# GEORGE MASSEY TUNNEL REPLACEMENT PROJECT

## ASSESSMENT REPORT

With Respect to
the Application by the British Columbia Ministry of Transportation and Infrastructure
for an Environmental Assessment Certificate
pursuant to the *Environmental Assessment Act,* S.B.C. 2002, c.43

Prepared by:

Environmental Assessment Office

January 19, 2017



## Preface

The Environmental Assessment Office (EAO) manages the assessment of proposed major projects in British Columbia (BC), as required by the *Environmental Assessment Act* (the Act). The process includes:

- Opportunities for the involvement of all interested parties;
- Consultation with Aboriginal Groups;
- Technical studies to identify and examine potential significant adverse effects;
- Strategies to prevent or reduce adverse effects; and
- Comprehensive reports summarizing input and findings.

At the conclusion of each Environmental Assessment (EA), EAO provides a comprehensive Assessment Report (Assessment Report/Report), and makes recommendations to the Minister of Environment and the Minister of Community Sport and Cultural Development. The Ministers may decide to certify a project, decline to certify a project, or require further assessment.

During the EA, EAO prepared a Report on the potential environmental, economic, social, heritage and health effects of the proposed George Massey Tunnel Replacement Project (Project) proposed by the British Columbia Ministry of Transportation and Infrastructure (Proponent/Ministry of Transportation and Infrastructure). The Report, comprised of discipline-specific chapters, was prepared in consultation with an advisory working group made up of federal, provincial and local government representatives with the mandates and skill sets relevant to the EA, as well as Aboriginal Group representatives from Cowichan Tribes, Halalt First Nation, Katzie First Nation, Kwantlen First Nation, Lake Cowichan First Nation, Lyackson First Nation, Musqueam Indian Band, Penelakut Tribe, Hwlitsum[1], Semiahmoo First Nation, Stz'uminus First Nation, Squamish Nation, Tsawwassen First Nation and Tsleil-Waututh Nation.

This Report considers the potential for the Project to cause significant adverse environmental, economic, social, heritage and health effects. It identifies measures to prevent or reduce adverse effects and sets out EAO's analysis and conclusions. It also documents the work undertaken by EAO to consult and accommodate Aboriginal Groups and treaty nations, in keeping with the Supreme Court of Canada's direction in *Haida v. Minister of Forests* and related case law.

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[1] This reference to the Hwlitsum is not intended to signify any change in the position that the Province may have taken in other contexts in relation to the duty to consult with this group.

This Report, along with the Aboriginal Consultation Report (Part C), provides the foundation for the Recommendations of the Executive Director to Ministers.

Information and records relating to EAs are available on the EAO website at www.eao.gov.bc.ca. Questions or comments can be directed to:

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## Acronyms Used in the Assessment Report

| | |
|---|---|
| AAQO | Ambient Air Quality Objectives |
| Act | Environmental Assessment Act |
| AIR | Application Information Requirements |
| ALR | Agricultural Land Reserve |
| BC | British Columbia |
| BMP | Best Management Practices |
| C&E | Compliance and Enforcement (Program) |
| CAC | criteria air contaminants |
| CEMP | Construction Environmental Management Plan |
| $CH_4$ | methane |
| CMP | Compliance Management Plan |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| COPC | contaminant of potential concern |
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| CPD | Certified Project Description |
| CRA fisheries | Commercial, recreational, or Aboriginal fisheries |
| dB | decibel |
| dBA | a-weighted decibel |
| DFO | Department of Fisheries and Oceans Canada |
| EA | Environmental Assessment |
| EAC | Environmental Assessment Certificate |
| EAO | Environmental Assessment Office |
| ECCC | Environment and Climate Change Canada |
| eDNA | environmental DNA |
| EMP | Environmental Management Plan |
| ePIC | EAO electronic Project Information Centre |
| ERP | Emergency Response Plan |
| ESA | Environmentally Sensitive Area |
| FLNRO | Ministry of Forests, Lands and Natural Resource Operations |
| FSC | Food, social and ceremonial |
| FTE | full-time equivalent |
| GDP | Gross Domestic Product |
| GHG | greenhouse gas |
| ha | hectare |
| HA | Highly Annoyed |
| HCA | Heritage Conservation Act |
| HHRA | Human Health Risk Assessment |
| HIA | Health Impact Assessment |
| HOV | high occupancy vehicle |
| IC | Intermediate Component |
| IR | Indian Reserve |
| km | kilometre |
| LAA | Local Assessment Area |

| | |
|---|---|
| Ldn | Adjusted day-night level |
| LFN | low frequency noise |
| LFV | Lower Fraser Valley |
| m | Metre |
| MEM | BC Ministry of Energy and Mines |
| MOTI | BC Ministry of Transportation and Infrastructure |
| $N_2O$ | nitrous oxide |
| NCD | non-classified drainages |
| $NO_2$ | nitrogen dioxide |
| NOx | nitrogen oxides |
| NPA | Navigation Protection Act |
| OCP | Official Community Plan |
| OEMP | Operation Environment Management Plan |
| OGC | Oil and Gas Commission |
| PAH | polycyclic aromatic hydrocarbons |
| PM | particulate matter |
| Proponent | British Columbia Ministry of Transportation and Infrastructure |
| PY | person years |
| RAA | Regional Assessment Area |
| RCS | Regional Context Statement |
| RGS | Regional Growth Strategy |
| RMA | Riparian Management Area |
| ROW | Right of Way |
| RTM | Regional Transportation Model |
| SARA | Species at Risk Act |
| SFPR | South Fraser Perimeter Road Project |
| $SO_2$ | sulphur dioxide |
| $SO_x$ | sulphur oxide |
| SRKW | Southern Resident Killer Whales |
| TACs | toxic air contaminants |
| TC | Transport Canada |
| TEM | Terrestrial Ecosystem Mapping |
| TLU | Traditional Land Use |
| TLUS | Traditional Land Use Studies |
| TOC | Table of Conditions |
| TOR | terms of reference |
| TSS | total suspended solids |
| TUS | Traditional Use Study |
| VC | Valued Component |
| VFPA | Vancouver Fraser Port Authority |
| VHT | Vehicle Hours Travelled |
| VKT | Vehicle Kilometres Travelled |
| VSC | Visual Sensitivity Classes |
| WSA | Water Sustainability Act |

# PART A – INTRODUCTION AND BACKGROUND

## 1 Purpose of the Assessment Report

The purpose of the Assessment Report (Report) is to summarize the procedures and findings of the EA conducted on the EA Certificate (EAC) Application (the Application) for the British Columbia Ministry of Transportation and Infrastructure's (the Proponent) proposed George Massey Tunnel Replacement Project (Project). The Proponent submitted the Application to EAO on July 27, 2016.

EAO is required to prepare the Report for provincial Ministers who are responsible for making a decision on the Project under Section 17 of the *Environmental Assessment Act*. The deciding Ministers for this Project are the Minister of Environment and the Minister of Community, Sport and Cultural Development.

This Report:

- Describes the Project, provincial EA process, and consultations undertaken during the EA;
- Documents work undertaken by EAO to consult and accommodate Aboriginal Groups in keeping with the Supreme Court of Canada's direction in *Haida v. Minister of Forests* and related case law;
- Identifies the potential environmental, economic, social, heritage and health effects of the Project and how the Proponent proposes to mitigate effects;
- Identifies the residual effects after mitigation;
- Recommends certificate conditions; and
- Sets out conclusions based on the Project's potential for significant adverse residual effects.

This Report does not replicate the content presented in the Application. The Application and supplemental information provided by the Proponent, and other information received during the EA process from Working Group members, Aboriginal Groups, and members of the public have all been considered in the preparation of this Report and are posted to EAO's electronic Project Information Centre (ePIC).

Further information describing EAO's assessment methodology, EAC documentation, and EAO's Compliance and Enforcement Program is summarized in Appendix 1.

# 2 Project Overview

## 2.1 Proponent Description

If approved, the Environmental Assessment Certificate (EAC) would be held by the Proponent/BC Ministry of Transportation and Infrastructure. The Proponent is a provincial ministry that plans transportation networks, provides transportation services and infrastructure, develops and implements transportation policies, and administers related acts and regulations in BC.

## 2.2 Project Description and Scope

### 2.2.1 Project Description and Location

The Project would be located within the Highway 99 corridor in BC's lower mainland, between the Bridgeport Road interchange in the City of Richmond (Richmond) and the Highway 91 interchange in the Corporation of Delta (Delta) (see Figure 1). The George Massey Tunnel (Tunnel) is an important link in the regional and provincial transportation system, carrying an average of 80,000 vehicles a day. It is an important route for the movement of people and goods and is a key access point for businesses in Richmond, City of Surrey (Surrey), Delta, and Tsawwassen First Nation. The Tunnel provides an essential link between the municipalities of Delta and Richmond, and connects to key gateways such as Vancouver International Airport (YVR), Peace Arch and Pacific Canada-U.S. border crossings, BC Ferries Tsawwassen terminal, Deltaport, and Boundary Bay Airport.

The Project alignment is located entirely or partially within the asserted traditional territories, and/or Treaty Nation territories of Cowichan Tribes, Halalt First Nation, Katzie First Nation, Kwantlen First Nation, Lake Cowichan First Nation, Lyackson First Nation, Musqueam Indian Band, People of the River Referrals Office, Penelakut Tribe, Hwlitsum[2], Semiahmoo First Nation, Stz'uminus First Nation, Squamish Nation, Tsawwassen First Nation, and Tsleil-Waututh Nation.

[2] This reference to the Hwlitsum is not intended to signify any change in the position that the Province may have taken in other contexts in relation to the duty to consult with this group.

The Project would involve the construction of a 10-lane bridge built to modern seismic standards, with four general travel lanes and one dedicated transit/HOV lane in each direction; replacement of three interchanges at Westminster Highway, Steveston Highway and Highway 17A; widening of approximately 24 km of Highway 99 to accommodate dedicated transit/HOV lanes from Bridgeport Road in Richmond to Highway 91 in Delta; replacement of the Deas Slough Bridge; construction of multi-use pathways on either side of the bridge for cyclists and pedestrians; and decommissioning of the Tunnel.

Once commissioned, the Project would become part of the provincial highway system. The Proponent would select a contractor to provide products and services connected with the management, planning, and delivery of construction, operation, maintenance, and rehabilitation activities associated with the Project in accordance with defined performance measures.

If an EAC is issued, and other regulatory approvals are received, construction would start in 2017 and the Project would be expected to become operational in 2022. Tunnel decommissioning would start after the new bridge is commissioned in 2022.

The location of the Project is depicted in Figure 1 below.

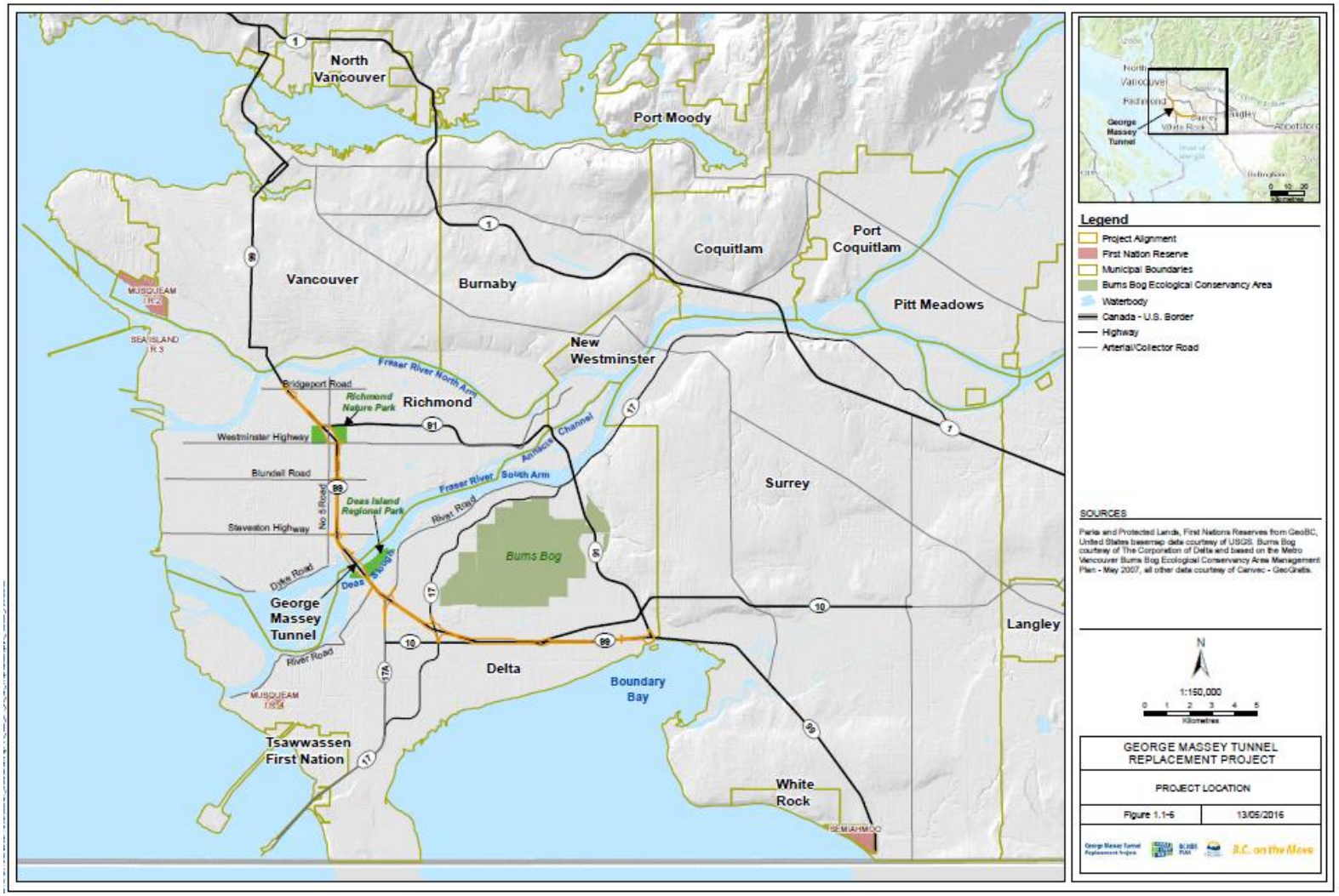


**Figure 1: Location of the Project**

### 2.2.2 Project Components

The Project would include the following components, described in further detail below:

- Highway 99 improvements and associated works;
- New bridge and approaches;
- Tunnel decommissioning; and
- Temporary construction-related activities.

*Highway 99 Improvements*

Improvements along Highway 99 from Bridgeport Road in Richmond to Highway 91 in Delta would be undertaken to support the replacement of the Tunnel with the new bridge. Proposed highway improvements would include:

- A dedicated public transit road, up to 1.5 km in length, connecting Highway 99 to Van Horne Way;
- Two new public transit/high occupancy vehicle (HOV) lanes between Bridgeport Road in Richmond and south of Highway 91 in Delta;
- Integrated transit stops on transit/HOV lanes at the Steveston Highway and Highway 17A interchanges;
- Up to four general purpose lanes and ramp connections;
- Drainage features, including by not limited to, ditches and culverts;
- Replacement of Highway 99 interchanges at Westminster Highway, Steveston Highway and Highway 17A;
- Replacement of overpasses and underpasses at road crossings, including but not limited to, Cambie Road, Shell Road, Blundell Road, Ladner Trunk Road and 112$^{th}$ Street;
- Multi-use paths at interchanges, including but not limited to, the Steveston Highway and Highway 17A interchanges, to facilitate east-west access across Highway 99, access to the multi-use pathways on the bridge, and connections to local roads and bicycle paths;
- Restoration of Green Slough; and
- Landscaping.

*New Bridge and Approaches*

A new 10-lane bridge with a clear span over the Fraser River and multi-use pathways for cyclists and pedestrians would be built to replace the existing Tunnel crossing. The bridge would also be built to accommodate potential future rapid transit. The bridge would have a length of up to 3.3 km and a navigational clearance of least 57 m, similar to the Alex Fraser Bridge. Works associated with the construction of the new bridge would include:

- Connections between the multi-use pathways on the new bridge to Steveston Highway, River Road South and the Millennium Trail;
- A southbound ramp exit for the bridge, connecting to River Road South;
- Biofiltration ponds to manage stormwater runoff from the bridge; and
- Removal of the Deas Slough Bridge.

*Tunnel Decommissioning*

The Tunnel consists of six, 104 m long segments that form an immersed tube under the Fraser River. The Tunnel was constructed by floating the segments to site where they were lowered into a dredged channel, connected together and then ballasted with a combination of concrete in the Tunnel and riprap on top of the Tunnel. The Tunnel dimensions are shown in Figure 2 below.

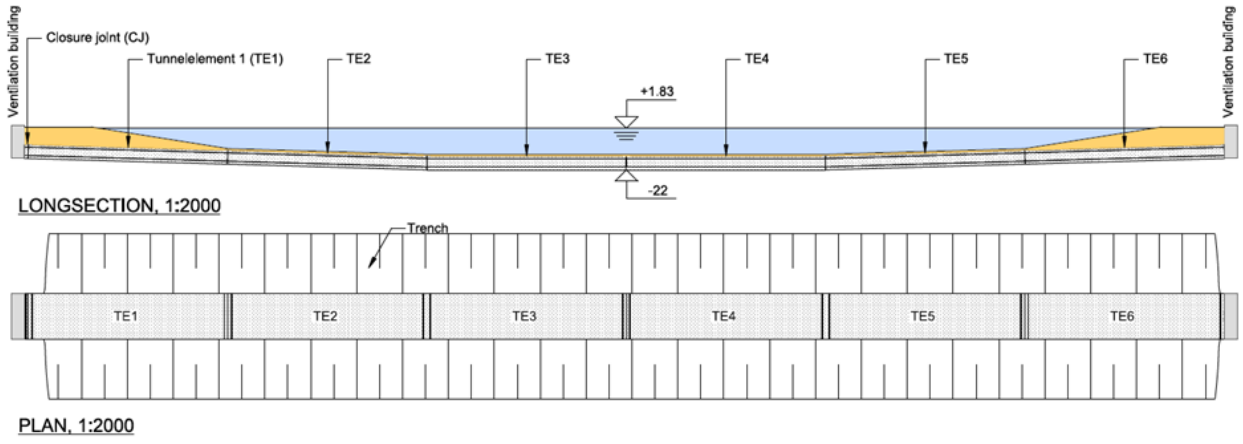


**Figure 2: Tunnel Dimensions**

Once the new bridge is open to traffic, the Tunnel would be decommissioned, and the four in-river Tunnel segments would be removed for off-site disposal. Works associated with Tunnel decommissioning would include flooding of the remaining two Tunnel

segments, backfilling of the Tunnel approaches, and removal of ventilation shafts and associated above ground enclosures.

The Reference Concept included in the Application for Tunnel decommissioning assumes that the four Tunnel elements would be removed over the course of one construction season (i.e., between freshets) and during the least risk window for fish. Project-related marine activity during Tunnel decommissioning is expected to last approximately 4 months, with installation of the bridge deck expected to be undertaken over 20 weeks.

According to the Proponent, the segments would be removed to eliminate future risk of damage to the new bridge and impact to shipping associated with significant seismic activity, to meet the Proponent's best practice regarding management of obsolete infrastructure and to provide opportunities to restore the Fraser River habitat.

EAO acknowledges concerns raised by the public and some Aboriginal Groups during the EA that the Tunnel was being removed in order to facilitate deeper, capital dredging of the south arm of the Fraser River to accommodate larger marine vessels. EAO and the Proponent have not been made aware of such plans during the EA and consequently these potential, future activities have not been included within the scope of the assessment. This is discussed further in Section 5.3.3 of this Report.

*Temporary Works*

The Project would include the following construction-related temporary infrastructure and facilities:

- Access roads and detours;
- Lighting to facilitate construction;
- Barging facilities;
- Temporary bridges across Deas Slough, at some or all of Highway 99 interchanges and overpasses within the Project area;
- Laydown areas; and
- Other ancillary components and activities.

Temporary or permanent worker accommodation is not being proposed; construction and operations personnel are expected to reside in their own homes or use existing rental housing.

### 2.2.3 Tolling

The Proponent intends to finance the Project's capital, operating, maintenance and rehabilitation costs through user tolls. Provincial tolling guidelines guide tolling of bridges operated by the provincial government. Tolling is also expected to help manage future traffic growth, which is assessed in section 5.4 of this Report.

Key elements of the proposed tolling framework for the Project include:

- A point toll at the bridge, consistent with common practice of locating toll collection at the most expensive part of a highway corridor, such as a bridge;
- A toll rate for four classes of vehicles; and
- A fully electronic free-flow collection system.

The proposed tolling system would be consistent with the system that is used at the Port Mann and Golden Ears Bridges and would be interoperable with these and other facilities.

EAO is aware that there continues to be discussion regarding funding future transportation initiatives in greater Vancouver and that a number of road pricing options have been suggested, including that all bridges in the region should be tolled. EAO anticipates that discussions regarding regional tolling will continue in the future and that any changes to the Provincial Tolling Guidelines may affect additional crossings, which the Proponent would consider in advance of the new bridge opening, if certified. The Proponent has indicated that proceeding with tolling as currently proposed would not preclude the ability to consider other options, such as a longer term regional funding strategy in the future.

### 2.2.3 Project Activities

*Construction*

The Proponent anticipates that construction would be completed in approximately five years. The construction activities would include:

- Site preparation (surveying, geotechnical investigations; clearing and grubbing, installation of temporary drainage structures; erosion and sediment control measures; establishment of staging and laydown areas);
- Temporary works (establishment of access roads and detours; installation of temporary lighting, temporary barging facilities, and temporary bridges);
- Ground improvements (pre-loading; densification);

- Highway widening and paving (embankment construction; road base preparation; paving and line painting; installation of sign bases, signs, and lighting);
- Interchange and overpass/underpass construction (ground improvements; installation of foundations, construction of concrete pile caps and piers, installation of girders, construction of concrete deck; removal of existing infrastructure);
- Construction of the new bridge (approaches; river crossing); and
- Decommissioning of the Tunnel after the new bridge and upgraded highway become operational.

*Operations and Ongoing Maintenance*

The new bridge and upgraded highway would become operational once all upgrades and construction of the new infrastructure are complete. Once operational, the new bridge and upgraded highway would become an integral part of the existing major transportation network of the Lower Mainland.

Operational activities would include:

- Routine operations, maintenance, and rehabilitation of the Highway;
- Bridge/structure maintenance and rehabilitation;
- Roadside maintenance, including signage;
- Drainage, emergency and traffic maintenance;
- Line marking;
- Electrical asset maintenance;
- Culvert replacement;
- Slope stabilization; and
- Interface with stakeholders, communities, the public, emergency services, and the Province.

Services associated with ongoing operation and maintenance activities would be provided in accordance with defined performance measures, in a manner consistent with the Proponent's *Environmental Best Practices for Highway Maintenance Activities* (Ministry of Transportation and Infrastructure 2010). Regular highway inspections would be scheduled to ensure that maintenance issues are identified and addressed on a continuing and consistent basis.

*Decommissioning and Abandonment*

The Project would become an integral part of a major transportation network and is not expected to be dismantled or abandoned in the foreseeable future.

## 2.3 Project Setting

The Project would cross provincial Crown land and would be adjacent to private land and the boundaries of Delta, Metro Vancouver and Richmond. The Project would also overlap with the asserted traditional territories of Aboriginal Groups, as discussed in Part C of this Report.

The Project would not cross any provincial or federal parks or protected areas; however, the Project would run adjacent to Metro Vancouver's Deas Island Regional Park, where the south entrance of the Tunnel is located. The Project alignment also crosses trails on Deas Island, as well as the Millennium Trail in Delta. In Richmond, the Project alignment overlaps with the Gardens Agricultural Park. There are also several parks within the Local Assessment Area (LAA) in both Richmond and Delta.

The majority of the Project alignment crosses Crown land and would be within the existing Highway 99 corridor. Most of the land adjacent to the Project is private land, and includes land designated for agricultural, industrial, institutional, mixed commercial and residential, and park uses, and the nearby Vancouver Landfill in Delta. The potential adverse effects of the Project on existing agricultural and land uses are assessed in sections 5.1 and 5.2 of this Report, respectively.

## 2.4 Alternative Means of Undertaking the Project

Section 1.4.2 of the Application provides information on alternatives for the Tunnel replacement, evaluation of the alternatives, and identification of the preferred alternative.

The following five alternatives were evaluated:

- Maintain existing Tunnel;
- Replace existing Tunnel with new bridge;
- Replace existing Tunnel with new Tunnel;
- Maintain existing Tunnel and build new crossing along existing Highway 99 Corridor; and
- Maintain existing Tunnel and build new crossing in a new corridor.

The evaluation of alternatives was conducted using a multiple accounts evaluation framework that included specific criteria, grouped under six categories as below[3]:

- Efficient transportation for all users – traffic congestion; transit capability; travel time reliability; and pedestrian and cycling accessibility;
- Safety – incident response capability; earthquake protection; and traffic safety;
- Agriculture – agricultural land effects; and access to/from agricultural areas;
- Environment – local and regional air quality, wildlife and terrestrial habitat, and marine life and habitat;
- Jobs and the economy – access to gateways and trade corridors, access to business and industrial land, and marine access for goods movement; and
- Social and community considerations – community access (including across the highway within communities); private property effects; noise effects; and visual effects.

The Application reported that the preferred alternative of replacing the Tunnel with a new bridge would have the greatest ability to improve access across the highway between communities, pedestrian and cyclist accessibility and connectivity between agricultural areas on either side of the corridor. It also would involve the least amount of in-river disturbance, and have the greatest positive influence on local air quality.

