Neutral	No or non-detectable effect on marine use
Magnitude	Amount of the effect relative to natural or baseline conditions	Negligible	• Fraser River South Arm: No restriction • Deas Slough: No restriction
		Low	• Fraser River South Arm: maintenance of two-way navigation channel with tug assisted access • Deas Slough: periodic nightly closure
		Moderate	• Fraser River South Arm: maintenance of one-way navigation channel with tug assisted access • Deas Slough: multi-day closure
		High	• Fraser River South Arm: full closure of navigation channel • Deas Slough: multi-week closure
Extent	Geographic extent / distribution of the residual effect	Site	Project area
		Local	• Fraser River South Arm: 2.5 km downstream and 5 km upstream of the Tunnel • Deas Slough: 500 m on either side of Deas Slough
		Regional	Fraser River South Arm from approximately three kilometers southwest of the Alex Fraser Bridge to the river mouth

Criteria	Description	Definition of Rating	
Duration	Length of time over which the residual effect is expected to persist	Negligible	Effect is expected to last less than 1 month
		Short-term	Effect is expected to last less than 6 months
		Moderate	Effect is expected to last between 6 to 18 months
		Severe	Effect is permanent
Frequency	Nature of the occurrence of the residual effect (e.g., how often the stressor impacts marine use)	Isolated	Single occurrence or unexpected event
		Rare	Up to twice per week
		Occasional	Two to four occurrences per week
		Continuous	Daily occurrence
Reversibility	Potential for the effect to be reversed or naturally return to baseline level after the disturbance has ceased (or following a period of time after the disturbance has ceased)	Reversible	Existing conditions will be restored after effect has ceased
		Irreversible	Existing conditions will not be restored after effect ceases
		Change	Effect may fluctuate between positive and adverse for the duration
Likelihood	Likelihood that the residual effect may occur	Low	Likelihood of residual effect is less than 25%.
		Moderate	Likelihood of residual effect is between 25% and 75%.
		High	Likelihood of residual effect is greater than 75%.

5.2.5.1 Construction

As described in **Section 5.2.3**, the Project has the potential to temporarily affect marine access, and the volume and frequency of marine traffic, during construction activities such as bridge construction, removal of Deas Slough Bridge, and Tunnel decommissioning. With the implementation of mitigation measures discussed in **Section 5.2.4**, it is expected that these effects can substantially mitigated; however, short-term effects during construction cannot be avoided, and Project construction is anticipated to have the following temporary residual effect:

- Changes in commercial navigation, navigation for CRA fisheries, and recreational navigation in Fraser River South Arm and Deas Slough during marine-based construction activities

A detailed characterization of the above construction-related residual effect is provided below, and a summary of the criteria ratings presented in **Table 5.2-6**.

Context: The Fraser River South Arm supports a variety of marine uses, including international and domestic shipping; commercial, recreational and Aboriginal (CRA) fishing; and recreational boating and moorage. Given the importance of these activities to provincial and federal economies, Aboriginal Groups, many businesses, and the general public, sensitivity of marine use in the Fraser River South Arm to changes or access limitations to the navigation channel can be considered to be relatively high. Mitigation measures identified in **Section 5.2.4,** which include maintaining continued access to the navigation channel during construction, have been proposed, taking this sensitivity into account. Sensitivity of marine use to post-mitigation construction-related effects is, therefore, considered to be low.

Table 5.2-6 Summary of Criteria Ratings for Changes to Commercial Navigation, Navigation for CRA fisheries, and Recreational Navigation

Criteria	Criteria Rating	Rationale for Criteria Rating
Direction	Adverse	Effect on marine use anticipated due to changes in access to waterways or marine traffic frequency and volume.
Magnitude	Low to Moderate	• Fraser River South Arm: Maintenance of one or two-way navigation channel with tug assisted access • Deas Slough: periodic nightly closure
Extent	Local	• Fraser River South Arm: 2.5 km downstream and 5 km upstream of the Tunnel • Deas Slough: 500 m on either side of Deas Slough