### 2.4.1 Key Concerns Raised Related to Project Alternatives

During the EA, several concerns were raised by members of the public and several Working Group members with regards to the Project alternatives assessed.

***8-lanes versus 10-lanes***

Concerns were raised by members of the public, Richmond and Metro Vancouver regarding the number of lanes proposed and why a 10-lane bridge was selected instead of an 8-lane bridge.

While daily traffic volumes would be reduced by tolling, the Proponent noted that the Port Mann Bridge tolling experience demonstrated that there is less impact on traffic volumes during busier times of the day. Detailed analysis of traffic patterns by time of day, combined with an analysis of operational and safety requirements, determined that

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[3] http://engage.gov.bc.ca/masseytunnel/files/2015/06/GMT-2014-March_Evaluation-of-Crossing-Scenarios.pdf

the 10-lane bridge (8-lanes plus two transit/HOV lanes) would still be needed even with a tolled bridge and that, with an 8-lane bridge, there would still be peak hour congestion on opening day. Comparatively, the 10-lane bridge would eliminate congestion on opening day and accommodate projected regional growth. In addition, the Proponent also stated that the 10-lane bridge has operational advantages over an 8-lane alternative for merging traffic coming from the Steveston and Highway 17A interchanges, resulting in greater traffic safety benefits.

***Cost of the Project and Project outcomes***

Members of the public, Richmond, Metro Vancouver, Musqueam Indian Band and Tsleil-Waututh Nation questioned the rationale for the Project, including the cost of the Project relative to other alternative Project or replacement scenarios, and whether the estimated benefits associated with reducing traffic congestion would be realized. Some members of the public suggested that investing more into rapid public transit would solve existing traffic congestion issues, as well as improve air quality and human health. Likewise, Richmond and Delta expressed interest in a future rapid transit/light rail option in the bridge and highway design.

The Proponent responded that the Project has been designed to support a range of transportation, land use and economic development objectives identified in a range of regional and local land use and transportation plans. The Proponent indicated that the Province has a mandate and responsibility to keep this highway operating efficiently for all vehicles, including goods movers, tourists and travellers from beyond the region. This mandate supports and also extends beyond regional land use and transportation objectives.

The Proponent noted that the new bridge would help promote transit, carpooling, cycling and walking, while also serving the commercial and general passenger vehicle demand that planned regional growth will generate. Tolling the new bridge would also help to support the Metro Vancouver Regional Growth Strategy's vision of compact communities, shorter travel distances and less car traffic. Transit improvements, including the extension of transit median lanes between Bridgeport Road in Richmond and Highway 91 in Delta, a dedicated transit-only ramp at Bridgeport Road and transit exchanges at the Steveston Highway and Highway 17A interchanges, would make taking transit more reliable and convenient.

The Proponent indicated that it has worked with TransLink and local municipalities, including Richmond, Delta and Metro Vancouver, to identify the improvements that could be incorporated into the Project to provide needed capacity improvements while

also further encouraging alternatives to single occupancy vehicles on this corridor. The Proponent also recognizes that this route is the busiest transit route of all the Fraser River road crossings (carrying more than 10,000 transit users daily), and indicated that this has been reflected in the proposed transit improvements that have been incorporated in the Project scope. The new bridge would be built to also accommodate potential future rapid transit.

## 2.5 Project Benefits and Purpose

### 2.5.1 Project Purpose

The purpose of the Project would be to address substantial traffic congestion and safety challenges along the Highway 99 corridor that affect the efficient movement of people and goods within the region.

Since the Tunnel opened in 1959, greater Vancouver's population and economy have grown, and its population is forecast to continue to increase by more than one million people over the next 30 years. Without improvement to the current crossing, the Application states that economic growth and regional liveability will be constrained by congestion and increasing travel times for commuters, goods movers, commercial and other traffic.

### 2.5.2 Economic Benefits of the Project

*Economic Benefits from Project Construction*

This section summarizes the estimated Project benefits during construction and operations, as reported in the Proponent's Application.

According to the Application, the overall capital construction cost of the Project is estimated at $3.5 billion in as-spent dollars. The amount spent each year during the five-year construction period is anticipated to range between 10% and 30% of the estimated total as-spent dollars, ramping up from year one, with the peak occurring in years two and three and the remainder diminishing through to the completion of construction and commencement of operations.

**Estimated Employment:** The Application notes that, during construction, the Project would create an estimated 9,000 direct construction jobs, plus over 8,000 indirect jobs through the businesses that support and supply the direct construction activities. These numbers would translate to approximately 11,000 direct full-time-equivalent positions (FTEs), plus 8,500 indirect FTEs. The majority of construction jobs would be filled from

within BC, as has been the case with other Lower Mainland transportation projects in recent years, according to the Application.

**Estimated Tax Revenues:** The Application notes that during construction, the Project is expected to generate an estimated $518 million in tax revenues, with $162 million accruing to the federal government, $135 million to the provincial government, and $4 million to local governments.

*Economic Benefits from Project Operations*

**Estimated Employment:** The Application notes that, during operations (road and bridge maintenance, tolling, administration), the Project would be expected to generate 60 to 90 permanent, primarily full-time, direct jobs. Indirect employment during operations would be estimated at an additional 60 to 70 permanent jobs. Wage rates would be in the range of $25 to $38 hourly, or $45,000 to $65,000 in 2011 dollars (prior to cost of living adjustments). The majority of operational jobs would be filled locally, or from within BC.

**Estimated Tax Revenues:** The Application estimates that the annual tax revenues from operating expenditures would be $4.0 million per year, with $2.2 million accruing to the federal government, $1.6 million to the provincial government, and $0.3 million to local governments.

**Long-term Economic Development Benefits:** According to the Application, the Project is forecast to increase the rate of regional gross domestic product (GDP) growth by about $13 million per year starting in 2021. By 2045, the increased rate of growth would be expected to result in incremental GDP growth of $325 million per year, and incremental employment (direct, indirect and induced) of approximately 4,500 to 5,000 permanent jobs. The present value of this incremental GDP growth is estimated at $1.65 billion.

### 2.5.3 Community and Social Benefits of the Project

The Project is proposed to address current challenges associated with traffic congestion along the Highway 99 corridor, while providing better connectivity and more options for travel modes, and according to the Application is expected to have the following community and social benefits:

- Travel time and reliability improvements for all users – the Application estimates that the average commuter would experience 25-35 minutes daily savings in commute time;

- Improvements in local air quality;
- Reductions in vehicle collisions and safety risk, with an estimated decrease in crash frequencies of 35% as stated in the Application;
- Improvements in access and mobility for local agricultural operations; and
- Improvements in access to transit, carpooling, and active modes of transportation.

In addition to addressing traffic challenges along the Highway 99 corridor, the Project would provide an opportunity to enhance environmental values that have been affected by previous development, including restoration of Green Slough to its historic alignment and enhancement to habitat in Deas Slough.

## 2.6 Applicable Permits

In addition to the provincial EA approval, the Project would need various permits and authorizations from federal and provincial governments. Key permits and authorizations that would be needed are listed in Table 1 below.

**Table 1: Key Permits and Authorizations**

| Name of Authorization | Statute and Authorizing Agency | Description of Need for Authorization |
|---|---|---|
| **Provincial** | | |
| *Agricultural Land Commission Act,* S.B.C. 2002, c. 36<br>Agricultural Land Reserve Use, Subdivision and Procedure Regulation, B.C. Reg. 171/2002<br>Section 6, Permission for non-agricultural use | Agricultural Land Commission (ALC) | New bridge and related highway corridor widening for new areas located within the Agricultural Land Reserve (ALR) |
| *Heritage Conservation Act*, R.S.B.C. 1996, c. 187, s. 12 and s.14<br>Heritage Inspection Permit, Heritage Investigation Permit, or Site Alteration Permit | Ministry of Forests, Lands and Natural Resource Operations (FLNRO), Archaeology Branch | Heritage inspection, investigation, or site alteration of lands in the Project alignment |
| *Land Act*, R.S.B.C. 1996, c. 245 | FLNRO | Tunnel decommissioning and construction of Project components on provincial Crown land |
| *Water Sustainability Act,* S.B.C. 2014, c. 15, Section 11<br>Water Sustainability Regulation, B.C. Reg. 36/2016, Parts 2 and 3<br>Change Approval (under Part 2 of the Regulation) or Notification (under Part 3 of the Regulation) for changes in and about a stream | FLNRO | Activities in and about watercourses, including construction of the new bridge and approaches, and Tunnel decommissioning |

| Name of Authorization | Statute and Authorizing Agency | Description of Need for Authorization |
|---|---|---|
| *Wildlife Act,* R.S.B.C. 1996, c. 488<br>General Permit for wildlife relocation or salvage | FLNRO | Relocation or salvage of wildlife within the Project alignment as required during Project construction |
| **Federal** | | |
| *Aeronautics Act*, R.S.C. 1985, c. A-2<br>Approval for construction of works in or near Canadian aerodromes | Transport Canada (TC) | Construction of the new bridge |
| *Canada Marine Act*, S.C. 1998, c. 10<br>VFPA Project Permit | Vancouver Fraser Port Authority (VFPA) Planning and Development Department | Decommissioning of the Tunnel and construction of Project components within VFPA navigational jurisdiction |
| *Fisheries Act*, R.S.C. 1985, c. F-14<br>S. 35(2)(b) Authorization | Department of Fisheries and Ocean Canada (DFO) | Tunnel decommissioning and other Project-related activities within the Fraser River |
| *Navigation Protection Act*, S.C. 2014<br>Permit or Approval | TC | Tunnel decommissioning, bridge clearance, and other Project-related activities within the Fraser River |
| *Species at Risk Act,* S.C. 2002, c. 29<br>Permit or Agreement | Environment and Climate Change Canada (ECCC) | Relocation or salvage of listed wildlife as needed during Project construction |

# 3 Assessment Process

## 3.1 Overview and Scope of the Environmental Assessment

EAO determined that the Project was reviewable pursuant to Parts 5 and 8 of the Reviewable Projects Regulation because the Project would involve:

- Dismantling or abandonment of an existing shoreline modification facility that, if it were a new facility, would entail dredging, filling, or other direct physical disturbance of equal to or greater than two hectares (ha) of foreshore or submerged land, or a combination of foreshore and submerged land, below the natural boundary of an estuary; and
- Modification of an existing public highway that results in the addition of equal to or greater than 2 lanes of paved public highway to an existing paved public highway over a continuous distance of equal to or greater than 20 km.

A federal EA was not required for the Project, as it is not considered a Designated Project under the *Canadian Environmental Assessment Act, 2012 (CEAA 2012)* .

## 3.2 Major Milestones of the BC Environmental Assessment

**December 16, 2015:**
EAO issued an Order under Section 10 of the Act to start the provincial EA.
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=5

**January 7, 2016:**
EAO issued an Order under Section 11 of the Act, specifically ordering the means by which public consultation with respect to the Project Description and Key Areas of Study document be conducted.
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=9

**January 15, 2016:**
EAO initiated a 31-day public comment period on the Project Description and Key Areas of Study (Project Description/Valued Components) document.
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=11
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=7

**March 7, 2016:**
EAO issued an Order under Section 11 of the Act, which set the scope, procedures and methods of the EA.
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=16

**May 24, 2016:**
EAO issued the final Application Information Requirements (AIR) to the Proponent.
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=22

**May 30, 2016:**
The Proponent submitted an Application for an EAC for the Project. EAO evaluated the Application against the AIR, and determined that the Application met the AIR on July 25, 2016 (see below).
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=28

**July 25, 2016:**
EAO issued an Order under Section 24(4) of the Act, at the request of the Proponent, which provided a time limit extension to the Application evaluation period to allow the Proponent additional time to address comments from EAO and Working Group members.
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=27

**July 27, 2016:**
The Proponent submitted the copies of the Application and the 180-day Application Review period began.
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=36

**August 3, 2016:**
EAO initiated a 61-day comment period on the Application.
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=35

**January 19, 2017:**
EAO referred the Project to provincial Ministers for decision.

## 3.3 Role of the Advisory Working Group

EAO established a Working Group for the Project, which was made up of provincial, federal and local government agency staff with the mandates and skill sets relevant to the review of the Project, as well as representatives of potentially-affected Aboriginal Groups as set out in the Section 11 Order issued for the EA for the Project. See Appendix 2 for a list of Working Group members.

EAO sought and considered advice from the Working Group in order to understand and assess the potential adverse effects associated with the Project. Working Group members were responsible for providing advice to EAO on:

- Key EA documents including, but not limited to, the Project Description and Key Areas of Study document, Application Information Requirements (AIR), Application, supplemental technical memos and plans submitted by the Proponent as requested by the Working Group[4], and EAO's Assessment Report;
- Government policy direction and/or gaps that could affect the conduct of the EA;
- Potential conflicts with the legislation and/or regulations of their organizations;
- EA information requirements as compared with permitting design and information requirements; and

[4] Proponent's submissions including the application, addenda, technical memos and plans are available here: https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=30

- Technical issues that were raised by the public during the public consultation process.

EAO reviewed the adequacy of the Proponent's responses to all comments received from Working Group members during the review of the draft AIR and the Application[5], and held various meetings with Working Group members to discuss outstanding issues and concerns. EAO considered all comments and issues raised during the EA in development of its Assessment Report.

## 3.4 Aboriginal Groups Consultation

On March 7, 2016, EAO issued a Section 11 Order which specified the consultation activities that both EAO and the Proponent would undertake with all Aboriginal Groups potentially affected by the Project.

At the initial stages of the EA for the Project, EAO conducted a preliminary strength of claim assessment to determine whether an Aboriginal Group would be included in Schedule B or C:

Aboriginal Groups in Schedule B of the Order were consulted at the deeper end of the consultation spectrum, and provided the following opportunities:

- Participation in the Working Group;
- Participation in meetings to identify and discuss the exercise of proven and asserted Aboriginal rights and title (Aboriginal Interests) that may be affected by the Project and potential measures to avoid, mitigate, address or otherwise accommodate impacts;
- Review and comment on key documents, including the draft AIR, the Proponent's Application, EAO's draft proposed conditions and Assessment Report, including Aboriginal Consultation Report;
- Submission of a document outlining the Aboriginal Group's views on the Assessment Report to be included in the package of materials sent to Ministers when the Project is referred for decision;

[5] The Working Group Comment Tracking Table on the draft AIR is available here: https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=23.
The Working Group Comment Tracking Table from Application Review is available here: https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=68.

- Notification of key milestones – such as the issuance of the AIR, acceptance of the Application for review, timing of public comment periods (including open houses) – when the final Assessment Report is referred to Ministers and the resulting decision; and
- Invitation to meet with EAO to discuss any Aboriginal Interests in the Project area.

Aboriginal Groups on Schedule B of the Section 11 Order were:

- Cowichan Tribes;
- Halalt First Nation;
- Katzie First Nation;
- Kwantlen First Nation;
- Lake Cowichan First Nation;
- Lyackson First Nation;
- Musqueam Indian Band;
- Penelakut Tribe;
- Hwlitsum[6];
- Semiahmoo First Nation;
- Stz'uminus First Nation;
- Squamish Nation;
- Tsawwassen First Nation; and
- Tsleil-Waututh Nation.

Aboriginal Groups on Schedule C of the Section 11 Order were:

- People of the River Referrals Office.

People of the River Referral's Office was provided the following opportunities:

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[6] This reference to the Hwlitsum is not intended to signify any change in the position that the Province may have taken in other contexts in relation to the duty to consult with this group.

- Notification of key milestones – such as the issuance of the AIR, acceptance of the Application for review, timing of public comment periods (including open houses) – when the final Assessment Report is referred to Ministers and the resulting decision;
- Invitation to meet with EAO to discuss any Aboriginal Interests in the Project area; and
- Invitation to review and comment on the Proponent's Application, EAO's draft Assessment Report, including the Aboriginal Consultation Report, and proposed conditions.

Further detail regarding consultation with Aboriginal Groups is provided in Part C of this Report.

## 3.5 Local Government Consultation

The following local governments were invited to participate in EAO's Working Group: Richmond, Delta, Metro Vancouver, and Tsawwassen First Nation. Consultation with Tsawwassen First Nation is discussed in Part C of this Report. Prior to entering the EA, the Proponent met with and engaged local governments to share Project information and to seek input on various aspects of the Project. During the EA, the Proponent and EAO regularly met with local governments.

*City of Richmond*

Richmond participated in the Working Group and provided technical review of comments and supplemental information, and participated in Working Group meetings. EAO met with Richmond staff on multiple occasions to discuss Richmond's outstanding concerns with the Project, in addition to discussing potential mitigations measures and conditions, and requests for information.

Key concerns outlined by Richmond throughout the EA process include but are not limited to:

- Traffic, including: potential impacts to local road systems; potential increased congestion at the Oak Street Bridge; view that the rationale for a 10-lane bridge versus 8-lane bridge is not sufficient; and concerns regarding traffic modelling including some of the Proponent's assumptions in modelling, such as assumptions about future mode shift;

- Drainage concerns, including runoff from the new bridge;
- Potential adverse effects to agriculture and land use;
- Compatibility with provincial, regional and local land use plans;
- Potential effects to the Richmond Nature Park and Gardens Agricultural Park, including potential operations noise effects to a planned childcare facility;
- Project design and potential visual effects, particularly related to the new Steveston interchange;
- Potential future dredging of the Fraser River;
- Seismic risk of the proposed bridge;
- Potential increased noise and decreased air quality as a result of the Project in nearby residential areas; and
- Interest in seeing a net gain in habitat values associated with ditches within the existing right-of-way, that are expected to be relocated as part of the Project.

In response to concerns communicated by Richmond, EAO requested the Proponent provide the following:

- A memo outlining anticipated future traffic conditions on local roads in Richmond once the Project becomes operational. The memo was provided on October 17, 2016, and outlines traffic analysis specifically of Steveston Highway and No. 5 Road[7];
- A memo outlining the Proponent's rationale for the selection of the proposed alignment along the Highway 99 corridor, as it pertains to agricultural properties within the ALR, in Richmond. The memo was provided on October 26, 2016[8]; and
- A visual rendering for the Gardens Agricultural Park.

*Corporation of Delta*

Delta participated in the Working Group and provided technical review of comments and participated in Working Group meetings. During the EA, Delta noted the importance of the Highway 99 corridor for the movement of people and goods, and expressed its

[7] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=50
[8] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=51

support for reducing traffic congestion for Delta commuters. Delta expressed its support for adding more lanes and its interest in future rapid transit and light rail, which it believes have been accommodated in the Project design. Delta noted that the Project would create opportunities for pedestrians and cyclists which currently do not exist. During the EA, Delta provided comments related to public transportation and transit, as well as potential effects on agricultural use, including the potential influence of Tunnel removal on the Fraser River salt wedge and salinity at the Fraser River and the 80th Street Pump Station.

*Metro Vancouver*

Metro Vancouver participated in the Working Group and provided technical review of comments and supplemental information, and participated in Working Group meetings. EAO met with Metro Vancouver staff several times during the EA to discuss the Project.

On June 29, 2016, during Application evaluation, Metro Vancouver published a media release, which noted its concern regarding potential impacts to regional assets, infrastructure and legislative responsibilities. Key areas of concern identified in an attached June 24, 2016, report included:

- Insufficient consideration of alternatives to a 10-lane bridge;
- Lack of integration into the regional growth strategy and transportation network;
- Ecological disruption to the Fraser River estuary, an important habitat for salmon and birds;
- Impacts on Metro Vancouver infrastructure, including water mains and sewer lines;
- Disruption of recreational activities within Deas Island Regional Park and ecological conditions adjacent to the Park;
- Downloading of major expenditures onto local governments for road improvements;
- Negative effects on transit ridership and affordability;
- Insufficient consideration of climate change and air quality;
- Lack of transparency and consultation with respect to design and business case; and
- Interest in a federal EA for the Project.

Metro Vancouver provided this report to EAO formally on July 7, 2016. EAO responded on August 3, 2016, to note that several of these previously communicated concerns had helped inform the development of the AIR, in particular, those related to traffic, regional park lands, and utilities infrastructure. On October 19, 2016, Metro Vancouver parks staff provided EAO and the Proponent with a tour of Deas Island Regional Park, to better understand their comments regarding the Project, as well as concerns about potential adverse effects related to recreational park use, ecological values, and cumulative effects associated with the BC Hydro Transmission Line Relocation Project.

On October 19, 2016, EAO participated in a meeting with local governments, including Metro Vancouver, related to traffic. On November 15, 2016, the Proponent provided a follow up memo that described: the Project approach to traffic modelling; consideration of additional modelling scenarios; traffic considerations outside of the LAA; and operational phase monitoring.

EAO acknowledges the Proponent's ongoing engagement with local governments and considered the comments and concerns raised by municipalities during the EA in requesting supplemental information from the Proponent and in developing proposed EAC conditions.

## 3.6 Public Consultation

Public consultation requirements are set out in the Section 11 Order, and are intended to provide multiple opportunities for the public to provide input. Shortly after the issuance of the Section 11 Order, the Proponent was required to prepare a Public Consultation Plan. The plan described the Proponent's consultation objectives and activities. Through the course of the EA, the Proponent submitted two Public Consultation Reports to EAO. The first Public Consultation Report was submitted in May 2016, during the pre-Application stage, and the second was submitted in November 2016, near the end of Application Review. The Public Consultation Plan and Public Consultation Reports are posted on EAO's ePIC website.[9]

### 3.6.1 Summary of Proponent Activities

Beginning in 2012, prior to entering the EA process, the Proponent undertook two phases of public consultation to understand the need for the Tunnel replacement

[9] Pre-Application Public Consultation Report are available at: https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=6, and the Application Review Public Consultation Report is available at: https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=58 .

and to explore different options. At the beginning of the pre-Application stage, the Proponent undertook a third phase of consultation to review its Project Definition Report[10], a document that presents the Proponent's vision, rationale and plan for the Project. The following summarizes these three phases:

- Phase 1: Understanding the need (November to December 2012) – gathered input to better understand travel demand, operating conditions and design considerations. Approximately 1,150 people participated.
- Phase 2: Exploring options (March to April 2013) – gathered input on five potential tunnel replacement scenarios and criteria to evaluate these scenarios. Approximately 1,000 people participated.
- Phase 3: Project Definition Report (December 2015 to January 2016) – gathered feedback on the Project scope and business case.

Summary reports for each of these three phases can be found on the Proponent's Project website.[11]

The following public consultation activities were carried out by the Proponent during the EA process:

- Hosted five public open houses;
- Presented to business and community organization groups, which included more than 100 presentations;
- Meetings, phone calls and emails with key stakeholder groups, including municipal, provincial and federal elected official and government staff, Aboriginal Groups, and stakeholders, including agricultural organizations, business organizations, commercial and recreational marine users, community and resident groups, recreational groups and first responders;
- Established a Project office in Richmond, where information display boards, access to the Project website, fly-through animation of the Project corridor, and 3D models of the Project are made available for the public. At time of writing, over 5,000 people had visited the office;

[10] https://engage.gov.bc.ca/masseytunnel/files/2015/12/GMT-Project-Definition-Report-Dec-2015.pdf
[11] www.masseytunnel.ca

- Advertised key updates, event information sessions, procurement opportunities, and other relevant information in multiple local newspapers, and in several languages; and
- Launched a Project website (www.masseytunnel.ca) in November 2012.

Through public engagement during the course of the EA, EAO has been satisfied with the Proponent's understanding and responsiveness to public interests.

### 3.6.2 Summary of EAO Activities

EAO hosted the following two public comment periods and five open houses over the span of the EA:

- The 31-day public comment period on the Project Description and Key Areas of Study document was held from January 15 to February 15, 2016, and 450 public comment submissions were made. Two public open houses were held: one in Richmond on January 26, 2016, and the other in Delta on January 27, 2016. Approximately 750 people attended.
- The 61-day public comment period on the Proponent's Application was held from August 3 to October 3, 2016, and approximately 120 public comment submissions were made. Three public open houses were held: two in Delta (on August 17 and September 13, 2016), and one in Richmond on September 12, 2016. Approximately 500 people attended.

The key issues raised by the public through the submitted public comments included the following:

- **Traffic and tolling**– Concerns that the Project would result in increased traffic and congestion at other locations, such as the Oak Street Bridge and the Alex Fraser Bridge. Concerns about the price of the tolls, as well as the potential to increase traffic congestion at other locations to avoid the toll on the new bridge;
- **Public transit, cycling and pedestrian routes** – Requests that the Project include a light rail line to improve public transit. Concerns that the Project should focus more on HOV lanes, cycling and pedestrian lanes rather than driving lanes;
- **Potential future dredging and industrialization of the Fraser River** – Concerns that the removal of the Tunnel would allow a deepening of the channel to accommodate further industrialization of the Fraser River;
- **Rationale for the Project** – Concerns about the rationale for the Project, specifically why a 10-lane bridge is needed over other alternatives, such as

upgrading the existing Tunnel or investing more funds into increasing rapid transit;

- **Air Quality and climate change –** Concerns about emissions that would result from increased car use due to the Project and potential effects on regional air quality, as well as greenhouse gasses (GHGs) and climate change.
- **Agriculture –** Concerns about the potential effects of the Project to farmland in Delta and Richmond, and removal of land from the ALR.
- **Fish and fish habitat** – Concerns about the potential effects of the Tunnel removal on fish and fish habitat in the Fraser River;
- **Seismic concerns** – Concerns about the structural design and integrity of the bridge, especially in the case of a large earthquake;
- **Public Consultation** – Concerns that the public consultation for this Project has not been adequate, and that the EA did not include an assessment of other alternatives to the Project; and
- **EA Process** – Comments and questions regarding the rigour of the EA process, such as technical review, neutrality of EAO and transparency, and requests that a federal environmental review be conducted.