Criteria	Criteria Rating	Rationale for Criteria Rating
Duration	Short term	Effect will be short-term, temporary, and limited to Project construction activities requiring marine-based vessels or equipment.
Frequency	Occasional	Effect is anticipated to occur two to four times per week
Reversibility	Reversible	Effect will be reversed following completion of Project construction.
Likelihood	High	The likelihood of temporary changes in marine use during Project construction activities requiring marine-based vessels and equipment is anticipated to be greater than 75%

During construction of the new bridge and decommissioning of the Tunnel, low to moderate adverse effects could be expected within the navigation channel of the Fraser River South Arm. The navigation channel will remain open at all times. As described in **Section 5.2.3 Potential Effects**, partial restriction of the navigation channel may be required during construction of the bridge portion that spans over the central portion of the Fraser River South Arm, and during decommissioning of the Tunnel. This may require a one-way navigation channel. Vessels traveling through the channel during this time will be assisted by tug boats. It is anticipated that a two-way navigation channel will be maintained during construction of the northern and southern most portions of the bridge spans. During this time, vessels would be able to travel in both directions, assisted by tug boats as required. The extent of the effect of Project construction on marine use is considered to be local. Marine-based construction activities will occur primarily within the Project area, and with mitigation, associated effects on marine use are not expected to extend beyond the LAA. Construction of the new bridge and decommissioning of the Tunnel are expected to be moderate in duration. Decommissioning of the Tunnel will be of shorter-term duration, occurring between July and February. Construction of the new bridge is anticipated to involve installation of a new section of the bridge deck one or two times per week, working from the abutments and approaches outward toward the center of the Fraser River South Arm. Decommissioning of the Tunnel is anticipated to involve removal of the four in-river segments of the Tunnel, requiring restrictions to the navigation channel on an intermittent (two to four times per week) basis. Given this, the frequency of potential construction-related effects on marine use is considered to be occasional. Following completion of construction, marine use within and adjacent to the Project area will be restored to baseline conditions, and Project-related effects to marine use are fully reversible.

As described in **Section 5.2.3 Potential Effects**, construction of the south approach to the new bridge and removal of the Deas Slough Bridge has the potential to affect marine activity within/along Deas Slough temporarily. Although full closure of Deas Slough will be required during some activities (such as decommissioning the Deas Slough Bridge and construction the new bridge approach and foundations at this location), such work will be of short duration and will be scheduled for nights whenever possible. Nighttime closures will minimize the effect on marine users within Deas Slough as it is understood that most activity within Deas Slough is daytime recreational use. The extent of the effect is expected to be local. Construction activities within Deas Slough will be limited to Project area, and with the mitigation applied, the effect is not expected to extent past 500 m on either side of Deas Slough. The duration is expected to be short-term and it is expected that nighttime closures would occur occasionally during construction of the new bridge component spanning Deas Slough, and decommissioning of the Deas Slough Bridge. Construction-related effects on marine use within Deas Slough are fully reversible. Removal of the Deas Slough Bridge will result in an increase in air draft from 2.5 metres to 20 metres, which will result in an improvement in navigation conditions within Deas Slough following completion of Project construction.

Potential construction-related residual effects of the Project on marine use are considered to be adverse in direction, low to moderate in magnitude, local in extent, short-term in duration, occasional in frequency, and reversible.

5.2.5.2 Operation

The new bridge has been designed in a manner that avoids the potential for interaction between the Project and marine use in the Fraser River South Arm, and no post-construction Project-related effects are anticipated.

Removal of the Deas Slough Bridge will eliminate structures in the slough that currently infringe on the local navigation channel. Wil the replacement of the Deas Slough Bridge, current available air draft of approximately 2.5 metres will be increased to approximately 20 metres, and the existing three span crossing will be replaced by a single, longer span structure. These Project-related changes are expected to have a positive effect on marine use in Deas Slough during the operational phase.

5.2.5.3 Proponent's Determination of Significance

Definition of significance: A residual effect on marine use, specifically, access to the Fraser River South Arm and Deas Slough, would be considered significant where Project works require a closure of the entire navigation channel for more than 12 hours, or the deep draft channel for more than 24 hours. This significance threshold relating to marine use is based on the Ministry's understanding of existing marine uses and is informed by consultation with marine users and Aboriginal Groups to-date. Based on such consultation, it is assumed that constraints on access more substantive than those noted above would result in potential economic impacts on commercial marine operators and/or prevent access to CRA fisheries opportunities.

Significance determination: There will be no full closures of the navigation channel during the construction phase and no change in access during the operations phase. The most notable constraints on access during construction will be limited to:

- Occasional closures of the deep draft channel (8-10 hours, up to twice per week) during Tunnel decommissioning.
- The need for occasional (2-4 times per week) tug-assisted transit through the navigation protection zone during Tunnel removal.

Since Project works do not require a closure of the entire navigation channel for more than 12 hours or the deep draft channel for more than 24 hours, Project-related residual effects on marine use are not considered significant.

5.2.5.4 Confidence and Risk

Prediction of confidence was based on the assumption that the anticipated construction activities are reasonably accurate and that the recommended mitigation measures will be implemented. With respect to mitigation measures, the confidence associated with the effectiveness of the mitigation measures is that they have been successfully implemented by the Ministry on other projects in B.C.

Low, moderate, or high confidence reflects the level of uncertainty associated with determinations of likelihood and significance. The level of confidence in the effects prediction for marine use, associated with both the significance determination and the likelihood, is high.

Given the confidence level in the effects prediction and the anticipated moderate residual effects, risk is determined to be low and risk analysis is not required (see methods **Section 3.9 Confidence and Risk**).

5.2.6 Cumulative Effects and their Significance

During construction, no temporal or spatial effects of other Projects are anticipated to overlap with the temporary effects associated with the Project. During operation, no residual effects are anticipated. An assessment of cumulative effects is not required.

5.2.7 Follow-up Strategy

Project-related effects are anticipated to be limited to those associated with marine-based construction activities. During construction, monitoring will include assessment of the implementation and effectiveness of the mitigation applied, including compliance with the Notice of Works and the MAMP. A post-construction follow-up strategy is not proposed.

5.2.8 References

British Columbia Ministry of Environment (B.C. MOE). 2006. Alive and inseparable, British Columbia's coastal environment: 2006. B.C. Ministry of Environment, Victoria, B.C. Available at: http://www.env.gov.bc.ca/soe/archive/reports/bcce06/bcce_report.pdf. Accessed May 2016.

British Columbia Ministry of Environment, Lands and Parks (B.C. MELP), and Fisheries and Oceans Canada (DFO). 1998. Review of Fraser River steelhead trout (*Oncorhynchus mykiss*). Prepared by the B.C. Ministry of Environment, Lands and Parks, and Fisheries and Oceans Canada. Available at: http://a100.gov.bc.ca/appsdata/acat/documents/r281/Anonymous1998_1062018598770_bd5e32610c5c44b4927ed0fbcf804c77.pdf. Accessed May 2016.

Det Norske Veritas (DNV). 2012. Fraser River Tanker Traffic Study. Prepared for Port Metro Vancouver. Available at: \http://www.vancouverairportfuel.ca/adminpanel/files/Fraser_River_Tanker_Traffic_Study_Full_Report%20sflb.pdf. Accessed May 2016

Environment Canada. 1994. Survey of outdoor recreation experiences in the Fraser River basin. DOE FRAP 1996–-21, Prepared by Crane Management Consultants Ltd., Prepared for the Fraser River Action Plan, Vancouver, B.C. Available at: http://research.rem.sfu.ca/downloads/frap/9621.pdf. Accessed May 2016.

Fisheries and Oceans Canada (DFO). 2012. Pacific Region Integrated Fisheries Management Plan Salmon Southern B.C. June 1, 2012 to May 31, 2013. Fisheries and Oceans Canada.

Fisheries and Oceans Canada (DFO). 2013*a*. Fraser River fisheries information. Available at http://www.pac.dfo-mpo.gc.ca/fm-gp/fraser/abor-autoc-eng.html#Lower_Fraser_River. Accessed April 2015.

Fisheries and Oceans Canada (DFO). 2013*b*. Eulachon fishery overview - Pacific Region. Available at: http://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/pelagic-pelagique/eulachon-eulakane/overview-apercu-eng.html#Commercial. Accessed April 2015.