Many issues were raised by the public through the submitted public comments during the pre-Application and Application Review stages. These comments and the Proponent's responses were considered by EAO and are discussed further in the relevant sections of this Report. Key issues raised by the public helped inform EAO's assessment of the Project, including requests for supplemental information during the EA, the completion of EAO's Assessment Report and the development of EAO's proposed EAC conditions.

Public comments from both public comment periods and the Proponent's responses are posted on the EAO's ePIC website[12].

[12] Public comments on the Project Description and Key Areas of Study document and the Proponent's responses are available at: https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=20. Public comments on the Application and the Proponent's responses are available at: https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=59.

## 3.7 Information Requests during Application Review

During the Application Review phase, EAO requested additional reference materials and supplemental information from the Proponent to support the EA of the Project. EAO's requests for additional information were primarily driven by concerns raised and requests submitted by the public, Working Group and Aboriginal Groups.

Key information that was provided to EAO by the Proponent during Application Review included, but is not limited to:

- George Massey Tunnel Replacement Project Land Use Study, June 2016;
- George Massey Tunnel Replacement Project Hydrogeology Study, May 2015;
- George Massey Tunnel Replacement Project River Hydraulics Video;
- Memo: Rationale for Right-of-Way Widening Location in Richmond;
- Memo: Steveston Highway/No. 5 Road Intersection Traffic Analysis;
- Response to Information Request Regarding the Traffic Assessment for the George Massey Tunnel Replacement Project;
- Construction Emissions Memo;
- Terrestrial Wildlife Memo;
- Marine Access Management Plan Outline; and
- Marine Users Group draft Terms of Reference.

Project-related information was made available to the public on EAO's ePIC, at https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/detail.

# PART B – ASSESSMENT OF POTENTIAL ADVERSE EFFECTS

In conducting this EA, EAO considered the potential adverse environmental, economic, social, heritage and health effects, including cumulative effects, of the Project. EAs in BC use valued components (VCs) and intermediate components (ICs) as an organizing framework for the assessment of the potential effects for proposed projects. VCs are components of the natural and human environment that are considered by the Proponent, Aboriginal Groups, public, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance. EAO's Assessment Report for the Project is organized around the following VCs and ICs assessed in the Application.

| | |
|---|---|
| **Environmental Effects**<br>• Air quality (section 4.1)<br>• River hydrology and morphology (4.2)<br>• Sediment and water quality (4.2)<br>• Fish and fish habitat (4.3)<br>• Marine mammals (4.3)<br>• Underwater noise (4.3)<br>• At-risk amphibians (4.4)<br>• Terrestrial wildlife (4.4)<br>• Vegetation (4.5) | **Socio-Economic Effects**<br>• Agricultural use (5.1)<br>• Land use (5.2)<br>• Visual quality (5.2)<br>• Marine use (5.3)<br>• Traffic (5.4)<br>**Heritage Effects**<br>• Heritage resources (6.1)<br>**Health Effects**<br>• Human health (7.1) |

EAO assessed the potential for the Project to have significant adverse effects on these VCs. The assessment also considered how accidents and malfunctions (section 8.2) and effects of the environment on the Project (section 8.3) could affect these VCs. These assessments were based on the Application provided by the Proponent, supplemental materials, and consultation with the Working Group, Aboriginal Groups and the public

# 4 Assessment of Environmental Effects

## 4.1 Air Quality

### 4.1.1 Background

Air quality was selected as an IC due to its importance to the environment and human health. Three studies were conducted to inform the air quality assessment: existing air quality data analysis; emissions modelling; and air quality dispersion modelling. These studies focused on criteria air contaminants (CACs), road dust (total PM, $PM_{10}$ and

$PM_{2.5}$), and toxic air contaminants (TACs). The Application also estimated GHG emissions, which include $CO_2$, $CH_4$, $N_2O$ and black carbon, and are contributors to global climate change.

The LAA is a 2-km wide corridor that extends 1 km on either side of the Highway 99 centreline, over the length of the Project alignment (Bridgeport Road to Highway 91). The regional assessment area (RAA) includes the Lower Fraser Valley (LFV) airshed. Metro Vancouver is the delegated authority that manages air quality in this area.

Ambient air quality for the LAA was determined using data provided by Metro Vancouver at six monitoring stations within 20 km of the Project area. Data for the LAA were compared to regional, provincial or federal Ambient Air Quality Objectives (AAQOs) to determine potential Project-related changes in air quality. TAC data were obtained from the National Air Pollution Surveillance network. Other factors, such as meteorology and climatology, vehicle emissions, road dust and traffic data, were considered in establishing baseline air quality.

Baseline air dispersion modelling identified existing exceedance of some AAQOs for carbon monoxide (CO), nitrogen dioxide ($NO^2$), benzene and benzo(a)pyrene (Table 2).

**Table 2: Estimated Maximum and 98th Percentile Concentrations (µg/m$^3$) of Pollutants with Existing Exceedances**

| Pollutant | Averaging Period | Maximum Concentration (µg/m$^3$) | 98$^{th}$ Percentile Concentration (µg/m$^3$) | Ambient Air Quality Objective (µg/m$^3$) |
|---|---|---|---|---|
| Carbon monoxide | 1-hour | 20,325.1 | 8,616.0 | 14,300 |
| | 8-hour | 4,980.6 | 2,491.8 | 5,500 |
| Nitrogen dioxide (100% conversion) | 1-hour | 2,574.1 | 1,086.0 | 188 |
| | Annual | 92.8 | n/a | 40 |
| Benzene | 1-hour | 58.0 | 24.4 | 30 |
| | 24-hour | 6.9 | 4.3 | 2.3 |
| | Annual | 2.0 | n/a | 0.45 |
| Benzo(a)pyrene | 24-hour | 8.9E-04 | 5.7E-04 | 5.00E-05 |
| | Annual | 2.6E-04 | n/a | 1.00E-05 |

**Notes:** n/a = Objective not applicable. Shaded cells indicate an exceedance of the relevant, most stringent AAQOs

### 4.1.2 Potential Project Effects and Proposed Mitigation Identified in the Application

*Construction*

Construction activities could interact with air quality through emissions from road dust and fuel combustion in diesel, propane and gasoline-powered machinery, equipment and vehicles operating during highway upgrades and the bridge construction. These

activities could lead to fugitive dust and common air contaminants (such as nitrogen oxides (NOx), sulphur oxides (SOx), and volatile organic compounds (VOCs)). Although the Application did not quantify the estimated air emissions associated with construction, additional information regarding air emissions associated with construction was provided during Application Review and is discussed in section 4.1.3.

*Operations*

During operations, traffic patterns, volumes and fleet compositions (as older vehicles would be gradually replaced by newer vehicles) are expected to result in changes in emissions associated with the Highway 99 corridor. The Application assessed the potential changes in air quality along the Highway 99 corridor due to Project activities by estimating air emissions from vehicles and road dust under baseline/existing conditions (2011), future (2031) conditions without the Project, and future (2031) conditions with the Project, then estimated emission values to predict contaminant concentrations in air for the LAA. For 2031 future estimates, the Application assumed the worst case scenario (untolled), in terms of the highest estimated traffic volumes. The Application anticipates that with tolling, traffic demand would be reduced, which would lead to lower emissions than predicted.

The Application estimated that, in general, vehicle emissions would be lower in 2031 than in 2011, with or without the Project, with the exception of road dust and sulphur dioxide ($SO_2$). The Application expected that such reductions would occur as a result of turnover in the vehicle fleet, combined with improvements in emissions control technology and cleaner fuels. Modelling predicted that future increases in sulphur dioxide levels would be lower with the Project than without the Project. Generally, road dust emissions are expected to increase linearly with the growth in traffic volume.

Table 3 presents the dispersion modelling results for predicted concentrations of CACs and TACs for the two future scenarios of Highway 99 traffic (with and without the Project) in the Project alignment.

**Table 3: Contaminant Concentrations (µg/m$^3$) Associated with Highway 99 Traffic in 2031 (with and without the Project)**

| Pollutant | Averaging Period | 2031 Without Project | | 2031 With Project | | Most Stringent Objectives |
|---|---|---|---|---|---|---|
| | | Maximum Concentrations | 98th Percentile | Maximum Concentrations | 98th Percentile | |
| **CACs** | | | | | | |
| VOCs | 1-hour | 1,832.2 | 764.2 | 393.5 | 134.4 | n/a |
| | 24-hour | 193.7 | 123.1 | 49.4 | 32.9 | n/a |
| | Annual | 55.8 | n/a | 13.8 | n/a | n/a |
| Carbon monoxide | 1-hour | 17,500.5 | 7,422.3 | 10,977.6 | 3,758.8 | 14,300 |
| | 8-Hour | 4,470.6 | 2,348.2 | 2,439.8 | 1,222.7 | 5,500 |
| Nitrogen dioxide (100% Conversion) | 1-hour | 1,252.4 | 526.0 | 539.7 | 184.0 | 188 |
| | Annual | 45.4 | n/a | 18.6 | n/a | 40 |
| Sulphur dioxide | 1-hour | 29.9 | 12.5 | 8.3 | 2.8 | 196 |
| | 24-hour | 3.3 | 2.2 | 1.0 | 0.7 | 125 |
| | Annual | 1.0 | n/a | 0.3 | n/a | 25 |
| $PM_{10}$ (vehicles) | 24-hour | 23.1 | 15.3 | 3.8 | 2.5 | 50 |
| | Annual | 6.8 | n/a | 1.1 | n/a | 20 |
| $PM_{2.5}$ (vehicles) | 24-hour | 9.6 | 6.4 | 2.5 | 1.7 | 25 |
| | Annual | 2.8 | n/a | 0.7 | n/a | 8 |
| **Road Dust** | | | | | | |
| $PM_{10}$ | 24-hour | 45.1 | 29.2 | 29.5 | 19.6 | 50 |
| | Annual | 14.2 | n/a | 8.1 | n/a | 20 |
| $PM_{2.5}$ | 24-hour | 10.9 | 7.1 | 7.1 | 4.7 | 25 |
| | Annual | 3.4 | n/a | 2.0 | n/a | 8 |
| **TACs** | | | | | | |
| Benzene | 1-hour | 32.4 | 13.6 | 13.3 | 4.5 | 30 |
| | 24-hour | 4.0 | 2.6 | 1.7 | 1.1 | 2.3 |
| | Annual | 1.2 | n/a | 0.5 | n/a | 0.45 |
| Benzo(a)pyrene | 24-hour | 5.1E-04 | 3.3E-04 | 2.3E-04 | 1.6E-04 | 5.00E-05 |
| | Annual | 1.5E-04 | n/a | 6.4E-05 | n/a | 1.00E-05 |

**Notes:** n/a = Objective not applicable

According to the modelling, the 2031 scenario "without the Project" is anticipated to have more exceedances of AAQOs than the 2031 scenario "with the Project." Specifically, without the Project, there is a predicted exceedance of AAQOs for maximum concentrations of CO, $NO_2$, benzene and benzo(a)pyrene associated with Highway 99 traffic in the Project alignment. The Application estimates that in the 'with Project' 2031 scenario, the only AAQO exceedances predicted would be benzo(a)pyrene and the maximum 1-hour $NO_2$ concentration, both of which would be of lower concentrations as a result of Project improvements.

*Greenhouse Gas Emissions*

Congestion, or the idling vehicle delay hours, is a main source of current GHG emissions along the Highway 99 corridor. With the exception of $CH_4$, a decrease in GHG emissions on the Highway 99 corridor is forecasted between 2011 and 2031 with or without the Project, largely due to new engine technologies, which the Application anticipates would provide substantial reductions in overall GHG emissions levels. The Application notes that the forecasted increase in emissions for $CH_4$ is due to the combination of increasing traffic and increasing frequency of diesel-engine vehicles, which are projected to outweigh the decrease in $CH_4$ emission rates for similar-engine vehicles. Table 4 summarizes the comparison of GHG emissions for the two 2031 scenarios (with and without the Project).

**Table 4: Forecast 2031 GHG Emissions, with and without Project (untolled)**

| Pollutant | 2011 Existing Roads Emissions (tonnes/yr) | 2031 Emissions (tonnes/yr) | | Change from Without Project Scenario in 2031 (tonnes/yr) |
|---|---|---|---|---|
| | | Without Project | With Project | |
| $CO_2$ | 146,939 | 129,338 | 121,493 | -7,845 |
| $CH_4$ | 12.2 | 15.0 | 15.1 | 0.1 |
| $N_2O$ | 8.0 | 3.5 | 3.5 | 0 |
| Black carbon | 4.1 | 1.1 | 1.2 | 0.1 |
| $CO_2e$ (20-year) | 163,157 | 135,002 | 127,336 | -7,666 (-5.7%) |
| $CO_2e$ (100-year) | 153,287 | 131,753 | 123,973 | -7,780 (-5.9%) |
| Note: Because the new bridge would be tolled, it is expected that $CO_2e$ reductions with the Project would be greater than those noted above. | | | | |

The Proponent has committed to developing an air quality and dust control management plan, as part of the construction environmental management plan (CEMP), which would describe measures to minimize dust and emissions associated with construction activities.

### 4.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, the Working Group and public raised concerns about the potential effects of the Project on air quality.

Several Working Group members, including Metro Vancouver, Cowichan Nation Alliance[13] and Lyackson First Nation, raised a concern regarding the lack of modelling for construction-related emissions in the Application.

During the EA, EAO requested the Proponent provide an estimate of the anticipated construction-related emissions and the Proponent submitted a memo on anticipated construction-related emissions of criteria air contaminants that have the potential to affect human health. The supplemental information noted that air emissions during construction would result from construction vehicles and equipment, including tugboats, construction equipment such as graders and loaders, and process fuel use in asphalt and concrete plants that may be located on-site.

Estimated construction-related air emissions (based on anticipated level of activity) were compared to emission forecasts for the LFV and are summarized in Table 5 below.

**Table 5: Estimated Construction-Related Air Emissions in Tonnes per Year (t/yr)**

| Pollutant | Construction-related Emissions (t/yr) | LFV Emissions (2020) (t/yr) | Percent of LFV Emissions |
|---|---|---|---|
| CO | 53.3 | 345,365 | 0.02 % |
| NOx | 131.7 | 47,659 | 0.28% |
| $SO_2$ | 0.3 | 7,668 | 0.00% |
| VOCs | 15.2 | 85,438 | 0.02% |
| $PM_{10}$ | 9.3 | 12,729 | 0.07% |
| $PM_{2.5}$ | 8.4 | 7,102 | 0.12% |
| $NH_3$ | 0.1 | 14,431 | 0.00% |

The Proponent estimated that construction-related emissions would be relatively minor, as they would be temporary in nature and represent less than a 0.3% contribution to regional air emissions for all CACs.

EAO proposes a condition requiring the development of a CEMP that would include measures to mitigate and manage air quality during construction.

Some members of the public and Working Group raised a concern that the air quality analysis assumed the 'worst-case scenario' of the bridge being untolled, which was

[13] Cowichan Nation Alliance represents Cowichan Tribes, Halalt First Nation, Penelakut Tribe, and Stz'uminus First Nation, all of whom were included on Schedule B of the Section 11 Order and invited to participate in the Working Group.

different than the actual scenario proposed in the Application. Fraser Health, Metro Vancouver, Richmond, Tsleil-Waututh Nation and Vancouver Coastal Health raised further concerns that the scoping of the study area boundary for air quality was too narrow, and that a potential increase of traffic at other locations or crossings as a result of the Project (such as the Alex Fraser Bridge and Oak Street Bridge), could affect air quality in the region or at specific locations outside of the Highway 99 corridor. Metro Vancouver also requested that the Proponent quantify the full range of projected GHG reductions or increases due to the Project, including induced or reduced overall traffic in the RAA.

> The Proponent responded that a wide range of future traffic scenarios in terms of tolling, traffic volumes and congestion levels have been considered in the Application. The emissions data presented in the Application were conservatively based on the untolled bridge scenario, the scenario under which traffic volumes and emissions levels would be highest (i.e. the worst case scenario). Under the untolled scenario, with substantial Alex Fraser Bridge traffic diverting to the new bridge, the Proponent stated that the favourable emissions impact of congestion reduction at the new bridge would outweigh the emissions impacts of increases in traffic volume, and Alex Fraser Bridge congestion reduction would represent an additional GHG reduction benefit. Under the tolled scenario, as proposed in the Application, an increase in traffic at the Alex Fraser Bridge is expected primarily during off-peak times when there is available capacity along Highway 91, and GHG reduction on Highway 99 would be higher than under the untolled scenario.
>
> The Proponent also noted that even under the worst-case (untolled) scenario, the emissions savings associated with congestion relief (reduced idling) would outweigh the increased traffic associated with an untolled bridge, leading to a net reduction in emissions levels and improvement in air quality resulting from the Project. Because the new bridge would be tolled, the Proponent anticipates that traffic volumes and emissions levels would be lower than the values predicted under the untolled scenario.

Penelakut Tribe questioned how the height of the bridge was considered in the air quality modelling, and requested that the LAA be extended to 3 km downwind of the bridge, in order to capture potential air quality impact to Tl'uqtinus, a historic village site on the south arm of the lower Fraser River. The village site and Penelakut Tribe's concerns are discussed in more detail in section 14.8 of this Report.

The Proponent responded that, when compared to emissions from traffic through a Tunnel, traffic emissions from an elevated bridge would disperse over a larger area, resulting in lower ambient concentrations. Generally, the higher the elevation of the emission source, the greater the time that the emissions have to mix with the surrounding atmosphere and reduce ambient concentrations prior to reaching ground level. The Proponent subsequently provided an analysis that noted the maximum pollutant concentrations predicted for the Tl'uqtinus Village site under existing (2011) conditions and future (2031) conditions with and without the Project. Maximum values were predicted at a point closest to the Project. The analysis indicated that predicted concentrations tend to improve as a result of the Project and that there are no exceedances of AAQOs.

Key issues raised regarding the effects of air quality on human health are presented in section 7.1 of this Report.

#### 4.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the Project would result in the following residual adverse effects on air quality:

- Change in ambient air quality during construction.

EAO's characterization of the expected residual effects of the Project on air quality, as well as EAO's level of confidence in the effects determination, is summarized below.

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Moderate resilience | The region is largely urban, where primary emission sources include the transportation and industrial sectors. There are existing exceedances of AAQOs along the Highway 99 corridor, but generally existing ambient air quality remains below applicable objectives and is expected to improve with or without the Project due to new emission control technologies. The region has a moderate resilience to further emissions. |
| Magnitude | Negligible-to-low | Project construction activities are predicted to result in a negligible-to-low increase in CACs. |
| Extent | Local airshed | Effects on air quality are expected to be localized during construction. |
| Duration | Short-term | The duration of residual effects on air quality would be limited to the construction phase, which would occur over approximately 4-5 years. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Reversibility | Reversible | Residual effects are expected to cease with the completion of construction activities and related effects would be reversed once construction is complete. |
| Frequency | Regular | Emissions from construction-related activities would occur frequently at regular intervals. |
| Likelihood | The likelihood of residual effects to air quality is high. | |
| Confidence | There is a high level of confidence in the likelihood. | |

#### 4.1.5 Cumulative Effects Assessment

The most relevant reasonably foreseeable project that has the potential to interact with residual air quality effects of the Project is TransLink's proposed Pattullo Bridge Replacement Project, with a planned construction period between 2019 and 2023. This construction phase overlaps temporally with the Project; however, given the distance between the two projects and the relatively short-term and negligible emissions expected during construction, no cumulative effects on air quality are expected.

#### 4.1.6 Conclusions

Considering the above analysis having regard to the conditions identified in the Table of Conditions (TOC) and the Certified Project Description (CPD) (which would become legally binding as a condition of the EAC), EAO is satisfied that the residual effect of the Project on air quality would be negligible-to-low. EAO's determination of significance for residual effects to air quality as it relates to the human health VC can be found in section 7.1 of this Report.

### 4.2 Hydrology

#### 4.2.1 Background

Hydrology components assessed in this chapter include river hydraulics and morphology as well as water and sediment quality, as described below.

The Application documented the current water and sediment quality in the Fraser River in the vicinity of the Tunnel. The Application further assessed anticipated Project-related changes related to water levels, velocities, and flow patterns (river hydraulics), and also assessed the influence on sedimentation and erosion patterns (morphology) related to the river bed profile due to the decommissioning of the Tunnel. Finally, the Application assessed the potential effects of turbidity and sediment re-suspension associated with works in or near water, including installation of bridge foundations along the edge of

Deas Slough, Tunnel removal, and the decommissioning of the Deas Slough Bridge. The river hydraulics and morphology, and sediment and water quality ICs are summarized and assessed below. The assessment of the potential adverse effects of the Project on these ICs was used to further inform the assessment of adverse effects on fish and marine mammals, at-risk amphibians, and vegetation VCs.

The use of water and activities that may cause changes to streams in BC are regulated under the *Water Sustainability Act* and associated Regulations. The federal *Fisheries Act* provides for the protection of fish and fish habitat from harmful changes and from the deposition of deleterious substances, including excess levels of suspended sediment. The Ministry of Environment's ambient water quality guidelines provide the basis for water quality assessments and the Canadian Environmental Quality Guidelines define recommended numerical concentrations as it relates to biota and fish habitat function.

*River Hydraulics and Morphology*

The LAA for River Hydraulics and Morphology includes the area of the Fraser River South Arm, from just upstream of Tilbury Island to the mouth of the Fraser River. The RAA encompasses the area of the Fraser River South Arm from just upstream of Annacis Island to the Fraser River estuary, including Sturgeon and Roberts Banks.

Baseline data collection involved literature review, collection of velocity-discharge and bathymetric data, interpretation of historical aerial photographs and the analysis of bathymetric surveys conducted periodically by Public Works and Government Services of Canada, and by the Greater Vancouver Water District.

Historically, the Fraser River estuary has experienced rapid geomorphic change. The river transports large volumes of sand to the river mouth, where patterns of deposition, mobilization, and transport are heavily influenced by the tides. The Application notes that temporary scour during annual freshets can be in the order of several meters at some locations, and that migrating sand dunes can reach heights of up to 4 m. As a result, the configuration of channels at the river mouth is complex and in the absence of human intervention would be in constant flux.

The Application notes that no major shifting in the banklines has occurred since the late 1930s, where human development along the river and on its floodplain took place. Banklines of mid-channel islands are largely unprotected, and therefore more likely to change over time. Annual dredging that takes place in the Fraser River South Arm contributes to disturbance to sediments and water in the LAA and RAA. There has been

historical lowering of the river bed downstream from New Westminster as a result of dredge volumes harvested for beneficial uses and localized intentional deepening to accommodate vessel drafts.

*Sediment and Water Quality*

The LAA for sediment and water quality extends approximately 7 km downstream from the Tunnel (including Ladner Reach and South Arm Marshes) and 1.5 km upstream of the Tunnel, and also includes upland water courses within the Project alignment plus a 30 m buffer. The RAA extends 7 km upstream from the Tunnel and downstream from the Tunnel to the river mouth.

Project-related effects on water and sediment quality were assessed based on the documented baseline conditions with regard to chemical contamination in concert with predicted levels of Project-related sediment re-suspension, followed by down-current re-settlement. Baseline conditions for sediment and water quality were defined based on a literature review conducted in 2014 that identified information gaps and the subsequent field sampling and analysis of sediment and water quality.

The main channel of the Fraser River South Arm consists primarily of coarser-grained sediment, with metal concentrations not exceeding levels specified in the Canadian Sediment Quality Guidelines. Sediment in and near Deas Slough are more diverse and generally of finer texture due to slower currents. Historically, samples collected in this area have routinely exceeded Canadian sediment quality guidelines for arsenic, chromium, and copper trace elements that tend to occur at higher concentrations in finer-textured sediments. Samples collected by the Proponent during the 2014 field studies confirmed the findings of previous studies and noted that the presence of these trace elements in sediments are attributed to natural geological sources and conditions, as opposed to human-caused contamination.

The Proponent's study of water and sediment quality focused on changes in sediment composition and organic carbon content and changes in sediment quality in terms of contaminant concentrations.

The Application indicated that data collected in 2014 showed that water in the Fraser River South Arm had parameters (such as pH, temperature, dissolved oxygen and electrical conductivity) falling within the federal water quality guidelines for the protection of aquatic life. Turbidity in the Fraser River South Arm is high and is determined by tides and freshwater outflow.

Baseline sampling conducted by the Proponent indicated that elevated concentrations of aluminum, chromium, and copper were found in sediment samples from Deas Slough. These trace elements are naturally present in finer-textured clayey and silty sediments that are routinely carried as suspended sediment in the Fraser River South Arm. No polycyclic aromatic hydrocarbons (PAH), extractable petroleum hydrocarbons, oil, or grease were detected in the water samples collected.

### 4.2.2 Potential Project Effects and Proposed Mitigation Identified in the Application

*Construction and Tunnel Decommissioning*

Potential effects of the Project on river hydraulics and river morphology in the lower Fraser River were investigated using a three-dimensional model that examined potential changes in hydraulics and bed elevations. Modelling was applied to the site of the removed Tunnel, for both trench infilling and post-trench infilling phases. The modelling program analysed sediment transport and deposition, current velocities, water levels, flow splits, trench infilling and migration, and post-trench infilling morphological changes.