Fisheries and Oceans Canada (DFO). 2013*c*. Pacific Region Integrated Fisheries Management Plan, Fraser River Eulachon, April 1, 2013 to March 31, 2014. Fisheries and Oceans Canada. http://www.pac.dfo-mpo.gc.ca/fm-gp/mplans/2013/eulachon-eulakane-2013-eng.pdf. Accessed April 2015.

Fisheries and Oceans Canada (DFO). 2014*a*. Fraser River fisheries archived reports - First Nations catch reports. http://www.pac.dfo-mpo.gc.ca/fm-gp/fraser/archives-a-eng.html. Accessed April 2015.

Fisheries and Oceans Canada (DFO). 2014*b*. Pacific Region Integrated Fisheries Management Plan, Salmon, Southern B.C., June 1, 2013 to May 31, 2014. Fisheries and Oceans Canada. Available http://www.dfo-mpo.gc.ca/Library/348529.pdf. Accessed May 2016.

Fisheries and Oceans Canada (DFO). 2015. Fishery Notices. Available at: http://www-ops2.pac.dfo-mpo.gc.ca/fns-sap/index-eng.cfm?pg=fishery_search&ID=all&CFID=12917193&CFTOKEN=77952413. Accessed April 2015.

Fraser River White Sturgeon Working Group. 2009. Middle (SG-2) and lower (SG-1) Fraser River sturgeon monitoring plan guide. Prepared by Robert Ahrens, Prepared for the British Columbia Conservation Federation, Vancouver, B.C.

Kiesman, R. 2013. Commercial fishing industry alive and well in Steveston. Richmond Review15 February 2013; section Community. Richmond, B.C.

Metro Vancouver (2016). Deas Slough Recreational Use Schedule Available at: http://www.metrovancouver.org/services/parks/ParksPublications/Deas_Slough_schedule.pdf. Accessed May 2016.

Port Metro Vancouver (PMV). 2014*a*. Statistics Overview - 2014. Port Metro Vancouver. Available at: http://www.portmetrovancouver.com/wp-content/uploads/2015/03/2014-statistics-overview.pdf. Accessed May 2016.

Port Metro Vancouver (PMV). 2014*b*. Notice of Dredging – Deas Slough and Ferry Road Boat Ramp.

Port Metro Vancouver (PMV). 2014*c*. Land Use Plan. Port Metro Vancouver. Avalable at:http://www.portmetrovancouver.com/wp-content/uploads/2015/06/port-metro-vancouver-land-use-plan-english.pdf. Accessed May 2016.

Port Metro Vancouver (PMV). 2015. Local channel dredging contribution program. Port Metro Vancouver. Avalable at: http://www.portmetrovancouver.com/wp-content/uploads/2015/05/2015-04-15-Local-Channel-Dredging-backgrounder.pdf. Accessed May 2016.

Richmond Chamber of Commerce, and D.E. Park and Associates Ltd. 2014. The economic importance of the lower Fraser River. Richmond Chamber of Commerce, Richmond, B.C. Available at: http://www.richmondchamber.ca/external/wcpages/wcwebcontent/webcontentpage.aspx?contentid=10641. Accessed May 2016.

Schweigert, J., C. S. Abernethy, D. Hay, M. Mcallister, J. Boldt, B. McCarter, T. W. Therriault, and H. Brekke. 2012. Recovery potential assessment of eulachon (*Thaleichthys pacificus*) in Canada. Canadian Science Advisory Secretariat, Research Document 2012/098, Fisheries and Oceans Canada, Nanaimo, B.C.

APPENDIX A

Overview of Potential Project Interactions with Marine Use

Table 1 Overview of Potential Project Interactions with Marine Use

Project Phase/ Component	Interaction Ranking	Project Works and Activities that Interact with the VC	Nature of Potential Interaction
Marine Use			
Pre-construction / Site Preparation			
Pre-construction / Site preparation	No interaction	• Surveying • Clearing and grubbing within the existing Highway 99 ROW • Installing temporary drainage structures and diversions • Conducting additional site investigations (i.e., a geotechnical drilling program) • Installing temporary roads, laydown areas, and site offices • Relocating utilities • Preloading for embankment and highway construction • Acquiring property for the Project • Restoration of Green Slough to its original location	**Nature of interaction:** No interaction anticipated. **Rationale:** Proposed activities will be land-based. If marine site investigations are required, geotechnical drilling will not require interruptions of the river mainstem.
	No effect	• N/A	N/A
	Potential effect	• Installing temporary bridges and barging facilities	**Potential Project-related effects include:** • A temporary infringement or obstruction of marine use during instream works.

Project Phase/ Component	Interaction Ranking	Project Works and Activities that Interact with the VC	Nature of Potential Interaction
Construction			
New bridge including approaches and ramp connections	No interaction	• Installing upland piers, including pile installation • Installing drainage structures/settling ponds • Ground improvements associated with new bridge piers • Constructing approach spans (concrete deck slab on steel or concrete girder) • Constructing bridge towers and installing support cables using land-based equipment • Installing retaining walls	**Nature of interaction:** No interaction anticipated. **Rationale:** Proposed activities will be land-based. Ground improvements in Green Slough will not require closure of the local navigation channel.
	No effect	• N/A	N/A
	Potential effect	• Hoisting pre-assembled deck segments from barges in the river or land-based transport system • Installing in-stream piers in Deas Slough and Green Slough, including pile installation	**Potential Project-related effects include:** • A temporary infringement or obstruction of marine use during instream works

Project Phase/ Component	Interaction Ranking	Project Works and Activities that Interact with the VC	Nature of Potential Interaction
Highway 99 improvements, including interchange upgrades	No interaction	• Replacement of interchanges at Westminster Highway, Steveston Highway and Highway 17A • Replacement of over/underpasses at Cambie Road, Shell Road, Highway 91 Westbound Ramp, Blundell Road, Ladner Trunk Road and 112th Street • Highway widening from Bridgeport in Richmond to Highway 91 in Delta including construction of embankments, placing and compacting fill for road base, establishing improved drainage and paving	**Nature of interaction:** No interaction anticipated. **Rational:** Proposed activities will be land-based.
	No effect	• N/A	N/A
	Potential effect	• N/A	N/A

Project Phase/ Component	Interaction Ranking	Project Works and Activities that Interact with the VC	Nature of Potential Interaction
Tunnel decommissioning	No interaction	• N/A	N/A
	No effect	• N/A	N/A
	Potential effect	• Removing electrical/mechanical/utilities equipment from the Tunnel • Backfilling of onshore portions of Tunnel approaches • Removing of four Tunnel segments and associated scour protection • Transporting Tunnel elements for offsite disposal, and operating support vessels for that activity	**Potential Project-related effects include:** • A temporary infringement or obstruction of marine use during instream works.
Decommissioning of Deas Slough Bridge	No interaction	• N/A	N/A
	No effect	• N/A	N/A
	Potential effect	• Removal of Deas Slough Bridge including substructures	**Potential Project-related effects include:** • A temporary infringement or obstruction of marine use during instream works.

Project Phase/ Component	Interaction Ranking	Project Works and Activities that Interact with the VC	Nature of Potential Interaction
Operation and Maintenance			
Highway 99 and interchanges	No interaction	• Operating reconfigured Highway 99 and interchanges • Highway 99 and interchange maintenance (drainage maintenance, winter maintenance, emergency maintenance, road cleaning, etc.)	**Nature of interaction:** No interaction anticipated. **Rationale:** Proposed activities will be land-based.
	No effect	• N/A	N/A
	Potential effect	• N/A	N/A
New bridge	No interaction	• Bridge maintenance (winter maintenance, emergency maintenance, structure maintenance, etc.)	**Nature of interaction:** No interaction anticipated. **Rational:** Proposed activities will be land-based.
	No effect	• N/A	N/A
	Potential effect	• Operating the new bridge	**Potential Project-related effects include:** • Changes to the navigability of the Fraser River South Arm.

"N/A" indicates that no Project works and/or activities are applicable to the category