During Tunnel removal, which would involve the removal of sediment, rock apron, concrete mattress and four of the six Tunnel segments, the river bed material is expected to be disturbed. Installation of bridge piers along the edge of Deas Slough is not expected to have an effect on hydrology.

The Proponent is also proposing to realign Green Slough to a configuration closer to its historical, pre-Highway 99 alignment. The Application states that the realignment of Green Slough is not expected to have any effects on hydraulics or morphology in Deas Slough or the South Arm of the Fraser River, provided the outlet of Green Slough remains at a similar elevation to its current configuration. The Application also states that enhancements to estuarine and riparian habitat associated with the realignment would provide a net benefit compared with existing conditions.

The effect of sediment generation would depend on the ambient suspended sediment concentrations at the time of removal. The Application assumes that Tunnel removal would commence in mid-summer, after freshet flows have receded, and would continue into the winter low-flow period. The hydraulic modelling predicted a temporary decrease in river flow velocity and consequent sediment deposition over the deeper trench left after the removal of the Tunnel segments. Modelling in the Application indicated that the trench would be naturally infilled in approximately 210 days.

Sediment re-suspension and entrainment in Fraser River flows during Tunnel removal could result in temporary increases in total suspended solids (TSS) and turbidity levels, adding incrementally to the suspended sediment loads in the river that occur naturally. However, this potential construction-related residual effect on water and sediment quality is similar to that associated with maintenance dredging routinely undertaken in the Fraser River South Arm in terms of TSS levels; the re-suspended sediment would be of similar textural and chemical quality to the downriver sediments and would not be expected to measurably alter riverbed habitat quality or characteristics. Movement of marine construction vessels and equipment along the Fraser River during installation of bridge components and the transportation of Tunnel elements for offsite disposal has potential to affect water and sediment quality through accidental leaks or spills of fuels, or other contaminants typically used in construction vessels and equipment.

According to the Application, minor changes in current velocities during Tunnel removal are not expected to result in bank erosion, barriers to fish migration or impediments to marine traffic. Based on the volume and expected nature of the sediment and sand fill around the Tunnel, the temporary increase in suspended sediment volume is estimated to range from one percent to nine percent over ambient volumes between August and December, during Tunnel removal. As year to year suspended sediment loads vary widely, the estimated range of increase due to Tunnel removal is well within the range of natural variability. Suspended fine sediments generated during Tunnel removal would be transported to the Strait of Georgia before deposition could occur but no noticeable effects on deposition in the Strait of Georgia are expected, given the negligible increase over baseline conditions. Minor deposition could also occur in slower-moving areas such as channel margins and sloughs.

Local scour and deposition are expected during Tunnel removal due to flow acceleration around exposed edges of Tunnel segments; however, the Application notes that these effects are expected to be temporary and small in scale. With the implementation of standard Best Management Practices (BMPs), such as the use of washed rock to upgrade existing riprap bank protection along the shorelines, if required, the amount of suspended sediment is anticipated to be negligible.

Temporary changes to downstream river bed elevations after Tunnel removal have the potential to affect the Lulu Island-Delta watermain. The Proponent would engage Metro Vancouver (the owner of the watermain) in developing a mitigation plan that would include provisions for monitoring the riverbed upstream and downstream of the watermain during and after Tunnel removal, stockpiling of appropriately-sized rock near the Project site for priority scour protection repairs and upgrades at the watermain

crossing, and establishing on-call contracts with a Qualified Professional and qualified marine contractor to ensure that scour protection repairs can be designed and implemented on short notice, if required.

Post-trench infilling morphological changes provided by near-field modelling indicated a bed lowering up to 1.0 m less with Tunnel removal than under existing conditions. The modelling also indicated approximately 0.5 m in bed lowering in the navigational channel within 150 m distance from the Tunnel (stopping upstream of Lulu Island-Delta watermain). The Lulu Island–Delta watermain is located approximately 600 m downstream from the Tunnel and it has a scour protection apron over its southern half. The far-field modeling showed potential river bed elevation changes within 500 m upstream and 1,500 m downstream of the Tunnel, consisting of deposition of approximately 0.5 m in the middle of the channel and scour of 0.5 m to 1 m at the margins of the channel. Potential changes in bed levels adjacent to Tilbury Island were predicted to be negligible.

In relation to the flow split, the modelling indicated that the predicted change in the flow splits were within the range of natural variability. The removal of the Tunnel was not expected to have an effect on the flow split between Woodward Reach and Ladner Reach and therefore is not expected to contribute to the expansion of Ladner Reach through erosion of Deas Island or the nose of Kirkland Island.

*Operations*

The new bridge would have a clear-span and, as such, there would be no impact to river hydraulics and river morphology during operation.

During operations, water and sediment quality may be impacted by activities related to the maintenance of stormwater management ponds and drainage facilities, where there is potential for an increase in the rate of stormwater runoff into the river and sloughs. Peak flow rates have the potential to affect water quality in the receiving aquatic environment due to increased concentrations of nutrients, organics, metals, chlorides, bacteria, and hydrocarbons.

The mitigation measures proposed in the Application related to water quality include standard industry BMPs undertaken for past developments by the Proponent. As part of the design, the Proponent plans limited in-water or near-water activities, with the works isolated by using multiple silt curtains or other sediment control measures, to avoid or minimize siltation effects. The Proponent may also use other measures such as: use of hydraulic suction during the removal of fill materials adjacent to the Tunnel; and

transportation of material off site using spoil barge(s) equipped with a sediment containment system.

The Proponent's erosion and sediment control plan, part of the CEMP, would provide more specific measures to control suspended sediment during construction in Deas Slough and Green Slough. Such measures may include: development of temporary drainage systems to receive, filter and direct stormwater and runoff during construction, development of sediment settlement ponds, re-stabilization of vegetated areas that are cleared or disturbed during construction, and careful storage of waste material and soil to prevent possible entry into the aquatic environment.

Water quality monitoring would be conducted during construction activities that have the potential to induce turbidity (e.g., Tunnel removal, construction along the edges of Deas Slough and Green Slough). Water quality monitoring would include continuous turbidity monitoring using in-situ monitors, or frequent collection of samples at established monitoring stations in the Fraser River south arm main channel within proximity to the Tunnel crossing, as well as downstream of deployed sediment containment measures in Deas Slough, especially during higher risk construction activities.

The bridge design would incorporate a stormwater collection and distribution system that conveys stormwater runoff to appropriate upland infrastructure for proper treatment (e.g., stormwater detentions ponds or biofiltration swales) before discharging to the Fraser River or adjacent streams, thereby avoiding potential impacts on the water and sediment quality. These enhanced stormwater management approaches are expected to result in an improvement in water and sediment quality in the Fraser River, as compared to existing conditions.

### 4.2.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, the Working Group, including Aboriginal Groups raised concerns about the potential effects of the Project on river hydraulics and morphology, and sediment and water quality.

*Impacts of Tunnel Removal on the Lulu Island-Delta Watermain*

Tsleil-Waututh Nation, Delta and Metro Vancouver requested additional information on whether the river bed lowering would reach the watermain and the degree of impact if the scour protection and bed cover were affected. They expressed concern that the 210 days for which the model was run would be insufficient to assess impacts. Metro Vancouver also noted that the mitigation measures proposed were reactive in nature,

rather than preventive, and that overall the measures identified by the Proponent would not be practical to implement.

> The Proponent responded that a mitigation plan for the Lulu Island-Delta watermain would be developed in conjunction with Metro Vancouver. If a lowering of the edges of the scour protection apron were identified, the scour protection aprons would be upgraded under the direction of a Qualified Professional.
>
> The Proponent indicated that focusing on monitoring and mitigation efforts, rather than modelling, to address potential risk to the Lulu Island-Delta watermain crossing, would provide the best opportunity to avoid potential adverse effects. During further Project design and planning, the Proponent would undertake additional hydraulic modelling to confirm there are no potential interactions with the watermain based on final construction plans, to inform and support mitigation planning. The Proponent would engage Metro Vancouver in developing a mitigation plan for ensuring the integrity of the watermain.
>
> EAO proposes a condition requiring the Proponent to develop a Lulu Island-Delta watermain management plan, in consultation with Metro Vancouver, which would include details for monitoring the watermain during and for two years after Tunnel decommissioning. This plan would also include an adaptive management plan to address unanticipated effects of the Project on the watermain or prescribed mitigation measures that are found ineffective.

*Potential Impacts to Navigation during and Post Tunnel Removal*

VFPA requested that a monitoring program of a minimum of three years be undertaken to assess the morphology of the river bed in relation to navigability of the main channel. VFPA and Musqueam Indian Band also expressed an interested in being consulted on developing a timeline, staging plan and marine users' communication plan, similar to other projects that have the potential to impact navigation.

> The Proponent responded that the marine access management plan would identify any marine-based staging areas that may be required during construction; describe the anticipated construction schedule for marine-based activities and detail local marine communications and emergency preparedness procedures. The Proponent also committed to develop and implement river bathymetry monitoring requirements in consultation with VFPA.

EAO proposes conditions requiring the establishment of a marine users group, and the development of a marine access management plan, that would include the construction activities, including staging areas, which have the potential to interfere with marine access and navigation. EAO also proposes a condition requiring the development of a river bed and hydrology management plan to monitor for and mitigate potential adverse effects to the river bed and foreshore of the Fraser River South Arm.

*Monitoring of Changes to Sediment and Water Quality*

Musqueam Indian Band raised concerns regarding data collection and the monitoring of potential changes in water and sediment quality, and in particular how changes could have an effect on fish and fish habitat. Concerns were also raised by Tsleil-Waututh Nation, Musqueam Indian Band and Lyackson First Nation with regard to sediment quality directly beneath the Tunnel segments and the potential of release for contaminated sediment.

The Proponent responded that a temporary increase in suspended sediment volume over ambient volumes was estimated to range from one percent, if Tunnel removal would be undertaken in August, to nine percent, if undertaken in December. The volume of suspended sediment that is naturally transported through the assessment area during removal of one segment ranges from a maximum of 300,000 $m^3$ in August to a minimum of 30,000 $m^3$ in December.

Additional sediment sampling would be conducted directly adjacent to the Tunnel as part of developing a detailed plan for managing environmental aspects associated with Tunnel decommissioning. In addition, upriver and downriver monitoring would be undertaken during relevant periods of in-river works to contextualize the degree of change in natural turbidity. Additional sampling would be designed to allow for the characterization of sediment that has potential to be disturbed during Tunnel decommissioning.

EAO proposes a condition requiring the Proponent to develop a water quality management plan. This plan would include details on mitigation measures to manage turbidity levels consistent with BC's Water Quality Guidelines; to monitor locations upstream, downstream or adjacent to areas of physical disturbance during instream work; and to identify and report any exceedances of the BC Water Guidelines.

### 4.2.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the Project would result in the following residual adverse effects on hydrology:

- A temporary increase in the volume of suspended sediment.
- Temporary bed lowering.

EAO's characterisation of the expected residual effects of the Project on hydrology, as well as EAO's level of confidence in the effects determination, is summarized below.

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | **Both:** Variable sensitivity | The Fraser River estuary is very active morphologically and the river transports large volumes of sand to the mouth of the river where patterns of deposition, mobilization, and transport are heavily influenced by the tides. Human intervention controls the flux of sediment transportation and deposition. |
| Magnitude | **Sediment suspension**: Low<br><br>**Bed lowering**: Low | **Sediment suspension**: Change would be within the range of natural variability in terms of sediment quality and volume and would be of low magnitude. Deposition of re-suspended sediments in downriver areas is not expected to measurably alter riverbed habitat quality or characteristics.<br><br>**Bed lowering**: An expected 1-2 m lowering of bed is within the range of natural variability on the Fraser River and would not expose the watermain directly, but could diminish the future effectiveness of the scour protection. |
| Extent | **Both:** Local | **Sediment suspension**: Most of the relocation of sediments would be within the LAA with some negligible fine sediment volume migrating into the Strait of Georgia, although is not expected to measurably alter riverbed habitat quality or characteristics from baseline conditions.<br><br>**Bed lowering**: Bed lowering would occur within 600 m of the Tunnel trench, between the Tunnel alignment and the Lulu Island-Delta watermain. |
| Duration | **Both:** Short-term | **Sediment suspension**: A short-term increase in TSS and sediment redistribution may occur during the removal of the Tunnel segments that would commence in mid-summer, after freshet flows have receded, and extend into the winter low-flow period.<br><br>**Bed lowering**: The effects of the Tunnel removal on the river bed would dissipate within two freshets after the removal. |
| Reversibility | **Both:** Reversible | **Sediment suspension**: Effects are considered reversible; water quality is expected to return to baseline conditions in less than one day, following cessation of activities<br><br>**Bed lowering**: River bed levels would return to normal, as the impact of |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | Tunnel removal dissipates following infill and is considered reversible. |
| Frequency | **Sediment suspension:** Frequent<br><br>**Bed lowering**: Continuous | **Sediment suspension:** Frequent occurrences of sediment re-suspension, that could affect TSS/turbidity levels in the immediate vicinity of the Tunnel during removal, are anticipated.<br><br>**Bed lowering**: Bed lowering would occur continuously for up to two years starting with Tunnel removal, but would gradually return to normal over time. |
| Likelihood | There is a high likelihood of increase in the amount of turbidity and suspended sediments in the water immediately above and down river from the Tunnel removal. Bed lowering is also highly likely to occur. | |

### 4.2.5 Cumulative Effects Assessment

In relation to cumulative effects, the Application indicated that the only other project or activity that had the potential to interact with the Project was the routine maintenance dredging in the Fraser River South Arm conducted by VFPA. However, the Application notes that Tunnel decommissioning would be scheduled so that there would be no temporal overlap between the two activities. The temporal gap between these two activities would depend on bed conditions and sediment loads in the vicinity of the Tunnel at the time of decommissioning, which would determine the need for maintenance dredging in the area. Consultation between VFPA and the Proponent to develop an appropriate schedule is expected to mitigate potential for the effects of the two activities to overlap temporally or spatially, and therefore no cumulative effects are anticipated.

Based on publicly available information on the anticipated construction schedule for the proposed WesPac Tilbury Marine Jetty Project, currently undergoing an EA, any dredging associated with the construction of the WesPac Tilbury Marine Jetty Project is anticipated to be complete before the proposed start of Tunnel decommissioning in 2023.

### 4.2.6 Conclusions

Considering the above assessment and having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of an EAC), EAO is satisfied that the residual effect of the Project on hydrology would be low. EAO's determination of significance for residual effects to hydrology as it relates to fish and fish habitat, at-risk amphibians and vegetation can be found in sections 4.3, 4.4 and 4.5, respectively.

## 4.3 Fish and Fish Habitat and Marine Mammals

### 4.3.1 Background

Fish and fish habitat and marine mammals were selected as VCs due to their ecological importance and their importance to local fisheries and communities, and Aboriginal Groups, whose cultures and traditional resource harvesting activities are deeply connected to the lower Fraser River and estuary. The Project intersects several watercourses and water features that are known to, or have the potential to, be inhabited by fish species with fisheries or conservation values of importance to commercial, recreational and Aboriginal (CRA) fisheries and Aboriginal Groups for traditional purposes. Marine mammals were also selected as a VC because harbour seals and sea lions are known to use the Project area at the Fraser River South Arm and have the potential to be adversely affected by underwater noise associated with Project construction.

The assessment of fish and fish habitat focused on five sub-components: salmon, sturgeon, eulachon, trout and char. Four indicators were selected for the assessment of Project-related effects on fish and fish habitat: likelihood of injury or mortality of fish; TSS levels (mg/L) and turbidity; underwater sound levels; and loss of habitat area. Change in the acoustic environment from underwater noise was selected as the indicator for the assessment of marine mammals. Sound pressure level and sound exposure level were used to assess the potential for injury or behavioural disturbance to marine mammals due to Project-related underwater noise.

The LAA for fish and fish habitat includes the Fraser River South Arm from approximately the middle of Shady Island to 500 m upstream of the Project alignment, and in upland areas including the Project alignment plus 30 m on either side of the Project alignment. The RAA includes the Fraser River South Arm (including Canoe Pass) extending from the river mouth to 1,000 m upstream of the Project alignment, and Project alignment plus 500 m on either side of the Project alignment in upland area.

The LAA for marine mammals is defined as all areas where Project-related effects to marine mammals could potentially occur, including the zone of audibility for harbour seals based on modelled underwater noise from construction activities. The RAA encompasses a portion of the Fraser River from the river mouth upstream to Annacis Island, and a portion of Roberts Bank, providing a regional context for the ecological effects of the Project.

*Regulatory Context*

The *Fisheries Act*, administered by DFO, is the main statute related to the conservation and protection of fish, fish habitat and marine mammals. Fish and fish habitat protection measures include a prohibition, if unauthorized, against serious harm to fish that are part of a CRA fishery, or to fish that support such a fishery; and a prohibition against the deposit of deleterious substances in water frequented by fish. Serious harm to fish is defined in the *Fisheries Act* as "the death of fish or any permanent alteration to, or destruction of fish habitat" and requires authorization from DFO with mitigation and offsetting to maintain or improve the ongoing productivity of CRA fisheries. DFO is also responsible for administering all aspects of the *Species at Risk Act* (SARA) related to aquatic and marine species at risk. Regulation and management of marine mammals occurs primarily through the *Marine Mammal Regulations* under the *Fisheries Act*.

There are no regulatory thresholds for the management of underwater noise in Canada. Auditory injury thresholds for fish and marine mammals and behavioural disturbance criteria for marine mammals recommended by the U.S. National Marine Fisheries Service and DFO have been adopted for the Project. Behavioural thresholds for marine mammals are applied to fish in a similar fashion and are considered conservative.

Changes in and about a stream require notification or change approval under Section 11 of the BC *Water Sustainability Act* (WSA), administered by FLNRO. In general, in-water works would be undertaken in accordance with provincial standards and best practices, including the Proponent's Standard Specifications for Highway Construction 2012, and would comply with the terms and conditions of applicable notifications and approvals under the WSA.

### 4.3.2 Potential Project Effects and Proposed Mitigation Identified in the Application

This section provides a summary of potential effects and proposed mitigation identified in the Application for fish and fish habitat and marine mammals.

<u>Fish and Fish Habitat</u>

The Project is located approximately 18 km upstream of the Fraser River mouth, within a section of the Fraser River South Arm that is influenced by a tidally-driven salt water wedge that penetrates near the river bottom. The shoreline of the Fraser River South Arm is generally characterized by extensive industrial activity. A high proportion of

habitat, including within the Project alignment, is classified as being of low or moderate productivity, whereas more productive shoreline habitat is generally confined to a narrow band of intertidal marshes, and mud- and sand-flats around Tilbury and Annacis islands.

Deas Slough is a backwater feature of the Fraser River South Arm. The slough's shoreline is designated primarily as highly productive habitat. In contrast, riprap-armoured shoreline in the vicinity of the existing Deas Slough Bridge is characterized as low to moderate productivity habitat. Green Slough is classified as an environmentally sensitive area under Delta's Official Community Plan and its shoreline is classified as habitat of high productivity.

Of the 43.5 km of assessed upland ditches that parallel or intersect Highway 99 within the LAA, 5.2 km (12%) are considered "seasonal (e.g., overwintering) habitat for CRA or listed fish species", and 10.0 km (23%) are considered a "significant upstream source of food or nutrients to year-round and seasonal habitat for CRA or listed fish species." The remaining ditches are of low or no value to CRA fish.

Fish species of CRA importance that rely on aquatic habitats throughout the lower Fraser River during different life history stages include Pacific salmon, sturgeon, eulachon, trout, and char. At-risk fish species that occur in the vicinity of the Project include white and green sturgeon. At present, Endangered and Special Concern status is being considered for Fraser River and central Pacific coast populations of eulachon, and south coast populations of bull trout, respectively. Provincially-listed fish species occurring in the vicinity of the Project include the Red-listed white sturgeon and green sturgeon, and the Blue-listed coastal cutthroat trout and bull trout.

*Physical injury and mortality to fish*

Key potential Project effects to fish and fish habitat identified in the Application include physical injury and mortality to fish.

Activities associated with Tunnel removal, including removal of sediment and the protective rock apron and concrete mattress on top of the Tunnel sections, have the potential to result in physical injury or direct mortality of fish from crushing or entrainment.

Sediment removal for Tunnel decommissioning is proposed to occur between July 16 and February 28, the least-risk timing window for the protection of juvenile salmon and

eulachon. Adherence to this timing window will avoid or minimize the potential for crushing and entrainment of these species.

The Application notes that, while low, there remains a risk of crushing or entrainment of smaller size classes of juvenile sturgeon in the event that Project-related sediment removal occurs within deep holding areas where sturgeon aggregate. Low numbers (up to five individuals) of juvenile sturgeon are known to aggregate in deep (>10 m) mainstem pools within the Fraser River South Arm. Such features have been identified in Annacis Channel (approximately nine km upstream of the Tunnel) and upstream of the New Westminster trifurcation. Although the river deepens appreciably (>20 m) immediately downstream of the Tunnel along the south bank, holding areas for juvenile sturgeon have not been identified at that location.

The risk may be higher if Project-related sediment removal occurred during the winter months when water temperature drops below 7°C, and juvenile sturgeon become more sedentary within overwintering habitats. However, the Application predicts residual effects to fish from physical injury to be of low magnitude, to have the potential to occur only during sediment removal, and to be limited to the immediate vicinity of the sediment removal operations.

Project-related sediment removal is proposed to occur in a dynamic section of the river, where maintenance dredging of sections of the navigation channel is conducted on an annual basis. Near-bed water flows are also high at this location, which the Application notes is uncharacteristic of low to moderate flow velocities that appear to be more typical of holding and overwintering areas preferred by sturgeon. Although most fish tend to disperse away from the noise and physical disturbance associated with sediment removal, it is possible that juvenile sturgeon may be entrained if they are unable to swim away from the disturbance. However, the Application does not expect that this would adversely affect overall population integrity.

Activities associated with Tunnel removal and Green Slough realignment also have the potential to result in physical injury or direct mortality of fish due to exposure to elevated levels of TSS. Although mitigation measures would be applied to minimize the exposure of fish to elevated TSS levels during these activities, such measures would not completely remove the potential for residual effects on some fish species and life history stages. As the primary mitigation measure, adherence to the least-risk work window of July 16 through February 28 would provide for the substantial avoidance of sensitive life history stages, most notably upstream-migrating adult eulachon and downstream-migrating juvenile Pacific salmon, and eulachon larvae. There are, however, fish present within the river on a year-round basis, and the timing

window would not provide for avoidance of upstream-migrating adult Pacific salmon or trout and char that are present within a broader timeframe.

Although fish populations are well-adapted to the turbid waters of the Fraser River and are often exposed to other sources of elevated TSS levels (both natural and human-sourced), there is still potential for physical injury and direct mortality. Demersal fish species (i.e. bottom feeders), including sturgeon, are less likely to be adversely affected by elevated TSS levels, given their ecology and physiology.

The Application assumes that Tunnel removal would commence in mid-summer, likely after freshet flows have receded, and extend into the winter low-flow period. Suspended sediment volume is predicted to temporarily increase between 1% and 9% over ambient levels during the course of the disturbance. This increase is considered low, given the natural variability of suspended sediment seasonally and annually in the river main channel. Any elevated TSS levels generated during realignment of Green Slough is less likely to be transported and fewer fine sediments would remain in suspension. The Application states that the potential change would be within the range of natural variability and is not expected to adversely affect fish population viability.

*Change in fish habitat*

There is potential for alteration of fish habitat during Project construction phase, from upgrades to, or installation of, rip rap in the vicinity of the new bridge, removal of the Tunnel, and disturbance or realignment of ditches associated with interchange upgrades, highway widening, and construction of bridge approaches, and operation phase (i.e., highway maintenance activities, such as ditch cleaning, removal of in-channel vegetation, brushing, and clearing).

Permanent alteration and loss of fish habitat is expected to occur during the Project construction phase due to overlap of the Project components (i.e., bridge, approach support piers) and the edges of Deas Slough and Green Slough.

Permanent alteration and loss of habitat in Deas Slough and Green Slough is expected to meet the definition of serious harm to fish under the *Fisheries Act*. Serious harm to fish is defined in the *Fisheries Act* as “the death of fish or any permanent alteration to, or destruction of fish habitat,” and requires authorization from DFO with mitigation and offsetting to maintain or improve the productivity of CRA fisheries.

Potentially affected aquatic habitats include highly productive (red-coded) tidal brackish marsh, and intertidal and shallow subtidal channel areas of Deas and Green

Sloughs. Fish habitat loss has the potential to affect fisheries productivity, because it may result in a measureable reduction in the slough's productive capacity as year-round rearing habitat for CRA fish, including juvenile Pacific salmon.

The new bridge would be a clear span structure over the Fraser River South Arm without any instream piers; however, there would be some overlap between bridge/approach support piers and the edges of Deas and Green sloughs. The Project would involve the partial infilling of Green Slough to allow for ground improvements and the construction of a new support pier for the bridge south approach. Infilling would occur where Green Slough presently connects with Deas Slough, between Highway 99 and Captain's Cove Marina. It is anticipated that temporary culverts would be installed along the west bank of Green Slough to sustain the existing tidal connection with Deas Slough while construction work is being conducted. Based on the reference concept, the anticipated loss of fish habitat is expected to be approximately 7,734 $m^2$ of instream and 3,734 $m^2$ of riparian area, summarized in Table 6 below.

**Table 6: Estimated Fish Habitat Losses Associated with Project**

| Structure | Estimated Habitat Loss ($m^2$) | |
|---|---|---|
| | Instream Area | Riparian Area |
| Deas Slough Piers Total | 2,027 | 2,080 |
| Green Slough Piers Total | 5,707 | 1,654 |
| Total Habitat Loss | 7,734 | 3,734 |

The Application notes that the Project design provides the following opportunities to restore and enhance fish habitat within and adjacent to the Project alignment:

- Restoration of Green Slough to its historic alignment under the new south approach span into a small embayment on Deas Slough, resulting in creation of 1,700 $m^2$ of instream and 1,275 $m^2$ of riparian habitat;
- Restoration of 125 $m^2$ of shallow subtidal fish habitat in Deas Slough, following removal of the existing Deas Slough Bridge instream support piers; and
- Offsetting of unavoidable Project footprint effects on Deas and Green sloughs through the development of comparable or more productive habitat, to be described in a Fish Habitat Offsetting Plan that would be developed in consultation with regulatory authorities. Offsetting habitats would be designed to maintain or improve the productivity of CRA fisheries, as required by DFO for *Fisheries Act* Authorizations.

Marine Mammals

The Project is located in close proximity to the Strait of Georgia which supports a number of marine mammals, including toothed whales, baleen whales, seals, sea lions, and sea otters. In the Strait of Georgia, marine mammals are the focus of a substantial wildlife viewing and ecotourism industry and are of cultural importance to Aboriginal Groups and the public. Seals and sea lions occur in or near the Project alignment seasonally, with peak abundance in the lower Fraser River and estuary typically coinciding with seasonal physical and biological factors such as availability of prey. Marine mammals use sound as a primary means of underwater communication and sensing.

A desktop literature review was done to assess harbour seal presence and abundance, including juveniles that are seasonally present in the Fraser River. The Application noted that while harbour seal are seasonally present in the Fraser River, they are relatively uncommon in the river when compared to their primary habitat (marine), and any potential short-term effects from Project construction would not affect their ability to feed and successfully reproduce, or result in population-level effects.

Potential Project effects to marine mammals identified in the Application include physical injury and/or behavioral disturbance during Project construction activities that would produce underwater and atmospheric noise, including impact pile driving, vibratory pile driving, vibrodensification, sediment removal, lifting of the Tunnel segments and support vessel movements.

Underwater and atmospheric noise generated during the Project construction phase was considered in the assessment. Project operation activities are not anticipated to generate underwater or atmospheric noise that can physically injure or change marine mammal behaviour. Potential changes associated with other Project interactions, including potential changes to sediment and water quality and potential collisions with vessels and other construction equipment either on land or in water, were determined to have a negligible effect on marine mammals and were not considered further.

Regulatory criteria were used to assess Project-related sound exposure to marine mammals. These criteria incorporate available known marine mammal reactions and various physical injury and behavioural effects due to pulsed and non-pulsed underwater noise sources. Underwater noise could affect marine mammal hearing, communication, or behaviour. Effects to hearing could include temporary or permanent hearing loss, or auditory masking. Behavioural effects could include increased

breathing raters, more time spent under or at the water surfaces, changes in swimming direction or speed, or displacement or avoidance of habitat. Potential effects from construction activities are anticipated to be similar for all marine mammals (i.e. seals and sea lions) occurring in the LAA within the Fraser River.

The Application also stated that the Project is not anticipated to affect southern resident killer whales (SRKW). Based on the results of underwater noise modelling, underwater noise generated by Project-related activities is not predicted to extend outside of the Fraser River, and therefore would not affect SRKW. In addition, the Application also indicates that the Project is not expected to affect the population integrity of any fish species in the Fraser River that support SRKW, including Chinook salmon. 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) and would not occur at a volume or frequency that could influence overall marine traffic patterns outside of the Fraser River South Arm.

The Application stated that the implementation of the mitigation measures described is anticipated to prevent physical injury and minimize the potential for behavioural disturbance of marine mammals (as represented by harbour seals). The Proponent states that Project-related construction activities are not anticipated to result in population-level effects to marine mammals, including species at risk, and no residual effects on marine mammals are anticipated.

Underwater Noise

The Application identified the potential for effects on fish and marine mammals from pulsed noise sources during construction, in particular from pile driving along the edge of Deas Slough, as well as non-pulsed noise sources from vibratory pile-driving, cutter suction dredging, rip rap removal, and tug and barge operations.

The highest potential level of pulsed noise would be generated by pile driving along the edge of Deas Slough during high tide; however, modelling results indicated that noise from this activity was concentrated at low frequencies (< 200 Hz), which dissipate rapidly in the shallow sediments of Deas Slough, confining the zone where the marine mammal behavioural disturbance threshold is reached to a relatively small (0.6 km) extent within Deas Slough. The results of underwater noise modelling of the scenario involving 100 minutes (3,500 blows) of impact pile-driving along the edge of Deas Slough, without mitigation, indicate that the potential extent of acoustic injury zone associated with this activity would be within 700 m for fish weighing less than two grams and approximately 600 m for fish weighing two grams or more. Modelling

results also indicate that underwater noise levels would be lower than the thresholds recommended for preventing auditory injury in seals and sea lions beyond 600 m from the source. These predictions are considered conservative because the model assumes that the receiver (i.e., fish or marine mammal) is stationary for the duration of the sound exposure.

Of the non-pulsed noise sources modelled, cutter suction dredging was found to generate the highest levels of underwater noise. The spatial extent within which the behavioural disturbance threshold for marine mammals was reached was smallest (0.44 km) for tug and barge activities associated with crane lift of the Tunnel segments. Noise generated by tug and barge traffic associated with the Project was found to be similar to existing ambient noise levels in the Fraser River South Arm, where the behavioural disturbance threshold for marine mammals is exceeded 20% of the time, primarily due to larger vessels such as tugs and container ships transiting in the river. A combination of cutter suction dredging, rip rap removal, and tug and barge operations was found to create the largest zone (3.45 km) where the behavioural disturbance threshold for marine mammals is exceeded.

Underwater noise from construction activities is expected to attenuate more rapidly with distance in Deas Slough than in the Fraser River South Arm. Sound is strongly attenuated in shallow water such at Deas Slough because of increased bottom loss resulting from absorption of sound energy by sediments. Furthermore, bottom loss is enhanced by soft sediments such as silt and clay, which are more absorptive than harder materials like sand and gravel. As a result, sound propagation in Deas Slough is further restricted by Deas Island and the surrounding riverbank.

Mitigation Measures

Key mitigation measures for preventing or minimizing the effect of the Project on fish and fish habitat, as identified in the Application, include:

- Designing the new bridge with a clear span across the Fraser River South Arm, thereby avoiding instream footprint effects in the river mainstem;
- Preparing and implementing a fish and fish habitat management plan that would describe mitigation measures to avoid or minimize potential Project-related adverse effects to fish and fish habitat, including physical injury or direct mortality, exposure to underwater noise or elevated TSS levels, and potential changes in fish habitat quality;

- Avoiding propagation of underwater noise from activities such as pile driving by implementing work within areas of temporary infill or scheduling such activities during periods of low tide, when work can be completed under shallow water conditions or in the dry;
- Incorporating stormwater management in the new bridge design and highway to mitigate potential effects to fish and fish habitat due to storm runoff-related changes in ambient water quality during Project operation;
- Preparing and implementing an erosion and sediment control plan describing measures to avoid or minimize potential physical injury or direct mortality of fish from elevated TSS levels, or changes in fish habitat quality resulting from degradation of ambient water quality due to induced turbidity, and re-mobilization of sediment contaminants;
- Preparing an underwater noise monitoring program which would be conducted during Project construction activities that have the potential to generate underwater sound levels that may exceed auditory thresholds that can cause physical injury to fish. If warranted by the results of monitoring, additional mitigation measures (e.g., bubble curtains or sound-damping sleeves) would be deployed;
- Enhancing fish habitat within and adjacent to the Project alignment, and monitoring and managing the effectiveness of Project-related habitat enhancement features through a follow-up monitoring program; and
- Developing and implementing a Fish Habitat Offsetting Plan to identify on- or near-site offsetting opportunities, outline offsetting implementation methods, and be designed to maintain or improve the productivity of CRA fisheries, as required for *Fisheries Act* Authorizations. To address the potential risk associated with offsetting habitat(s) not becoming fully functional, effectiveness of these features would be confirmed through a follow-up monitoring program as required by DFO.

The Proponent indicated that implementation of mitigation measures is anticipated to avoid or minimize physical injury or direct mortality, exposure to underwater noise or elevated TSS levels, and changes in fish habitat quality. Underwater noise mitigation is expected to be immediately effective in protecting fish from noise levels that could result in injury or mortality, and minimizing the potential for behavioural disturbance of fish.

Key mitigation measures for preventing or minimizing the effect of the Project on marine mammals, as identified in the Application, include:

- Preparing and implementing a marine mammal management plan to mitigate potential effects to marine mammals during Project construction activities that generate underwater noise; and
- Qualified environmental monitors would be onsite at all times during construction activities to monitor marine mammal activity in the vicinity of the Project and take appropriate action if marine mammals enter these zones. If harbour seals or other marine mammals are observed in the construction area, their activity would be monitored closely, and noise-generating construction activities would be shut down if they enter the pre-defined zones of potential injury or behavioural disturbance.

Implementation of mitigation measures is anticipated to prevent physical injury and minimize the potential for behavioural disturbance of marine mammals. Mitigation is expected to be immediately effective in protecting marine mammals from underwater noise levels that could result in injury or mortality.

### 4.3.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During their review of the Application, the Working Group and the public raised concerns about the potential effects of the Project on fish and fish habitat and marine mammals.

*Fish Habitat Offsetting and Habitat Improvement*

Several comments were raised by Working Group members with respect to habitat offsetting and proposed habitat enhancement opportunities. Musqueam Indian Band and Tsleil-Waututh Nation questioned what mitigation measures might be considered by the Proponent if habitats do not become fully functional and results in loss of fish habitat. Lyackson First Nation also questioned the effectiveness of proposed mitigation measures and how the Proponent would compensate Aboriginal Groups for losses to their marine resources and cultural practices. Hwlitsum requested additional information on the types of offsetting being considered and potential timelines of habitat offsetting.

The Proponent responded that unavoidable Project footprint effects of the Project on Deas Slough and Green Slough would be offset through the development of comparable habitat, to be described in a fish habitat offsetting plan, which would be developed in consultation with regulatory agencies and

Aboriginal Groups. The Proponent has committed to the following habitat enhancements:

- Restoration of the historic Green Slough alignment under the new south approach span into a small embayment on Deas Slough;
- Restoration of shallow subtidal fish habitat in Deas Slough, following removal of in-stream support piers of the Deas Slough Bridge;
- Restoration of upland areas on Deas Island following Tunnel decommissioning; and
- Enhancing habitat values, relative to current conditions, along upland ditches and watercourses adjacent to the existing Highway 99.

The Proponent also noted that fish habitat enhancement and offsetting opportunities would be identified and designed in consultation with relevant stakeholders, including Aboriginal Groups, municipalities, and regulatory agencies. They would be implemented following completion of construction of the new bridge and approaches, and in accordance with applicable approvals and authorizations. Offsetting fish habitats would be designed to maintain or improve the productivity of CRA fisheries. Habitat offsetting features are expected to provide some immediate benefits, and become fully productive and viable within three to five years following their creation. To address the potential risk associated with offsetting habitat(s) not becoming fully functional within an appropriate timeframe, proper function and effectiveness of these features would be confirmed through a follow-up monitoring program.

EAO proposes a condition requiring the Proponent to develop a plan for offsetting adverse impacts to fish habitat. The plan would also include identification and implementation of a monitoring program to evaluate the effectiveness of mitigation and offset measures and a description of how Aboriginal traditional knowledge and traditional use has been incorporated in the plan.

*Underwater Noise*

Musqueam Indian Band, Cowichan Nation Alliance, Katzie First Nation, Kwantlen First Nation and Lyackson First Nation raised concerns regarding potential noise effects to fish in the Fraser River. Musqueam Indian Band and Cowichan Nation Alliance specifically questioned the timing of pile driving activities during construction,

as underyearling sockeye have been known to hold in Deas Slough between April and October. It was noted that April to July 15 is outside of the timing window for work in the Fraser River, and therefore should be considered a sensitive time for doing work and that underyearling sockeye would be especially sensitive to noise in Deas Slough due to their size. Cowichan Nation Alliance also requested further details about noise monitoring and mitigation measures that may be implemented in the event that a noise-generating activity is ceased due to a threshold exceedance or negative effects to fish.

The Proponent responded that operation of marine construction vessels and equipment during in-river Project construction activities, including Tunnel decommissioning, have the potential to generate underwater noise at levels that may result in behavioural changes to fish, however the results of the marine operations noise model conducted for the Project showed that minimal change in underwater noise conditions would result, as the noise generated by operating marine construction vessels and equipment is anticipated to be similar to ambient underwater noise levels that characterize the Fraser River South Arm at this location, resulting in no adverse effects on fish and fish habitat.

The Proponent responded that potential effects of underwater noise on fish would be avoided or minimized by adherence to BMPs and other standard industry practices which set appropriate sound thresholds for the protection of fish. The avoidance of any in-water pile driving would be a primary mitigation measure for the Project. Specifically, pile driving would occur within upland areas or, in the case of Green Slough, within areas of temporary infill that are expected to provide effective mitigation through attenuation of noise through soils/ substrates. For any activities that have the potential to generate underwater noise, even where appropriate and effective mitigation measures are being applied, the Proponent committed to conduct underwater noise monitoring. In the event that a threshold is either exceeded or negative effects to fish are noted in the immediate vicinity of a noise-generating activity, the activity would cease until additional mitigation measures are implemented. As described in the application, this could include the deployment of sound-damping devices, such as bubble curtains.

EAO proposes a condition requiring the development and implementation of a fish and fish habitat management plan that would include mitigation and monitoring for underwater noise effects to fish during in-water construction activities in Deas Slough and the Fraser River South Arm.

*Light effects on fish*

Musqueam Indian Band raised a concern that fish species commonly have phototaxis (swimming towards light) and can be disoriented or confused by night lighting. They requested additional information on how the proposed lighting design of the bridge would minimize the impact to fish and fish habitat in the river below.

> The Proponent responded that lighting requirements for the new bridge would be in accordance with applicable highway and bridge design codes, and would incorporate measures to reduce or eliminate light-related effects. For example, dark sky compliant lighting would be diverted away from the water and directed to illuminate the running surface, and would be shielded to reduce light trespass or glare onto adjacent areas. Moreover, the high clearance of the majority of proposed bridge deck diminishes further any potential light-related effects to fish and fish habitat. The Proponent noted that no light-related adverse effects to fish and fish habitat have been documented for similar structures in the lower Fraser River, such as the Alex Fraser Bridge, the Port Mann Bridge, or the existing Deas Slough Bridge. Given these considerations, the Proponent does not anticipate any adverse effects to fish and fish habitat as a result of changes to ambient light conditions associated with bridge deck and pier lighting.

*Timing windows and Tunnel Decommissioning*

Comments were raised by several Aboriginal Groups in relation to least-risk timing windows for fish. It was noted that least-risk timing windows do not take into account critical timing for spawning salmon, trout and char migrating upstream through the Project footprint and that many species migrate during the instream work timing window, including pink, chum, coho, chinook, and sockeye salmon; coastal cutthroat and steelhead trout; Dolly Varden and bull trout. Comments were also raised by several Aboriginal Groups related to how fish migration behaviour would be monitored and what mitigation measures would be put in place if adverse effects to fish during Tunnel decommissioning are greater than anticipated. Musqueam Indian Band requested that construction activities with the potential to crush sturgeon within the Lower Fraser River not be conducted during winter months when sturgeon are more sedentary. FLNRO requested details on how the Proponent would assess the numbers and sizes of sturgeon that are crushed or entrained as part of the sediment removal.

> The Proponent responded that sediment removal for Tunnel decommissioning would be undertaken between July 16 and February 28, the least-risk timing

window for the protection of juvenile salmon and eulachon. Other CRA fish species, such as sturgeon, can also be expected to receive some level of protection from adherence to this in-stream construction window. Sediment removal works anticipated as a result of Tunnel decommissioning are comparable (but substantially smaller in scale) to annual maintenance dredging of other parts of the lower Fraser River.

Other best practices noted by the Proponent could include the use of a hydraulic suction dredge to remove finer sediment prior to Tunnel decommissioning and minimize the risk of crushing. The Proponent noted that the risk of entrainment of juvenile white sturgeon during suction dredging is expected to be relatively minor, given the following considerations:

- Suction created by hydraulic suction dredges declines exponentially from the dredge head. Beyond one metre from the suction dredge head, juvenile white sturgeon with fork length greater than 10 cm are expected to readily disperse and escape entrainment;
- In the tidally-influenced portions of the lower Fraser River, juvenile white sturgeon caught by previous sampling efforts were not smaller than 14 cm fork length; and
- It appears likely that juvenile white sturgeon (<10 cm fork length) are less tolerant of higher salinity waters, such as those encountered in the vicinity of the Tunnel, than are larger size classes.

Given the above considerations, and with adherence to best practices and timing windows, the Proponent considered the risk of crushing or entrainment to be substantially reduced. In terms of monitoring entrainment during dredging work, given the large volumes of dredge material and water being processed, the Proponent stated it is impractical to monitor the number and size of individual fish that might be entrained.

EAO proposes a condition requiring the development of a fish and fish habitat management plan that would include mitigation measures and monitoring to avoid risk of fish injury or mortality from crushing or entrainment and underwater noise during suction dredging and other in-water construction activities.

### 4.3.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the Project would result in the following residual adverse effects on fish and fish habitat:

- Physical injury or mortality to fish during construction.

EAO's characterization of the expected residual effects of the Project on fish and fish habitat, as well as EAO's level of confidence in the effects determination (including their likelihood and significance), are summarized in the table below.

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | **Injury or mortality from crushing or entrainment; or due to exposure to elevated levels of TSS:** Moderate to High sensitivity / Low to Moderate resilience | **Crushing or entrainment/elevated levels of TSS:** Fish species of CRA importance that rely on aquatic habitats throughout the lower Fraser River during different life history stages include Pacific salmon, sturgeon, eulachon, trout, and char. Fish species of conservation concern generally have a higher sensitivity and lower resilience to disturbance.<br><br>Juvenile and smaller size-class fish are more susceptible to crushing or entrainment than larger fish, due to their limited swimming capability, which may prevent them from avoiding the area of disturbance. Because they are associated with bottom substrates, demersal species, such as sturgeon, are more likely to experience adverse effects during dredging Sturgeon also forage and overwinter in the lower Fraser River. Fish eggs, larvae, and later stages of juvenile fish are typically more sensitive to elevated TSS levels than adults of the same species.<br><br>Resilience is considered low to moderate due to the different species affected by Project construction at different life history stages, although EAO notes that in-river construction activities would occur during the least-risk in-stream work window and is expected to protect juvenile salmon, and adult and larval eulachon. |
| | **Injury or mortality from underwater noise:** Low sensitivity / High resilience | **Underwater noise:** The Fraser River South Arm is an active marine transportation corridor, and existing underwater noise levels in the Project area, dominated by noise from vessels transiting the river, are relatively high. Sensitivity of underwater noise conditions in the river to temporary, short-term changes resulting from in-water construction activities, including tunnel decommissioning, is therefore considered to be low. |
| Magnitude | Low | **Crushing or entrainment:** Although most fish tend to disperse away from the noise and physical disturbance associated with sediment |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | removal, it is possible that juvenile sturgeon may be entrained if they are unable to swim away from the disturbance. Entrainment and loss of a few individual fish may occur during Project-related sediment removal; however, this is not expected to adversely affect overall population integrity. The magnitude of the potential residual effects on fish injury or mortality is considered low based on the anticipated level of potential effects and the effectiveness of the proposed mitigations.<br><br>**Elevated Levels of TSS:** Suspended sediment volume is predicted to temporarily increase between 1-9% over ambient levels during Tunnel removal. Given the natural variability of suspended sediment in the river, and that overall population integrity is not expected to be affected, the magnitude of this effect is considered to be low.<br><br>**Underwater noise:** The majority of construction and noise-generating activities near the shoreline are expected to be undertaken in the upland, in areas of temporary infill, in shallow water or in the dry during low tides. With monitoring and mitigation, a measurable change outside of the natural variability is expected; however the residual effects are not expected to result in underwater noise levels that injure fish or marine mammals. |
| Extent | Local | Spatial extent would be restricted to, or in close proximity to, the area of disturbance. |
| Duration | Short-term | **Crushing or entrainment/elevated levels of TSS:** Residual adverse effects of crushing or entrainment; or due to exposure to elevated levels of TSS would occur only during Tunnel removal (Fraser River South Arm). Partial infilling would happen in the dry at low tide. It is unlikely that sturgeon or other fish would be present in shallow areas of Green Slough under low tide conditions and consequently crushing is not expected to occur to this area.<br><br>**Underwater noise:** Potential effects from underwater noise would occur only during specific noise-generating construction activities undertaken in water, and is not expected to persist beyond the duration of such activities. |
| Reversibility | Reversible | **Crushing or entrainment/elevated levels of TSS:** Residual adverse effects to fish injury and mortality would be considered reversible once Project-related construction activities cease. Fish that do disperse are likely to return to the affected area soon after the disturbance has ceased.<br><br>**Underwater noise:** Underwater noise levels are expected to return to |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | baseline conditions as soon as the contributing activity ceases. |
| Frequency | Rare or infrequent | **Crushing or entrainment/elevated levels of TSS:** Fish injury or mortality events would occur rarely during Tunnel removal (Fraser River South Arm) and are not expected to occur in Green Slough.<br><br>**Underwater noise:** Residual effects from pulsed noise would occur only in the unlikely event that an in-water, noise-generating activity cannot be avoided. Effects from non-pulsed noise would occur only during specific noise-generating construction activities undertaken in water, including removal of Tunnel segments and overlying material. |
| Likelihood | The likelihood is moderate of residual effects to fish and fish habitat due to crushing or entrainment or elevated levels of TSS.<br><br>Noise-generating activities of pulsed noise sources near the shoreline are expected to be undertaken in areas of temporary infill, in shallow water or in the dry, during low tides, minimizing the probability of a measurable change in underwater noise. The likelihood of residual effects due to pulsed noise sources is low.<br><br>The likelihood is high that there would be a measurable change in underwater noise during in-water construction and Tunnel decommissioning activities due to non-pulsed noise sources. | |
| Significance | Considering the above analysis and having regard to the conditions identified in the TOC and CPD (which would become legally binding as a condition of an EAC), EAO is satisfied that the Project is not likely to have significant adverse residual effects on fish and fish habitat. | |
| Confidence | There is a moderate level of confidence in the significance and likelihood determinations of effects on fish and fish habitat due to crushing or entrainment, or elevated levels of TSS, and a high level of confidence in the significance and likelihood determinations of effects on fish and fish habitat due to underwater noise. Both levels of confidence are also based on the effectiveness of the proposed mitigation measures, existing federal and provincial regulatory requirements and compliance with the proposed EAC conditions. | |

### 4.3.5 Cumulative Effects Assessment

Annual maintenance dredging along sections of the navigation channel within the Fraser River South Arm is the only certain and reasonably foreseeable activity that could interact temporally and spatially with the Project. The VFPA performs annual maintenance dredging operations in the Fraser River South Arm, which are managed in a way that minimizes adverse effects to fish and fish habitat. The Application notes that dredging operations adhere to BMPs, including use of suction dredging, avoidance of productive fish habitat areas, and adherence to least-risk timing windows (i.e., July 16 to February 28) for the protection of juvenile salmon and eulachon.

Project-related construction effects that could result in a temporary increase in underwater noise levels in the Fraser River South Arm, Deas Slough, or Green Slough, are not anticipated to overlap spatially or temporally with other projects or activities and result in cumulative effects.

### 4.3.6 Conclusions

Considering the above assessment and having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of an EAC), as well as applicable municipal, provincial and federal regulatory requirements, EAO is satisfied that the Project is not likely to have significant adverse effects on fish and fish habitat and marine mammals.

## 4.4 Wildlife

### 4.4.1 Background

Terrestrial wildlife was assessed as a VC due to the potential for Project activities to interact with terrestrial wildlife species and habitat within the Project alignment. The assessment of terrestrial wildlife focused on upland birds, riverine birds and bats, and mammals. Key indicators to inform the assessment to wildlife included habitat loss, sensory disturbance, and collision mortality. At-risk amphibians were also assessed as a VC due to the potential for Project activities to interact with at-risk amphibians (northern red-legged frog and western toad) and their habitat.

The LAA for upland birds and at-risk amphibians is the Project alignment; whereas for riverine birds, bats and mammals, the LAA includes the Project alignment plus 250 m on either side of the Highway 99 centreline. The LAA for all subcomponents is expanded in the vicinity of the new bridge to include Deas Island and Deas Slough. The RAA for all terrestrial wildlife subcomponents includes a 1 km buffer on either side of the Highway 99 centreline, and all of Deas Island. The RAA for at-risk amphibians includes 2 km on either side of the Project alignment.

Wildlife surveys were conducted in 2014 to determine the presence of certain species, habitat suitability, and collision risk for avian and bat species. Table 7 presents some key findings from these studies on the existing conditions for each species group.

**Table 7: Existing Conditions for Terrestrial Wildlife Species Groups**

| Species Group | Existing Conditions |
|---|---|
| Barn owl | • Habitat is limited to agricultural areas, with highest known density in southwest Delta. Breeding occurs from April through to August;<br>• Nests and roosts mainly in man-made structures such as barns, silos and buildings. Field studies identified 49 barn owl occupied sites;<br>• Habitat suitability model found that 15.7% of the LAA was estimated to provide moderate- to high-suitability forging habitat for barn owl;<br>• No occupied nest sites were identified in the LAA, but there are many in the RAA; and<br>• Literature estimates that the mortality on high-use roads in agricultural areas is between 1.64 to 1.85 barn owls per km per year. |
| Raptors | • Fraser River delta has Canada's highest concentration of wintering raptors;<br>• Raptor species observed during field studies included bald eagle, red-tailed hawk, northern harrier, American kestrel, peregrine falcon, rough-legged hawk, and Cooper's hawk. Most abundant was bald eagle, followed by red-tailed hawk; and<br>• 9 raptor nests were identified in the LAA, 4 of which were active during 2014 breeding season. |
| Great blue heron | • Fraser River delta supports largest winter resident great blue hero population in BC. Herons forage in wetland habitats, including ditches and agricultural lands; and<br>• Field studies observed 33 herons in the LAA, but no nests were detected in the LAA. There are no colonies in the LAA or RAA |
| Songbirds | • Fraser River delta an important feeding and restring stop for migratory songbirds; and<br>• Surveys conducted in 2015 and 2016 observed 39 species of songbirds in the LAA. All species observed were common birds of developed locations in the Lower Mainland. |
| Swallows | • Three swallow species (tree swallow, violet-green swallow and barn swallow) commonly occur in Delta and Richmond during the summer; and<br>• 2014 field survey: 3 barn swallow nests and 1 cliff swallow nest observed under the Deas Slough Bridge; 2015 field survey: 13 barn swallow nests and 3 cliff swallow nests observed in the same location. Barn swallow nesting activity was documented, but cliff swallow nests were not active. |
| Marsh birds | • No bittern, rail or sora were detected during 2015 field surveys; however, reasonable habitat was present, but is neither large in extent nor free of nearby disturbances (requirements for marsh birds). |
| Riverine birds and bats | • 2015 radar and stand-watch surveys found that bird diversity and abundance were greater at the Project's proposed bridge crossing (LAA) relative to Port Mann Bridge reference site;<br>• Study at Port Mann Bridge reference site shows that collisions are rare, and birds altered behaviour to fly above or below the bridge structure;<br>• Most observations of at-risk species were above or below interaction zone for existing or proposed new structures, except for barn swallows;<br>• Acoustic and radar sampling surveys confirmed bat presence around the location of the proposed bridge. Most common species present were Yuma and California myotis; and<br>• A Yuma myotis maternity colony was discovered 1 km from the Project in Deas Island Regional Park. |

| Species Group | Existing Conditions |
|---|---|
| Small mammals | • Habitat suitability modelling for the LAA found high suitability habitat for Trowbridge's shrew to be 4% and less than 1% for Pacific water shrew; for southern red-backed vole and Olympic shrew, 13% and 9% of the LAA, respectively, is rated as usable habitat; and<br>• Pacific water shrew DNA was not detected at any surveyed locations. |
| River otter | • Generally, the survey area is considered to be low-suitability river otter habitat; and<br>• Two latrine sites identified in Project alignment. |

To determine existing conditions for at-risk amphibians, a habitat assessment and environmental DNA (eDNA) sampling were conducted. Two wetland communities were evaluated for their habitat suitability for red-legged frog, which included the cattail marsh adjacent to Green Slough, and the flooded forest on the north side of Highway 99 near the Vancouver Landfill. During the eDNA sampling, no red-legged frog or western toad presence was identified in the LAA. The results provide evidence that the red-legged frog is not likely to be using wetlands and ditches in the LAA for breeding.

### 4.4.2 Potential Project Effects and Proposed Mitigation Identified in the Application

This section provides a summary of potential adverse effects on wildlife and key proposed mitigation identified in the Application.

*Habitat Loss*

The Application states that during construction, loss of terrestrial wildlife habitat may occur from clearing and grubbing for temporary and permanent Project-related infrastructure associated with highway widening, interchange upgrades and the installation of new bridge piers. Table 8 presents the different species groups and description of potential habitat loss.

**Table 8: Potential Habitat Loss for Wildlife Species Groups**

| Species Group | Description of Potential Habitat Loss |
|---|---|
| Barn owl | Anticipated loss of some sub-optimal habitat (that has increased collision risk), which could lead to reduced mortality. |
| Raptors | Loss of sup-optimal habitat. Similar habitat areas area available nearby. |
| Great blue heron | Ditch relocation in advance of construction is included in Project design, and is self-compensating for habitat loss. |
| Songbirds | Loss of sub-optimal habitat that contains no unique elements required for populations. Similar habitat is also present nearby. |
| Swallows | No change to foraging habitat; however, potential loss of overall nesting habitat as a result of Deas Slough Bridge removal. |
| Marsh birds | No marsh birds observed during field studies, and small habitat losses in Green Slough only (less than 1 ha in total). |

| Species Group | Description of Potential Habitat Loss |
|---|---|
| Riverine birds and bats | • Loss of sup-optimal habitat. Similar habitat areas area available nearby;<br>• There is a Yuma myotis and possibly little Brown and California bat, maternity colony approximately 1 km from Project alignment, although there does not appear to be a potential for interaction. Nighttime work would occur in areas that are already well-lit and noisy, conditions that indicate low bat use; and<br>• Once the Project becomes operational, bats will continue to find habitat available in the LAA, with only a very small portion (the portion close to the bridge deck lit by vehicles) of the airspace they currently use for foraging being unavailable. Bat foraging habitat will remain available above, below (especially at the Fraser River interface which has the highest recorded use currently), and adjacent to the new bridge. No suitable roosting habitat adjacent to the Project alignment would be affected by the Project. |
| Small mammals | • Loss of high-rated habitat (for southern red-backed vole, Olympic shrew, Pacific water shrew and Trowbridge's shrew) in the LAA would be small areas;<br>• Project components overlap with 10% habitat defined as useable for southern red-blacked vole, and 6% for Olympic shrew; and<br>• 3% overlap with high-rated habitat for Trowbridge's shrew; no overlap with high-rated habitat for Pacific water shrew. |
| River otter | • Identified sites used by river otters are not located in areas with unique habitat features, and river otter are not habitat-limited in the LAA; and<br>• Potential temporary habitat loss at identified sites, but are likely to be reoccupied once construction is complete and habitat features are re-established. |

Temporary loss of at-risk amphibian living habitat may also occur during construction, due to clearing and grubbing of riparian vegetation, temporary de-watering of upland ditches, and installations of temporary drainage structures. Ditch relocation in advance of construction is included in Project design, and is self-compensating for habitat loss. It is anticipated that there would be some overlap between the Project components and amphibian habitat, specifically the cattail marsh adjacent to Green Slough where the support piers for the new bridge would be located.

*Habitat Alteration and Sensory Disturbance*

Project construction activities may increase noise levels or create visual and olfactory stimuli, which could result in sensory disturbance to terrestrial wildlife and create sub-optimal habitat or lead to habitat abandonment. The predicted noise and visual disturbances during construction are considered to be only slightly greater than the current baseline of activity in the LAA, which is dominated by three high-volume highways; Highways 99, 17A, and 17. Temporary abandonment around construction sites is expected to occur (i.e., raptors and great blue heron within 100 m of construction sites), but re-establishment is anticipated after construction is complete.

Beyond 100 m, given current human activity (noise and movement) the abandonment of habitat by wildlife is unlikely. For at-risk amphibians, clearing, ditch relocation and interchange upgrades have the potential to increase sedimentation and degrade ambient water quality in their living habitat. Accidental spills and failure of sediment containment measures could also result in changes to ambient water quality during construction.

Operation of the Project may also lead to habitat alteration for terrestrial wildlife, primarily through sensory disturbance which could occur by changes in light and noise that would accompany traffic growth, the operation of the new bridge, and water quality changes associated with ditch and watercourse alterations. Existing noise levels in the LAA are already high, and species that use this area have generally adapted to the existing conditions. Noise modelling indicated that sensory disturbance to terrestrial wildlife would be unlikely, as the difference between the maximum increase in noise with the Project (2.2 dBA) and without the Project (1.8 dBA) would be small.

Similarly, the Application considered Project-related changes to the existing light environment to be negligible. Light from vehicles is considered a small incremental increase because the current traffic volumes are high, and future forecasted traffic volumes would not result in measurable changes in light from vehicles. Interchange lighting would be similar to that of the existing highway in the LAA. While the bridge would include lighting to meet safety requirements, the current right-of-way across Deas Island also includes lighting; future conditions, which would include design considerations to minimize light-spill, is not anticipated to be substantially different. Despite the absence of long-term trend monitoring, the Application notes that species that are present in the Project area are expected to be habituated to the typical noise and lighting associated with a busy highway.

Highway maintenance activities, including ditch cleaning and riparian vegetation maintenance, may induce turbidity within upland ditches and degrade ambient water quality in at-risk amphibian living habitat. The widening of the highway is expected to result in an increase of stormwater runoff entering upland ditches, which could also alter at-risk amphibian living habitat.

*Mortality of Terrestrial Wildlife and At-risk Amphibians*

Direct mortality of terrestrial wildlife during construction could potentially occur during vegetation clearing and grubbing, stripping, soil excavation and decommissioning of the Deas Slough Bridge. In particular, these construction activities may lead to the destruction or failure of active bird nests and the mortality of small mammals that inhabit

woody debris, litter and soil. Since no at-risk amphibians were found in the Project alignment, the Application notes that interactions with construction activities are unlikely and mortality of at-risk amphibians is expected to be negligible.

Operation of the Project has the potential to adversely affect terrestrial wildlife by causing mortality of terrestrial wildlife due to collision with vehicles, mortality of upland birds due to destruction of active nests during maintenance and mortality of upland birds, riverine birds and bats as a result of collision with the new bridge.

The Application notes that barn owls are known to be affected by road collision mortality, due to collisions during use of highway verges, or from crossing roads between suitable habitats. For upland birds, changes to Highway 99 are not expected to markedly alter the level of collision effects over those currently seen which are generally low for most species. Traffic volumes are currently high, and would continue to be high after completion of the Project. Given the current traffic volumes, incremental future Project-related collision mortality increases would be negligible over the current baseline.

Barn owls are known to be affected by road collision mortality. This is particularly true during forced (no other habitat available) or voluntary use of highway verges where their primary prey, voles, is found in high densities, or from crossing roads between suitable habitats. Literature sources in the Application estimate the rate of mortality on high-use roads such as Highway 99 in agricultural areas is between 1.64 to 1.85 barn owls per km per year and that highway traffic exposure and the length of highways was shown to be the strongest predictor of collisions. Although barn owl mortality data along Highway 99 is not formally collected, incidental mortalities confirm that a collision risk currently exists in some areas. Since 2010, the Application reports that three to seven mortalities per year have been noted in the LAA between Highway 17A and Highway 91 and that mortalities on Highway 17 (South Fraser Perimeter Road), which includes mitigation to avoid barn owl collision, are monitored and that no barn owl mortalities have been reported on or adjacent to Highway 17 at the Project alignment.

For bird species that travel along the Fraser River, the addition of the bridge could potentially increase collision risk. Most of the birds (more than 70%) that are currently flying at elevations that could place them at risk, are species that appear to have an awareness of the presence of structures and sufficient manoeuvrability, so that they can avoid collisions. Such species include pigeons, swallows and cormorants, and therefore collision risk for these species is considered low. For other species, behavioral observations made at the Port Mann bridge show that most birds avoid collision by

flying above or below the bridge structures. Similar behaviour is expected for birds in the LAA.

Key mitigation measures for preventing or minimizing the effect of the Project on terrestrial wildlife and at-risk amphibians, as identified in the Application, include:

- Lighting design (including flashing navigation safety lighting) on the bridge and Highway 99 corridor would address safety requirements while including standard practices (e.g. shielding interchange and bridge lighting to reduce light trespass or glare) to minimize sensory disturbance to terrestrial wildlife;
- Overlap between the bridge support piers and the cattail marsh adjacent to Green Slough would be minimized to not affect the functionality of the ecosystem and would be offset through the creation of a cattail marsh;
- Strategies to mitigate potential adverse effects to terrestrial wildlife and semi-aquatic wildlife, including pre-construction requirements such as nest survey protocols, otter latrine and den surveys, timing window restrictions, buffer zones, and wildlife salvage procedures, would be implemented. Offsetting measures, if warranted, would also be included;
- Amphibian salvage and translocation would be conducted to avoid or minimize potential Project-related mortality to native amphibians from instream works during construction;
- Construction activities would be planned to coincide with least-risk timing windows for wildlife;
- Where clearing and grubbing must proceed during the bird breeding season, nest surveys would be conducted prior to the start of such works to confirm the presence/not detected status of breeding birds, and location of nesting sites;
- Prior to clearing and grubbing, wildlife salvage may be undertaken if there are locations of known small mammal occurrences; and
- Suitable replacement structures for barn swallow nesting would be provided in advance of Deas Slough Bridge removal, with the construction of the new bridge, and within the access route for maintenance of the new piers.

### 4.4.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

*Mitigation for Green Slough*

ECCC and FLNRO raised concerns regarding the proposed mitigation measures for Green Slough. Specifically, ECCC requested further information on wetland restoration efforts in Green Slough and FLRNO asked what steps would be taken to ensure water quality is sufficient to support amphibians.

The Proponent responded that restored habitat in Green Slough would be subject to post-construction monitoring to ensure habitat is functioning as intended. Details of frequency and duration of water quality monitoring will be described within the CEMPs. Under current conditions, runoff from the adjacent road surfaces flows directly, without any treatment, into the cattail marsh near Green Slough. The Proponent notes that the proposed installation of the biofiltration pond to capture and treat this runoff would result in substantial improvement in the quality of water entering the marsh and consequent improvement in habitat conditions.

EAO proposes a condition requiring the Proponent to develop a plan for offsetting the adverse impacts to fish habitat, which would include the requirement for the Proponent to restore Green Slough under the new south approach bridge span and would also include identification and implementation of a monitoring program to evaluate the effectiveness of mitigation and offsetting measures.

*Collision Risk to Barn Owls*

ECCC and FLNRO raised concerns regarding the mitigation measures proposed in the Application to address the increased collision risk to barn owls. Specifically, FLNRO requested further details on specific locations, while ECCC suggested further measures to address the increased risk to barn owls. ECCC also stated that they do not recommend the removal of suitable foraging habitat as a mean to reduce Barn Owl road mortality, as one of the leading causes of decline of the Lower Mainland Barn Owl population is continued habitat loss. In addition, Barn Owls have been assessed by COSEWIC as ‘threatened’, and if there is a positive listing decision by the Governor in Council, critical habitat identification may overlap with the construction and operations of the Project. ECCC recommended that the Proponent consider this draft critical habitat information and take measures to avoid and eliminate effects to this habitat, and propose a monitoring program that is consistent with the recovery strategy.

The Proponent responded that the removal of roadside verges (in order to support highway lanes) is considered part of the Project scope and not a mitigation measure or follow-up strategy to reduce barn owl mortality. However, the Project design would result in a reduction in the spatial extent of roadside verges, which is anticipated to reduce collision risk for barn owls in some locations. In general, hedgerows are proposed where there is right-of-way (ROW) availability close to high suitable barn owl foraging habitat along the Project alignment, and suitability mapping suggest that these areas will be primarily south of the Highway 17A interchange. However, the precise locations and extent of hedgerows will be identified during the detailed design phase of the Project. Monitoring will also be conducted to test the effectiveness of the hedgerows. The Proponent has committed to working with ECCC to understand the extent of proposed draft critical habitat for barn owl. Once a recovery strategy is developed, the Proponent would determine what measures can be taken within the existing highway right-of-way, to support the strategy's objectives.

Data on wildlife interaction along the Project alignment, including vehicle collision data for barn owls, would be collected prior to and during construction to help design effective mitigation and identify any trends. Wildlife monitoring would be conducted on the operational highway as part of the Ministry of Transportation and Infrastructure's Wildlife Accident Reporting System and reports would be reviewed monthly by the Proponent to confirm mitigation effectiveness and identify any trends or indications that suggest the need for further action.

EAO proposes a condition requiring the development of an operations wildlife and wildlife habitat management plan that would include the identification of the areas and times when data on barn owl vehicle collision incidents would be monitored.

*Impacts to Barn Swallows*

ECCC raised concerns regarding the proposed mitigation measures for barn swallows, specifically new nesting structures, as evidence suggests that these structures are only used minimally by barn swallows. ECCC also recommended that the Proponent minimize and avoid impacts to foraging habitat and food sources (insects).

The Proponent responded that their conclusion that barn swallow foraging habitat would not be affected by the Project is based on the current habitat conditions in the existing right-of-way (that do not provide substantive habitat value);

avoidance of Project-related effects on riparian and wetland areas adjacent to the Deas Slough bridge; and the restoration of Green Slough, which is anticipated to provide a benefit to invertebrate populations by adding riparian and wetland habitat.

In terms of the nesting structures, the Proponent responded that the precise design and locations of alternate nesting structures for barn swallows would be advanced during the detailed design phase of the Project, and that the Proponent would continue to consult with ECCC on the matter. The Proponent committed to conduct monitoring for barn swallow to test efficacy of mitigation measures.

EAO proposes a condition requiring the development of an operations wildlife and wildlife habitat management plan that would include monitoring of barn swallow nesting, in consultation with ECCC.

*Impacts to Wildlife on Deas Island*

Metro Vancouver, Lyackson First Nation and ECCC raised concerns regarding potential effects to terrestrial wildlife and at-risk amphibians on Deas Island, including impacts to the movement of birds in the area, as well as impacts to bald eagle nests and a bat colony. Metro Vancouver noted that one of the largest and most significant Yuma bat colonies in the Lower Mainland is located on Deas Island, and that colony could be affected by noise and construction activities during the breeding season (May to August) as well as by light from the bridge. Metro Vancouver requested that the Proponent commit to timing windows to avoid temporary and permanent disturbance to the bat colony.

The Proponent responded that construction activities are not expected to result in direct mortality of birds moving between Deas Island Regional Park and nearby forests. Nest disturbance would be minimized through mitigation measures proposed, such as clearing outside of bird breeding season and pre-clearing surveys. Bald eagles are generally tolerant to human activities, as demonstrated by their presence in the corridor, and there are practical measures that have been shown to be effective in minimizing effects on this species.

With respect to bats, the Proponent responded that based on the work undertaken in Project planning to understand potential effects on the existing bat maternity colony on Deas Island, the Proponent does not anticipate potential effects during construction or operation of the Project. This conclusion is based on several factors, including distance of the colony from the highway ROW;

provincial BMPs (e.g. buffer distance protections associated with bat colonies); minimal bat presence in the current ROW and areas directly adjacent as a result of existing levels of disturbance; and the presence of substantial alternative foraging habitat in adjacent areas. Lighting conditions associated with the bridge, which is designed to avoid light spill into adjacent areas, are anticipated to be similar to that associated with the existing highway infrastructure. While the Proponent's conclusion is that the Project would not result in effects on the existing maternal bat colony, the Proponent committed to undertake emergence monitoring at the maternal bat colony located within Deas Island Regional Park during the construction period to confirm the predictions of the effects assessment.

EAO proposes a condition that would require the Proponent to include, as part of its construction wildlife and wildlife habitat management plan, a description of how emergence monitoring at the maternal bat colony located on Deas Island Regional Park would be undertaken. The Proponent would be required to consult with Metro Vancouver in developing this plan.

#### 4.4.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures for wildlife, EAO concludes that the Project would result in the following residual adverse effects on wildlife:

- Loss of barn swallow habitat during construction; and
- Barn owl mortality during operations.

Summarized below is EAO's assessment of the expected residual effects of the Project on wildlife, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Low to moderate sensitivity | The Project area is a developed urban area within the existing Highway 99 corridor. Terrestrial wildlife in this area is already accustomed to traffic, noise and some lighting, and therefore have low sensitivity to further development. However, wildlife on Deas Island may be more sensitive to change in existing conditions with the addition of the new bridge. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Magnitude | **Barn swallow:** Moderate<br>**Barn owl:** Low | **Barn swallow**: Habitat loss associated with the removal of Deas Slough Bridge is considered to be of moderate magnitude, as the bridge is one of the few barn swallow nesting locations available in the LAA. However, other suitable nesting habitat is available outside the LAA, which is expected to minimize the magnitude of habitat loss effects.<br>**Barn owl**: As current traffic levels are already high, increases in collision risk for barn owl, as a result of forecasted increase in traffic volume, are not considered a risk to population survival due to proposed mitigation measures, which have proven effective on Highway 17. |
| Extent | **All:** Site-specific | The effects on terrestrial wildlife would be confined to specific sites, specifically to barn swallow nesting sites, and to Highway 99 where barn owl collisions may occur. |
| Duration | **Barn swallow:** Temporary<br>**Barn owl:** Long-term | **Barn swallow:** the loss of barn swallow nesting habitat would be temporary as the new bridge would be constructed and new nesting habitat would become available before Deas Slough Bridge is removed. If barn swallows do not use the bridge for habitat, artificial structures would be constructed, thereby reducing potential duration of effect.<br>**Barn owl:** barn owl mortality is expected to last throughout Project operations. |
| Reversibility | **All:** Reversible | **Barn swallow:** since new habitat would be made available before Deas Slough Bridge is removed, the effect is considered reversible.<br>**Barn owl:** populations can recover or be maintained, and are therefore considered reversible. |
| Frequency | **Barn swallow:** Single<br>**Barn owl:** Infrequent | **Barn swallow:** The effect would only occur once when the Deas Slough Bridge is removed.<br>**Barn owl:** The effect would occur infrequently during operations. |
| Likelihood | The likelihood is high that adverse effects on terrestrial wildlife discussed above would occur during Project construction and operations. | |
| Significance | Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the Project is not likely to have significant adverse residual effects on wildlife. | |
| Confidence | There is a high level of confidence in the likelihood and significance determination. | |

### 4.4.5 Cumulative Effects Assessment

Two projects in the area identified the presence of barn swallows and barn owls (Vancouver Airport Fuel Delivery and Roberts Bank Terminal 2). However, there were no residual effects identified to either species for these projects.

For other projects that may interact with barn swallows, but did not publish information describing effects, the Proponent conducted a review of the anticipated nature and extent of effects from these projects, which determined no residual effects on barn swallows are anticipated due to i) a lack of structures suitable for breeding in the respective project areas (e.g., Fraser River Dredging), or ii) the projects are too early in the design phases to understand the potential for residual effects (e.g., Pattullo Bridge Replacement). No cumulative effects on barn swallows are anticipated.

For other projects, that may interact with barn owls, but did not publish information describing effects, a review of the anticipated nature and extent of effects from these projects in regards to collision effect potential was conducted. The Pattullo Bridge Replacement involves vehicles that could collide with barn owl, but the project is too early in the design phases to understand the potential for residual effects. The South Fraser Perimeter Road Project (SFPR) was recently constructed and opened, and does interact with barn owls, although mitigation measures such as use of hedgerows were used along SFPR. An adaptive management plan to design mitigation and monitory efficacy was developed for SFPR. Monitoring indicates that populations of barn owls have been maintained. In areas of higher-than-expected mortality, additional mitigation is being proposed. While there is an interaction between SFPR and the Project, mitigation of effects currently being conducted on SFPR, and that proposed for the Project, is considered effective in avoiding cumulative effects on barn owl in southwest Delta.

#### 4.4.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of an EAC), EAO is satisfied that the Project is not likely to have significant adverse residual effects on wildlife.

## 4.5 Vegetation

### 4.5.1 Background

Vegetation was assessed as a VC due to the potential for the Project to have adverse effects on non-agricultural vegetated ecosystems that include native vegetation, vegetation communities of concern, and plant species of concern. Potential effects of the Project on agricultural lands are assessed in section 5.1 of this Report.

The Project is located largely in a highly disturbed area, within the ROW of an active transportation corridor where vegetation is generally indicative of effects of urban and

agricultural development. Small portions within the Project alignment support native vegetation, which may include species or ecosystems that are considered to be at risk by provincial or federal regulators, or are of interest to Aboriginal Groups.

The LAA is a 500 m wide corridor extending 250 m from either side of the Highway 99 centreline, over the length of the Project alignment, including interchanges. In the area of Deas Island, the LAA is extended to include the entire island. LAA and RAA are identical as the Project's potential effects are not expected to occur outside the LAA.

The assessment of vegetation focused on two indicators: at-risk plant species and at-risk plant ecosystems. The assessment examined the presence and extent by quantifying existing abundance and possible reduction in abundance of individual at-risk plant species and of plant communities potentially affected by clearing and habitat alteration.

The Proponent conducted a Terrestrial Ecosystem Mapping (TEM) desktop assessment to identify the potential locations of at-risk plants or ecosystems. TEM findings further informed the location of field surveys conducted to confirm presence of the studied components on the ground. The TEM study identified eight types of vegetated ecosystems in the LAA, comprising four wetland types, three forested types, and one sand dune ecosystem. Four agricultural land cover types and eight non-vegetated or anthropogenic land cover types constitute the remainder of the LAA.

No at-risk plant species were encountered during the field rare plant surveys, although Aboriginal Groups reported general observations of two species of lupine: the native streambank lupine (*Lupinus rivularis*) and the introduced tree lupine (*Lupinus arboreas*) in the study area. The Application noted that there are no mapped occurrences of streambank lupine or critical habitat polygons within the Project alignment and no plants were observed during the at-risk plant surveys.

### 4.5.2 Potential Project Effects and Proposed Mitigation Described in the Application

The majority of potential Project-related disturbance to vegetation would occur during construction-related activities, such as installation of temporary roads, bridges and detours, or clearing and grubbing of vegetation. The most important at-risk ecosystems that have the potential to interact with the Project consist of cattail marshes. Small portions (approximately 0.1 ha) of the cattail marsh located between Green Slough and River Road would be cleared of vegetation and grubbed during site preparation to accommodate installation of piles and piers for the new bridge. This cattail marsh is already disturbed due to the presence of invasive plants, roadside runoff, and garbage and the Application notes that effects would be minor.

Indirect disturbance through the introduction of invasive alien plants via construction vehicles or equipment may also occur. During operations, Project activities (including routine maintenance) are not expected to affect these ecosystems.

The following habitat enhancement measures are proposed to improve the functionality of this ecosystem:

- Removal of invasive species and garbage from the marsh, and revegetation using native species as appropriate to improve habitat quality in the area surrounding the new bridge support piers;
- Installation of an appropriate stormwater management system for the upgraded highway and the new bridge to avoid potential introduction of contaminants into the ecosystem through road runoff; and
- Follow-up monitoring of the effectiveness of the enhancement efforts.

Project footprint effects on the cattail marsh near River Road would also be offset through the creation of comparable cattail marsh habitat within the Project alignment. The measures above are expected to improve the quality and viability of the ecosystem and counteract potential effects of the small overlap with the proposed bridge support piers. An additional 2 ha in cattail marshes adjacent to the Highway 91 and Highway 99 interchange could potentially be affected during Project construction. The Application notes that available areas of open water would be revegetated with native cattails once Project construction is complete. The Application expects this marsh to be recolonized successfully and recover from construction-related disturbance if shallow-water habitat is retained during and after construction.
The new bridge and interchanges would be designed to prevent the direct release of storm water runoff from road surfaces into wetlands and waterbodies. Avoidance measures consist of appropriate site and route selection, scheduling, design, and construction and operation procedures and practices.

Key mitigation measures in the Proponent's terrestrial vegetation and wildlife management plan, that address potential effects on at-risk plant species and communities, would include:

- Limiting access points and storage of heavy machinery to prevent soil compaction within and adjacent the cattail marshes;
- Incorporating a collection and distribution system to convey and discharge stormwater runoff to appropriate upland infrastructure for proper treatment;

- Replanting exposed soil and reclaimed areas with native plant species, including species of importance to Aboriginal Groups, such as cattails, wapato, and berry-producing species; and
- Implementing provisions of the Proponent's *Best Practices Guide for Managing Invasive Plants on Roadways.*

### 4.5.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, the Working Group raised questions and concerns regarding the potential effects to vegetation.

Cowichan Nation Alliance requested that an impact assessment be conducted for all at-risk plant species and ecosystems within the LAA, not only for those overlapping the Project footprint.

> The Proponent responded that at risk plants and plant communities would be identified in the field prior to construction.
>
> EAO proposes a condition requiring the Proponent to conduct site habitat assessment surveys for red- and blue-listed plants and ecological communities identified by the BC Conservation Data Centre, for locations within the Project Footprint that may support red- and blue-listed plants and ecological communities, and to provide the survey results and mitigation measures to EAO, ECCC, FLNRO, and Aboriginal Groups for review.

Metro Vancouver requested that the Proponent dispose of invasive species at an appropriate industrial compost facility, dispose of soil contaminated with invasive species at a facility for deep burial, and use fill and soil amendments that are weed-free.

> EAO proposes a condition requiring the Proponent to control invasive plant species during construction in accordance with the Ministry of Transportation and Infrastructure's *Best Practices for Managing Invasive Plants on Roadsides*.

Richmond raised concerns related to the Project consistency with the Regional Context Statement (RCS) to protect and enhance natural features and their connectivity by implementing the 2012 Environmentally Sensitive Areas (ESA) Management Strategy which includes a best practices Ecological Network Concept, Riparian Area and enhanced 2012 ESA policies and guidelines. They requested clarifications related to measures the Proponent would take to ensure the desired consistency. Specifically,

Richmond requested the Proponent to demonstrate how the Project would maintain, protect and enhance Richmond's Riparian Management Area (RMA) and ESAs within agricultural lands on both sides of Highway 99 through a net gain approach.

> The Proponent responded that the Project would include measures to improve habitat conditions and ecological productivity associated with water courses that exist within the Project ROW in a manner that is consistent with the intent of Richmond's RMA and ESA frameworks and that doing so would provide benefits to multiple users (i.e., drainage, irrigation, and habitat). Improvements in ecological productivity would be achieved through the establishment of riparian buffers, planted with appropriate vegetation (i.e., native shrubs and trees), where RMAs and ESAs that fall within the highway ROW are relocated or otherwise affected. A detailed accounting of improvements to habitat values would be provided in the Proponent's application for approvals under the *Water Sustainability Act*. It is anticipated that the *Water Sustainability Act* application would be shared with Richmond by FLNRO through the referrals process.

#### 4.5.4 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC and CPD (which would become legally binding as a condition of the EAC), EAO is satisfied that the Project would have negligible effects on vegetation.

# 5 Assessment of Socio-Economic Effects

## 5.1 Agricultural Use

### 5.1.1 Background

Agricultural use was assessed as a VC due to the potential for Project activities to interact with agricultural activities in the Project alignment and areas adjacent to the Project. The assessment of agricultural use focused on the following three subcomponents: land in the ALR; irrigation and drainage; and farm infrastructure and operations.

The LAA for agricultural use includes Richmond, Delta and Surrey. The RAA is defined by the boundaries of Metro Vancouver.

The existing Highway 99 corridor is bordered by ALR along 26.6 km of its 40 km length, which includes ALR in both Richmond and Delta. Approximately 59% of Richmond's ALR is used for farming, whereas 76% of Delta's total ALR is used for farming.

Agricultural capability is rated through the Land Capability Classification for Agriculture in BC, which uses seven classes (Class 1 being the highest capability and Class 7 the lowest). The indicator “change in ALR land by capability class” was chosen to assess potential effects to the ALR subcomponent.

The RAA includes less than 2% of BC’s total area of farms; however, the farms in the RAA generate over 25% of the total gross farm receipts, largely due to favourable climate and proximity to markets. Forage and pasture make up almost 50% of the crop found in the RAA, followed by berries, vegetables, nursery and tree plantations. Agricultural land in the RAA is one of the most important food producing areas in BC, and is a key component to Metro Vancouver’s economy. The indicator “change in farm operations” was chosen to assess potential effects to the farm infrastructure and operations subcomponent.

Adequate soil drainage is a key challenge for farms in most of the Lower Mainland, and extensive, private on-farm and municipal drainage infrastructure is in place to counteract adverse effects of saturated soils on agriculture. Municipalities are also committed to improving existing drainage and irrigation systems in order to address current limitations. The indicator “change in irrigation and drainage systems” was chosen to assess potential effects to the irrigation and drainage subcomponent.

### 5.1.2 Potential Project Effects and Proposed Mitigation Identified in the Application

This section provides a summary of potential adverse effects on agricultural use and key proposed mitigation identified in the Application.

*Loss of Agricultural Land and Degradation of Soils*

Although the Project alignment largely follows the existing Highway 99 ROW in order to minimize impacts to agricultural and land uses, approximately 20 ha of ALR, over 32 properties, would need to be authorized for non-farm use in order to accommodate the Project. Lands affected would include narrow segments adjacent to the Highway 99 corridor between Blundell Road and Steveston Highway Interchange in Richmond, and between River Road and Highway 17 in Delta. Of the 20 ha that would be affected, approximately 17 ha is currently productive ALR land. Most of the 20 ha of ALR that would be removed consists of Agricultural Capability Class 1, 2 and 3 soils. This classification system is used to rate soil capability, with Class 1 soil being the highest capability.

The Agricultural Land Commission (ALC) and municipalities discourage non-farm use and exclusion, since preserving high capability agricultural lands in the ALR is an

important objective in their mandates. To offset agricultural land required for the Project, the Proponent has identified several Crown- or Proponent-owned parcels of land that would be made available for agricultural use.

In addition to the agricultural land requirements, soil quality degradation may occur during construction, specifically in laydown areas, temporary constructions areas, or heavy traffic areas. Construction activities may also degrade soil through contamination (e.g. fuel spills), soil erosion, and soil mixing.

Mitigation measures described in the Application to reduce potential soil degradation during construction include:

- Avoiding construction activities in agricultural fields;
- Using non-arable areas for temporary laydowns and roads;
- Undertaking construction activities during dry conditions and avoid activities during high winds to minimize soil erosion, wind erosion and soil compaction;
- Salvaging topsoil and subsoil, and using the salvaged soils for reclaimed areas to improve agriculture;
- Seeding longer-term topsoil storage piles to avoid erosion, organic matter loss, and infestation by weeds; and
- Implementing the emergency response and spill contingency plan and the erosion and sediment control plan of the CEMP.

The Proponent also identified several parcels of unused Highway 99 ROW that would be made available for future agricultural use. These areas would be restored and reclaimed to capability that is comparable to adjacent cultivated areas to offset Project-related loss of ALR. Table 9 presents the loss and proposed offset ALR by municipality.

**Table 9: Estimated Agricultural Land Loss and Offset from the ALR**

| Municipality | Total ALR (ha) | Loss of ALR (ha) | Offset ALR (ha) |
|---|---|---|---|
| City of Richmond | 4,756 | 8.1 | 10.2 |
| Corporation of Delta | 8,843 | 11.9 | 11.2 |
| **Total** | --- | 20.1 | 21.4 |

*Drainage, Water Quality, and Irrigation*

Due to the climate of the Lower Mainland, irrigation and drainage networks are vital to maintaining soil conditions for agricultural fields. The Project has the potential to affect municipal drainage infrastructure and irrigation sources, as well as on-farm drainage in the LAA. During construction, temporary alteration of drainage patterns, potential for sedimentation, and reduced access to irrigation water may adversely affect agricultural operations. Alteration of drainage patterns may also disrupt existing drainage, which would lead to saturated soils, reduced yields, delayed planting, and flooding and harvesting challenges.

Mitigation measures described in the Application to address potential effects on drainage are largely related to the design of the Project, and include:

- Improving drainage infrastructure to ensure no increase in flooding and to mitigate for potential increase in flow volumes to municipal pump stations;
- Sizing of new culverts to comply with current design criteria, and in consideration of possible climate change effects;
- Retaining existing ditches at current elevations and capacities, and deepening and increasing the capacity of ditches for additional storage and conveyance, where appropriate;
- Re-grading and cleaning existing ditches to improve hydraulic capacity and flow;
- Adding stormwater management ponds; and
- Adding temporary water management systems during construction.

The Application also assessed the potential for construction activities, specifically the decommissioning of the Tunnel, to alter the hydraulic characteristics of the Fraser River and influence the movement of the salt wedge in the river.

During a rising tide, the denser salt water from the Strait of Georgia advances up the river along the bottom of the channel while the river water flows over top, creating a wedge shape. The extent that the salt wedge moves up and down the river naturally fluctuates throughout the year in response to the combined influence of tides and in-river flow conditions. There are currently periods when the salt wedge naturally reaches the irrigation pump station at 80$^{th}$ Street intake in Delta. During these periods, the water is too saline for agricultural irrigation and a salinity sensor automatically shuts off the pumps. The potential for an increase of occurrence of saline water to reach the 80$^{th}$ Street intake in Delta following Tunnel removal was studied.

Modelling presented in the Application indicates that the timing window during which the salinity of the water exceeds the threshold for irrigation is almost identical for the two cases (i.e., with and without the Tunnel), and therefore the removal of the Tunnel would not affect the behavior of the salt wedge with respect to how it affects the 80th Street intake.

*Farm Infrastructure and Operations*

The removal of narrow segments of land adjacent to Highway 99 could lead to farm parcel fragmentation and changes to farm parcel boundaries, which could ultimately affect farm operations. For most parcels, the removal of land from farming is expected to be small and not expected to substantially change the field configurations or bisect fields. However, there are three parcels where the Application indicates the potential for an adverse effect as removal of land from these properties could make farming on the remaining portion difficult.

Construction activities may also lead to temporary disruption of on-farm utilities (e.g., power lines, telephone, gas), which could negatively impact farm operations. Similarly, some existing fences would need to be removed and relocated, which could temporarily impact access to farms. However, temporary provisions would be made to ensure ongoing access to such utilities during construction and permanent on-farm utilities would be restored once construction is complete.

The Application recognizes the correlation between the loss of ALR land and a decline in ecological and social interests associated with green space. As such, there is a potential effect on agricultural use regarding the perception that the Project alignment has resulted in a more developed and urban landscape. However, mitigating this perception is accomplished through the measures described below, especially minimizing the Project footprint, consolidating farm parcels, improving irrigation and drainage, and installing visual buffers.

Mitigation measures described in the Application to address potential effects on farm infrastructure and operations include:

- Implementing measures to address temporary disruption to on-farm utilities during construction;
- Informing farm operators of construction activities in advance and consulting on installation of new fences;
- Developing and implementing the construction traffic management plan to help facilitate efficient movement of agricultural traffic during construction, including

sharing this plan, and seeking input from the agricultural community, prior to implementation;

- Consolidating small farm parcels;
- Salvaging topsoil from permanent disturbance areas for use in field levelling in other areas of the LAA; and
- Improving on-farm and municipal drainage and irrigation ditches.

### 5.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, the Working Group and members of the public raised questions and concerns regarding the potential effects to agricultural use.

Richmond requested that a rationale be provided for why the widening of the corridor would occur on the west of Highway 99 in Richmond, as opposed to the east side. Richmond expressed a preference for widening to occur on the east side, given that an agreement was made between the City of Richmond and the ALC to increase farming on the west side.

The Proponent responded that the decision to widen to the west was made in consultation with agricultural specialists, the ALC, Richmond and Richmond Farmers Institute, which indicated that widening to the west was expected to have less impact to actively farmed agricultural land.

During the EA, the Proponent provided a memo to explain the rationale for how the proposed alignment was selected in order to minimize effects to agriculture. The memo noted that Project planning considered agricultural needs and included a Project objective of net zero or positive impact on agricultural land by constructing within the Highway 99 ROW as much as practical, by minimizing the amount of land required from the ALR for highway widening, and by minimizing impacts on the most actively farmed properties.

The memo confirmed that there are several active agricultural farms on the east side of Highway 99 between Blundell Road and Steveston Highway Interchange, while several agricultural properties on the west side of Highway 99 have already been affected by past development, including the City of Richmond Gardens Agricultural Park. The memo also noted that widening of Highway 99 to the west would avoid adverse effects to the most productive and actively farmed

agricultural properties. The Proponent indicated that consultation with the farming community began in 2012 and that they have continued to consult with numerous groups, which resulted in important suggestions for reducing impacts to lands that are actively being farmed, improving drainage and water quality, ability to cross the new bridge with farm equipment and improving safety.

Tsleil-Waututh Nation, Delta and Richmond expressed concerns regarding the proposed off-setting lands that would be made available for agriculture, and emphasized the need for ensuring soil capability of these parcels are equal to or better than the land approved for Project-related non-farm uses within the ALR. Richmond also questioned what farming activity would be anticipated on the new off-set lands and how topsoil conservation would be undertaken.

The Proponent responded that the land that would be restored to agriculture would include a mix of lands in the existing highway ROW that border on agricultural land, lands located within existing ramps that are currently isolated from adjacent farmland, and other areas where previous development has occurred. The Proponent committed to work with the ALC, municipalities and local farmers to ensure that the off-setting land is used for agricultural purposes. The Proponent expects that following the restoration of such lands, including the development of appropriate drainage, these areas would have high capability in the class 1-3 range, similar to the surrounding soils in the Project area. More detailed investigations would be carried out as part of the topsoil salvage program as described in the ALC application and as required to address individual property impact mitigation, through property acquisitions.

EAO proposes a condition requiring the development of an agricultural management plan that would include the means by which the measures, including topsoil salvage and reclamation, and restoration of agricultural land, would be implemented.

Delta, Richmond, Metro Vancouver, Tsleil-Waututh Nation and members of the public expressed concerns with water salinity, the influence of Tunnel removal on the salt wedge and how cumulative effects could increase water salinity.

The Proponent noted that the salt wedge modeling that was undertaken indicated that the timing window that salinity in the water exceeds the irrigation criterion would be nearly identical with and without the Tunnel. The study also found that the existing cross-channel ridge formed by the Tunnel falls within the natural variability of the topography of the river bottom, and that some of the natural

sand dunes on the bottom are similar in height or larger. Thus any temporary change in the riverbed profile caused by the removal of the Tunnel is not expected to influence the movement of the salt wedge to any substantive degree. During and following construction, water quality (salinity) monitoring in the vicinity of the 80th Street intake would be undertaken and monitoring data shared with the relevant Working Group members.

EAO proposes a condition requiring the development of an agricultural management plan, which would include the timing, duration and frequency of in-river salinity monitoring to be undertaken at the 80th Street Pump Station.

Delta and Richmond requested further detail on how irrigation and drainage infrastructure would be improved in the area.

The Proponent responded that they are committed to improving highway drainage and water quality as part of its agricultural enhancement strategy and that they would continue to work with municipalities, affected farmers and farmer's institutes when developing Project design specifications. Further discussions would be held to identify opportunities for drainage and irrigation improvements in agricultural areas while meeting municipal and provincial standards.

EAO proposes a condition requiring the development of a drainage and stormwater management plan. The plan would include identification of performance objectives related to stormwater volume and quality, specification of the methods and locations of stormwater collection and distribution system that would be incorporated into the bridge and interchange design, and the locations and methods for conducting monitoring of the performance objectives. EAO also proposes a condition requiring the establishment of an inter-agency working group, which would be consulted on the design of Project infrastructure including drainage design.

### 5.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the Project would result in the following residual adverse effects on agricultural use:

- Changes to Farm Parcel Boundaries.

Summarized below is EAO's assessment of the expected residual effects of the Project on agricultural uses, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | High sensitivity; low resiliency | In the LAA, farmland is in the ALR where agriculture is a priority use. These agricultural lands are also Class 1 and 2, which are considered the best and most productive agricultural lands. Agriculture in the LAA is susceptible to further land loss, and even small farm properties in the Project area can be economically viable. Therefore the area has less resilience to development effects than other areas of BC. |
| Magnitude | Low - Moderate | Changes to farm parcel boundaries resulting from the Project would be limited to three properties; however, these boundary changes could affect the viability of these farm operations. Changes in field size, configuration or shape could make it challenging to farm the parcel. |
| Extent | Site-specific | Changes to farm parcel boundaries would be limited to specific farm properties. |
| Duration | Permanent | Changes to farm parcel boundaries are considered permanent since the areas would be used for the expansion of Highway 99. |
| Reversibility | Irreversible | Changes to farm parcel boundaries are considered permanent, and therefore irreversible. |
| Frequency | Single | Changes to farm parcel boundaries would occur from a single event during construction. |
| Likelihood | The likelihood is high that adverse effects on agricultural use discussed above would occur during construction and operations. | |
| Significance | Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the Project is not likely to have significant adverse residual effects on agricultural use. | |
| Confidence | There is a high level of confidence in the likelihood and significance determination. | |

### 5.1.5 Cumulative Effects Assessment

Adverse residual agricultural effects are anticipated only on specific farm properties adjacent to Highway 99. No overlap with these properties and past, present or reasonably foreseeable projects or activities is expected, and therefore no cumulative effects to agricultural use are expected to occur.

### 5.1.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied

that the Project is not likely to have significant adverse residual effects on agricultural use.

## 5.2 Land Use and Visual Quality

### 5.2.1 Background

Land use was assessed as VC due to the potential for Project activities to interact with land uses in the Project alignment and areas adjacent to the Project. The assessment of land use focused on the subcomponents land use and regional growth. Visual quality was assessed as a separate VC due to the potential for new Project components (the new bridge and upgraded interchanges) to change the existing visual conditions in areas adjacent to the Project. EAO has assessed the potential adverse effects to land use and visual quality in this section of the Report.

The LAA for land use includes the Project alignment plus 500 m on either side of the Project alignment, and also includes Deas Island and Deas Slough. The LAA for regional growth includes the boundaries of Richmond, Delta and Surrey. The RAA includes the boundary of Metro Vancouver. The majority of the Project alignment would be on Crown land, adjacent to Richmond and Delta, within the existing Highway 99 corridor. However, most of the land adjacent to the Project is private land, and includes land designated for agricultural, industrial, institutional, mixed commercial and residential, and park uses, as well as the Vancouver Landfill in Delta.

Federal, provincial, regional and local land use and transportation plans outline the policies to manage land within their respective boundaries. Land use plans and strategies that are relevant in the context of the Project include those developed by VFPA, the Government of BC, Metro Vancouver, TransLink, Richmond, Delta and Surrey.

Indicators selected for the assessment of the land use subcomponent included:

- Consistency with land use plans and designations;
- Compatibility with adjacent or proximal land uses;
- Spatial area (ha) of change in existing land uses; and
- Disturbance to other land uses from Project-related activities, including disturbance to residential, commercial and industrial uses; as well as recreational use of Deas Island Regional Park.

Metro Vancouver has experienced substantial population growth in the last few decades, and the Application notes that predictions for the region show an increase of approximately 1.1 million people from 2011 to 2041. Regional growth strategies (RGSs) and local land use plans outline policies to manage future land uses based on projected population growth, employment levels, and land use supply and demand.

Metro Vancouver's RGS (Metro Vancouver 2015) sets out goals, strategies, and policies to guide the future growth of the region and provides the land use framework for transportation, economic, housing, utility, environmental, and climate change planning. It presents a vision for how the region will accommodate the one million people and over 500,000 jobs that are forecast in the next 25 years.

Indicators chosen for the assessment of the regional growth subcomponent included:

- Change in regional population growth and distribution; and
- Change in non-residential land (industrial and commercial) development and distribution.

The LAA for visual quality includes the area within a 6 km radius centered on the highest point of the new bridge, as this distance represents views of the new bridge as seen from various viewpoints, and also includes the Steveston Highway and Highway 17A interchanges. The Westminster Highway interchange is located just north of the LAA; however, modifications to the interchange are expected to be minor and only visible from the immediate surrounding area. There is no RAA for visual quality, as beyond 6 km, views of the bridge and interchanges would mostly be screened by existing structures and vegetation.

### 5.2.2 Potential Project Effects and Proposed Mitigation Identified in the Application

This section provides a summary of potential adverse effects on land uses and visual quality and key proposed mitigation identified in the Application.

<u>Land Use and Visual Quality</u>

*Construction*

During construction, a total of 716 $m^2$ of private land (non-agricultural) would be required for the Project; however, only small narrow lengths of land adjacent to the existing ROW would be needed. The Proponent plans to acquire properties in

accordance with applicable policies and best practices. The Application does not anticipate further changes in land use once the parcels are acquired.

Construction activities, such as the construction of the bridge, bridge approaches and interchange upgrades, may adversely affect nearby residential, commercial and industrial land uses, by leading to temporary transportation delays, access restrictions to marinas, wharves and boat launches, and increased noise. This also may affect users' experience of, or temporarily restrict access to, recreational areas, especially in the Deas Island Regional Park, the Millennium Trail, and marine recreation facilities. Daytime noise levels during bridge construction may also impact recreational users in Deas Island Regional Park.

*Operations*

The Application states that the proposed highway improvements associated with the Project would be consistent with the policies and strategies in local and regional planning documents considered to provide safe and reliable transportation options that reduce congestion and encourage other modes of transportation. A desktop review was conducted to also determine compatibility of the Project with adjacent and proximal land uses. The review considered traffic, noise, air quality, visual quality, and shadows from the new bridge. In general, the Application anticipates the Project would have a positive effect on traffic conditions, and is not anticipated to change compatibility between land use on the existing ROW and adjacent land.

Potential effects due to operational activities are expected to be limited to disturbance of nearby land uses, specifically related to changes in noise and visual quality. Land uses sensitive to changes in noise conditions were considered in the Application, and it is anticipated that with the implementation of mitigation measures, ambient noise levels during operation would be lower than current levels. Noise levels are, however, expected to increase at parks adjacent to the Project (e.g. Deas Island Regional Park). The assessment of noise, as it relates to human health, is discussed in section 7.1 (Health) of this Report. Improvements to air quality are expected to improve compatibility with nearby land uses. Air quality is assessed in section 4.1 (Air Quality) of this Report.

The Application notes that there would be several benefits to Deas Island Regional Park during operation, including improved access to the western end, making part of the Proponent's ROW adjacent to the park available to park users; revegetation of areas currently required for the Tunnel; and restoration of shoreline areas.

Project-related changes to visual quality are not expected to change the compatibility between land use on the existing ROW and adjacent land; however, the bridge would add a noticeable feature to the visual landscape of Deas Island Regional Park and the Millennium Trail. The addition of the new bridge, its towers, piers and deck, as well as the upgrade to existing interchanges, could affect existing visual quality from nearby recreational, residential, commercial and industrial lands. This change in visual quality would begin during the construction phase, and would continue throughout the operation of the Project.

The Project would cross the Fraser River delta, which is a relatively flat landscape that has been modified by human activity. The existing Highway 99 corridor is a prominent feature in the landscape and is surrounded by agricultural and recreational areas, as well as residential, commercial and industrial development. The Tunnel entrance and exit are on Deas Island, where there are recreational opportunities and scenic viewpoints.

The area surrounding the Tunnel includes Deas Island and some small-scale development on either side of the Fraser River. This development includes marinas, and low-rise residential and industrial buildings, which generally blend into the surrounding vegetation. Given these existing visual conditions, and the relatively flat topography of the area, the addition of the bridge would add a prominent feature to the landscape. The bridge would be much larger than existing infrastructure in the area. Certain viewpoints were identified to have the greatest impact to visual quality. These include the Tunnel access road on Deas Island, Captain's Cove Marina, and the Millennium Trail beside Captain's Cove. Visual simulations were created to illustrate future visual conditions. Viewpoints for the visual simulations were chosen based on the potential visibility of the new bridge alignment, as well as feedback from public consultation. A total of 17 viewpoints were chosen to represent visually important areas identified in the LAA, and all viewpoints focused on potential visual impacts associated with the new bridge.

The visual simulations for locations at greater distances from the bridge show that the change to the existing visual condition would be less, mainly due to distance of the viewpoints to the bridge, or partial or full screening from vegetation or existing infrastructure.

Changes to the Westminster Highway Interchange would include the construction of an access ramp on the northwest corner of the interchange, which is the opposite side of the nearest residential area. Given that the changes would be within the current ROW, which includes existing infrastructure, and there would be limited views of this change

from the residential area, the Application states that there would be no change in the existing visual quality at this location.

At the Steveston Highway crossing, a three-level interchange has been proposed to improve access and movement at this location. These upgrades would result in changes to visual quality. However, the Application states that given the existing anthropogenic disturbance of the area, the visual sensitivity class (VSC) of this area is considered to be low and a change in visual quality is not expected.

Although changes in visual quality would be unavoidable, the Application notes that design considerations have been incorporated to ensure that structures are aesthetically pleasing and blend with local and regional landscapes. Vegetation buffers would also be used to screen views or partially reduce visual effects of the bridge where practical. The Proponent has committed to continued discussions with stakeholders prior to finalizing the appropriate types and extent of vegetation buffers to be installed to provide a visual buffer between the bridge and sensitive viewpoints nearby.

During operation, new shadows would be cast on nearby land by the bridge deck, piers and support towers. This would occur in areas in Deas Island Regional Park and the Millennium Trail. Visual simulations were created to demonstrate the extent of these shadows. Shading is anticipated at Captain's Cove Marina and part of the residential areas of Riverwoods. During the winter solstice (when shading is expected to extend the longest), some units in Riverwoods would experience shading for about 2 hours in the afternoon. However, during the summer solstice, shading would occur over less time. Given the short periods of anticipated shading, the few affected residences and marine berths, and the variability in individual responses to shading, the Application considered this effect to be negligible.

The Project was designed to follow the existing Highway 99 ROW in order to avoid the displacement of nearby land uses as much as possible. Mitigation measures proposed in the Application to address effects on land use include: implementation of various management plans (including for air quality and dust control, noise management, marine access, and construction traffic and access); habitat enhancement and habitat offsetting in marsh areas; continued communication with adjacent property owners; and reconnecting recreational trails.

Regional Growth

During operation, improved transportation infrastructure may influence population and employment distribution within the region, as well as development and distribution of non-residential land.

The Project would involve upgrading infrastructure of the existing Highway 99 corridor and would not provide new access to previously inaccessible areas thereby leading to changes in population distribution. Instead, improved highway access typically encourages denser and more land-intensive development in existing land uses and supports planned land uses.

The Application summarizes the modelling results from a 2014 study conducted by Coriolis Consulting Corp. for TransLink. The study examines the potential effects of the Project on changes in housing and population, and population serving employment forecasts to 2045. Although the study assumed a new bridge with eight lanes, rather than 10, modelling results concluded that the Project is not expected to result in direct population or employment growth, but would help sustain the region's ability to access external markets. The study also predicted that Delta and Surrey would likely have a slightly higher share of population growth than other areas due to the construction of the new bridge.

Based on the findings of the 2014 TransLink report, and complimentary work undertaken to support Project planning that reviews Lower Mainland experiences with recent road-based transportation projects in the region, the Application concluded that the influence of the Project on land use would be limited to faster absorption and higher density development in the short term, with no measurable change in land use or medium- to long-term population and employment distribution.

The Application estimates that there is potential for a slightly faster pace of light industrial development in Richmond, Delta and south Surrey over the short term, as a result of the Project, although by 2045, there would not be a discernable difference in the total light industrial employment in these areas. The Application also examined the influence of transportation infrastructure improvements on land use trends and concluded:

- The Project influence on land use would be moderate due to the lack of available developable land and the presence of restrictive land use controls;

- Long-term development will focus on intensification of existing urban areas rather than expansion into currently undevelopable areas;
- The Project would add value and density to land already designated for development; and
- The strength of existing land use policies (e.g. ALR, Metro Vancouver's RGS and local official community plans [OCPs]) would limit any substantial changes to land use.

The Application concludes that the Project is not expected to substantially change current trends in industrial land use and development, and that it is expected to encourage denser development on existing land.

### 5.2.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, the Working Group and the general public raised questions and concerns regarding the potential effects to land use and visual quality.

*Consistency with Land Use Plans and Regional Growth Strategies*

Richmond and Metro Vancouver suggested that the Project is inconsistent with certain objectives in land use plans. Specifically, they expressed concern that a potential increase in traffic volumes associated with the Project (rather than regional growth) that would result from the Project is inconsistent with sustainability goals outlined in Metro Vancouver's Regional Growth Strategy (2011) and Richmond's Official Community Plan (2012) to reduce reliance on vehicles by encouraging alternate modes of transit. Richmond, Metro Vancouver and Tsleil-Waututh Nation requested that the Proponent provide further evidence for potential Project-related effects to regional growth, and a detailed land use model was requested to be undertaken to substantiate the Application's conclusions that the Project would not affect overall regional growth trends.

The Proponent responded that the Project has been designed to support a range of transportation, land use and economic development objectives identified in a number of regional and local land use and transportation plans and is generally consistent with these plans, which are described in greater detail in the Application. Examples cited by the Proponent include the Project being designed to reduce congestion, improve travel time and reliability, improve transit service, provide new alternatives for cycling and walking, provide safe alternatives for

slower moving traffic including trucks, and accommodate future rapid transit. Both the Proponent's study (Site Economics 2016) and TransLink's study (Coriolis 2014) indicate that the Project would not likely have a substantial effect on land use at the local and regional level because it does not provide new access. The Proponent also argued that since Metro Vancouver is a mature urban area, where demand exceeds supply, development of improved corridors, as compared with new corridors, is recognized to follow growth rather than lead or shape it.

*Potential Effects to Parks and Recreational Use Areas*

Richmond raised several concerns regarding potential effects to parks and recreational use areas in the City of Richmond. This included potential adverse effects to the City's Gardens Agricultural Park as well as trail users in the vicinity of the Project. Specifically, Richmond raised concerns regarding the potential loss of land, as well as noise, air quality, and visual effects from the proposed multi-level upgrade to the Steveston Highway Interchange. Richmond noted that there is also a child care facility that is scheduled to open in the park in early 2017. Richmond requested that additional mitigation measures be considered to address these potential effects.

EAO is aware that the Proponent is working with Richmond to purchase land for the additional ROW. The Proponent responded that they would continue to engage Richmond to identify mitigation measures, such as planting vegetation buffers along the interface of the Park and highway ROW. In addition, the Proponent would also work with Richmond through the property acquisition process regarding measures to address effects associated with the change in the size and configuration of the remaining land associated with the Gardens Agricultural Park.

The air quality model included receptors at the Gardens Agricultural Park, and although the child care facility was not initially identified as a sensitive receptor, a range of sensitive receptors and maximum points of infringement were incorporated into the health risk assessment to ensure protection of human health, including the Gardens Agricultural Park. Noise levels at the child care facility during operations would be below the 60dBA mitigation threshold for education facilities, as established in MOTI's 2014 noise policy. During the EA, the Proponent also developed visual renderings of viewscapes associated with the Gardens Agricultural Park that were provided to Richmond for review. Furthermore, the Proponent noted examples of design considerations that would be incorporated to mitigate visual impacts, which include planting between the

ditch and highway ROW line, and plantings in front of walls for screening purposes.

Several Working Group members raised concerns regarding access to recreational use areas and trails. Metro Vancouver raised concerns regarding Deas Island Regional Park, specifically the connections between trail networks, and access to Deas Island Regional Park. Delta raised a concern regarding temporary restrictions to the Millennium Trail. Delta requested further details on the scope of trail restrictions and measures to address these restrictions. Richmond also raised concerns regarding the potential adverse effects to the Richmond's Bridgeport Trail and Van Horne Way multi-use path due to transit only lanes.

The Proponent responded that further detail would be developed as the Project progresses and that they would commit to establishing arrangements for communication, between the contractor and both Delta and Metro Vancouver Parks, regarding access and connections both during and after construction.

Although exact restrictions on the Millennium Trail were not known at the time of the EA, the Proponent committed to working with relevant Working Group members and stakeholders to minimize restrictions. With regards to the Bridgeport Trail and the Van Horne Way multi-use path, the Proponent responded that access to both the trail and multi-use path would not be affected by the proposed transit-only lanes underneath the Oak Street Bridge. Where the transit-only lanes cross the trail and multi-use path, the Proponent would implement traffic control and signalization measures to provide safe passage of cyclists and pedestrians. The Proponent also stated that further consultation on multi-use paths and cycling facilities will be undertaken during further stages of detailed design consultation.

EAO proposes a condition requiring the development of a traffic and access management plan that includes measures to mitigate potential effects of the Project to pedestrian use and the means by which public access and recreational trails would be controlled, maintained, restored or enhanced. EAO also proposes a condition requiring the establishment of an inter-agency working group, which would be consulted on the design of Project infrastructure including cycling and pedestrian trails.

Metro Vancouver and members of the public expressed concern about the cumulative effects of the Project and BC Hydro's Transmission Line Relocation Project to Deas Island Regional Park. The relocation of the transmission line would require clearing of

existing vegetated areas, including part of a trail. Metro Vancouver was concerned that the park experience would be permanently impacted by this work, as well as shading from the new bridge, and requested that a cumulative effects assessment on the ground conditions at Deas Island Regional Park be considered. Concerns were also raised regarding the potential cumulative visual impacts of the Project and BC Hydro's transmission line.

> The Proponent assessed potential adverse effects on land use at Deas Island Regional Park in the Application and committed to work with Metro Vancouver to maximize benefits and address unavoidable effects, where possible. The Application considered the potential effect of the BC Hydro Transmission Line Relocation Project in the cumulative effects assessment of visual quality. Since the transmission line project is under the purview of BC Hydro, the Proponent encouraged Metro Vancouver to engage BC Hydro directly with respect to potential effects of that project.

*Visual Quality Assessment*

Richmond, Musqueam Indian Band and Lyackson First Nation questioned the methods used for the Application's visual quality assessment, as well as the areas chosen to conduct visual renderings. Richmond requested that the Proponent provide a visual simulation for the Steveston Highway Interchange and describe how visual effects would be mitigated through the design of the bridge and its overpasses, and through adjacent landscape development. Musqueam Indian Band requested further mitigation measures to address effects on Musqueam Indian Band's cultural landscape during construction.

> The Proponent responded that an assessment of changes in visual conditions was undertaken for the Steveston Highway Interchange. In the Application, the existing visual condition in this area is defined as ranging from 'Modification' to 'Maximum Modification', and that based on a qualitative assessment, it was concluded that future visual conditions would continue to range from "Modification" to "Maximum Modification", which reflected the current, highly developed nature of the area around this existing interchange. Instead of using simulated future viewscapes to support the visual assessment of interchanges, which would require digitally removing current infrastructure from photos and replacing it with visual rendering, the Proponent developed physical models, in conjunction with its qualitative assessment, to support its assessment of future visual conditions.

The Application included mitigation measures to address visual effects associated with the Project, which primarily includes vegetated buffers. The Proponent committed to further discussion regarding additional site-specific mitigation with Working Group members, and welcomed future input on visual aesthetic aspects of the Project during the design phase. With regards to potential adverse effects to the quality of experience for Aboriginal Groups, the Proponent committed to consult Aboriginal Groups in the development of a cultural heritage management plan.

EAO proposes a condition requiring that the Proponent consult with Aboriginal Groups and municipalities on landscaping and visual considerations for the Project, as part of the proposed inter-agency working group. EAO also proposes a condition requiring the development of an Aboriginal cultural awareness and recognition plan, in consultation with Aboriginal Groups.

### 5.2.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the Project would result in the following residual adverse effects on land use and visual quality:

- Change in access during construction; and
- Sensory (noise and visual) disturbance to adjacent land users.

Summarized below is EAO's assessment of the expected residual effects of the Project on current land uses and visual quality, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | **All:** Moderate sensitivity and resilience | **Change in access:** The area has moderate sensitivity to changes in access, as it is an important travel corridor for industrial, commercial, residential and recreational uses.<br><br>**Sensory disturbance:** The area has a moderate resiliency to sensory disturbance, as it is an urban area already associated with a major highway corridor. However, some areas (such as Deas Island Regional Park) may be more sensitive to a sensory disturbance with the addition of the new bridge. |
| Magnitude | **Change in access:** Low | **Change in access:** Magnitude of the adverse effect would be low. Changes in access would be required during the construction phase; however, with the implementation of a construction traffic and access plan, that would include |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | communication of construction schedule and potential temporary access disruptions, it is anticipated that this adverse effect would be limited to certain areas, such as shore-based facilities and land. |
| | **Sensory disturbance:** Low to moderate | **Sensory disturbance:** With the implementation of mitigation measures, sensory disturbance to nearby land users is generally expected to be low in magnitude for most of the Project alignment. However, at the Fraser River crossing, with the addition of the bridge, and the limited noise and visual mitigation measures that can be implemented for the bridge, the magnitude is expected to be moderate in degree, especially given the noticeable change in comparison with the existing Tunnel. |
| Extent | **Change in access:** Site-specific | **Change in access:** A change in access would be restricted to limited areas, such as shore-based facilities or portions of land-based trails. |
| | **Sensory disturbance:** LAA | **Sensory disturbance:** Sensory disturbance would be most apparent within the respective LAAs for visual quality and atmospheric noise. |
| Duration | **Change in access:** Short-term | **Change in access**: The adverse effect would be limited to the construction phase where temporary access limitations would occur. |
| | **Sensory disturbance:** long-term | **Sensory disturbance**: Noise and visual effects to recreational use areas would begin during construction and would continue throughout operations. |
| Reversibility | **Change in access:** Reversible | **Change in access**: Access disruptions would be limited to the construction phase and would be reversible once construction is complete, when trails would be reconnected and access resumed. |
| | **Sensory disturbance**: Reversible to irreversible | **Sensory disturbance**: Noise disturbances associated with the construction and operation of permanent structures would largely be reversible; however, the change in visual quality from existing conditions would be permanent and not reversible. |
| Frequency | **Change in access:** Frequent | **Change in access**: Disturbance to access would be limited to the construction phase and would be frequent. |
| | **Sensory disturbance**: continuous | **Sensory disturbance**: Sensory disturbance to recreational land use would be continuous throughout the construction and operations phases since the bridge and Project infrastructure are permanent structures. |
| Likelihood | The likelihood is high that adverse effects on land use and visual quality discussed above would occur during Project construction and operations. | |
| Significance | Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the Project is not likely to have significant adverse residual effects on land use and visual quality. | |
| Confidence | There is a high level of confidence in the likelihood and significance determination. | |

### 5.2.5 Cumulative Effects Assessment

Residual effects that are anticipated during construction and operations were considered in relation to other reasonably foreseeable projects. One project that could interact with the residual effect of sensory disturbance to recreational land use during operation is the replacement of BC Hydro's Transmission Line Relocation Project. The existing transmission line traverses Deas Island, but would require new structures that might be visible from similar viewpoints as the Project.

The Application noted the three relocation options that BC Hydro was considering at the time of the submission of the Application to EAO. During the EA, BC Hydro confirmed that the selected relocation alternative would include an overhead transmission line crossing the Fraser River and two steel lattice towers (approximately 120 m in height), one of which would be located on Deas Island and the other in Richmond, west of the new bridge. These two towers would be in line with the proposed new bridge towers, and the conductor lines would cross at approximately the same height as the bridge deck to mitigate visual effects. An additional smaller steel lattice tower (approximately 75 m in height) would also be required on Deas Island.

Given the design of the components of the transmission line project, and the alignment of the transmission line with the bridge piers and deck, EAO believes that this cumulative effect would be low in magnitude and not significant. No other projects were identified in the area that may interact cumulatively with the residual effects to recreational uses during construction and operations.

### 5.2.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the Project is not likely to have significant adverse residual effects on land use and visual quality.

## 5.3 Marine use

### 5.3.1 Background

Marine Use was assessed as a VC because of its importance to marine shipping interests, Aboriginal Groups, the public, other stakeholders and due to the use of the South Arm of the Fraser River for a range of important economic, social and cultural activities.

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. Recreational boating, supported by marinas and a rowing club located in Deas Slough, also takes place in the vicinity of the Project. Maintaining waterway navigation needs and access is important to the provincial and federal economies, Aboriginal Groups, many businesses, and the general public. The public's right to navigate the Fraser River South Arm and Deas Slough is protected by the *Navigation Protection Act* (NPA).

The Project would include construction activities in the Fraser River South Arm and Deas Slough that may temporarily infringe on the following three sub-components of marine use: commercial navigation; navigation for CRA fisheries; and recreational navigation. The Application assessed changes in marine traffic (i.e., frequency and volume) and accessibility of waterways as indicators.

The LAA is defined as 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. The LAA was established to encompass the area within which the Project is most likely to interact and potentially affect marine use. In determining the extent of the LAA, 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 is defined as the VFPA Land Use Planning Area 5 (Fraser River Central, from approximately 3 km southwest of the Alex Fraser Bridge) and Planning Area 7 (including only Fraser River South Arm, from approximately 3 km southwest of the Alex Fraser Bridge to the river mouth). The RAA includes most of VFPA's Land Use Planning Area 5 and 7 and was established to provide a regional context in terms of marine use in nearby marine planning areas.

*Commercial Navigation*

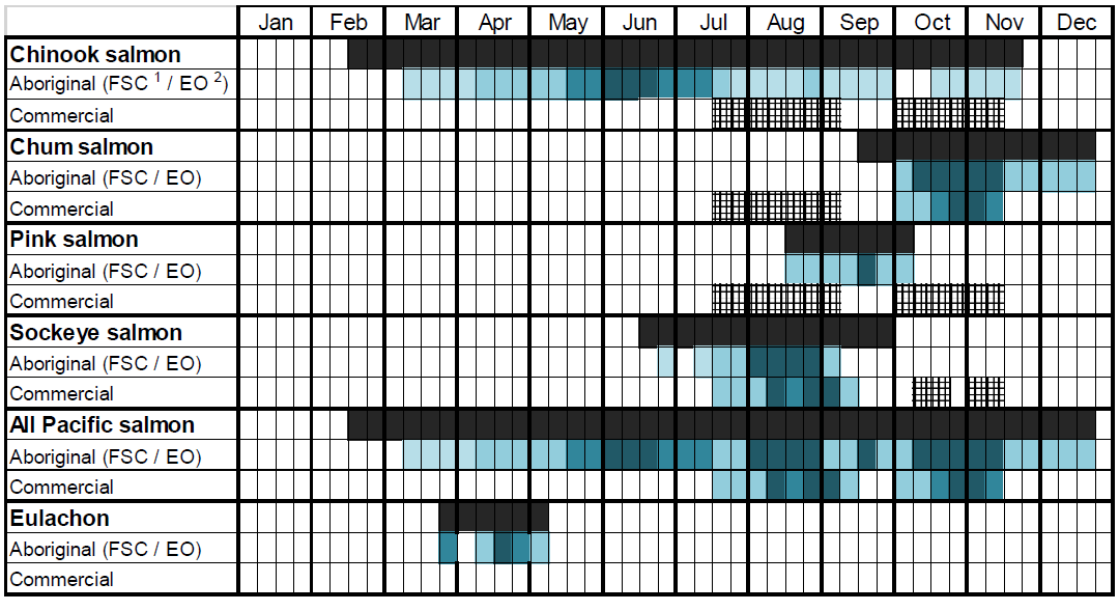
Navigation in the Fraser River South Arm is affected by river flow conditions. Water levels and tides, among others, are factors considered by Fraser River pilots when determining a vessel's passage plan through the Fraser River. More than 12,500 vessels transit the Fraser River South Arm annually, with tug-and-barge and cargo ferries being the most frequent vessel movements (accounting for approximately 48% and 36% of total vessel traffic volume, respectively).

*Navigation for Commercial, Recreational, and Aboriginal (CRA) Fisheries*

Fraser River fisheries contribute to the economic activity along the river. Commercial salmon fisheries in the vicinity of the Project are conducted primarily with gill nets.

Salmon gill net fisheries openings are relatively short, depending on run strength determined in-season. Commercial gill net fisheries target sockeye and chum salmon, but permit the retention of pink and chinook. 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 Groups participate in fisheries for domestic and food, social, and ceremonial (FSC) purposes in the lower Fraser River in the vicinity of the Project. Some Aboriginal Groups, such as Musqueam Indian Band, have identified the Project area as a key fishing location partly due to the congregation of fish in the area, including sturgeon, salmon and eulachon. However, Musqueam Indian Band has also noted that there are already existing constraints on marine use in the Fraser River due to maintenance dredging and marine traffic. In general, DFO manages Aboriginal fisheries to provide access for FSC purposes. 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. Lower Fraser River fisheries openings are summarized in Figure 3.




**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

**Figure 3: Species Run Timings and Aboriginal and Commercial Fisheries Openings (in Number of Hours) in the Lower Fraser River[14,15]**

Recreational fishing occurs within the lower Fraser River to provide food for personal use, as a leisure activity, or both. Fishing techniques within the lower Fraser River include trolling, mooching, and casting from boats, piers, or the shore, with casting from the shore most prevalent. Access to fishing along the lower Fraser River shoreline is possible from recreational parks in the vicinity of the Project (e.g., Deas Island Regional Park), 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).

*Recreational Navigation*

The Fraser River is important for a wide range of water-based recreation, including fishing, waterskiing, motor-boating, canoeing, sailing, windsurfing, river rafting and

[14] 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.

[15] 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.

kayaking. The 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. The Delta Deas Rowing Club is also 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.

The Proponent conducted a desktop review to understand the existing information available about marine use near the Project through a review of background information including reports and data. Preliminary consultation was also conducted by the Proponent, including meeting with key marine and water-based land users and agencies to discuss potential effects of the Project and understand interests.

### 5.3.2 Potential Project Effects and Proposed Mitigation Described in the Application

Potential effects on marine use were identified through consultation with potentially affected marine users, publicly available information sources, and experience gained by the Proponent in addressing marine use considerations on other projects, such as the Port Mann Bridge.

*Marine Access Disruptions during Construction*

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.

Depending on the final design and configuration of the bridge, bridge deck installation is expected to be undertaken over a period of approximately 20 weeks. Within work weeks, installation of the bridge deck would take place over a few consecutive days (e.g., 2-3 days) during the week. During this period, marine use would be constrained for specific days during which installation of the bridge deck is occurring. Construction of the new bridge would involve lifting pre-fabricated deck segments from barges in the river followed by the sequential connection of each segment to cables suspended from land-based towers. When the central segments of the bridge deck are installed, a temporary, one-directional navigation channel would be implemented to allow construction and marine traffic to proceed safely. Larger vessels traveling through the channel during this time would be assisted by tug boats. It is anticipated that a two-way navigation channel would 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.

A similar approach may be used during Tunnel removal, when barge-based equipment would be used to remove the four central segments of the Tunnel. The need for occasional (2 to 4 times per week) tug-assisted transit through the navigation protection zone (i.e., designated areas where navigation can occur safely during construction) during Tunnel removal is also expected. Transiting of recreational vessels under the Deas Slough Bridge would be temporarily affected or restricted in order to install the stone columns and piles along the edge of Deas Slough, to construct the south approaches to the new bridge, and to remove the existing Deas Slough Bridge. Project-related marine activity during Tunnel decommissioning is expected to last approximately 4 months.

Some commercial navigation, navigation for CRA fisheries, and recreational navigation may be temporarily affected by the establishment of 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, the Proponent assumes that vessels used to support CRA fisheries and smaller recreational vessels, which would have a reduced draft requirement compared to larger commercial vessels, would be less affected by this infringement. The deep sea channel in the area of the Project 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.

Proposed Closures

Full closures of the Fraser River South Arm navigation channel are not anticipated during the construction phase. However, temporary restrictions may apply to access within the main stem of the Fraser River South Arm and 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. Occasional closures of the deep draft channel (8 to 10 hours, up to twice per week) during Tunnel decommissioning are anticipated. The Proponent's discussion with a Marine Users Group has indicated that any potential impacts to shipping as a result of a closure of the deep draft navigation would be dependent upon the proposed hours of closure and whether or not it impacts the tidal window for movement of goods on the river.

Deas Slough would be subject to periodic nightly closures, as removal of the Deas Slough Bridge is expected to occur primarily at night. Communication with the harbour master is expected to minimize scheduling conflicts and ensure that the commercial

navigation schedule is maintained as much as possible throughout the construction phase.

Notice of Works

The Proponent expects to submit a Notice of Works form addressing the requirements of the NPA for construction activities in the Fraser River South Arm or Deas Slough that may interfere with marine use. The submission would include proposed measures to ensure maintenance of the navigation channel during construction and would also include the establishment of navigation protection zones to be maintained during marine-based construction activities. The Application notes that navigation protection zones would be established in consultation with the Marine Users Group to designate areas where navigation can occur safely during construction and would be delineated by navigational aids such as lighting or signage.

*Change in Marine Traffic Volume and Frequency*

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. An examination of vessel traffic in the Fraser River South Arm by Det Norske Veritas (DNV) identified an estimated 12,716 vessel movements (up and down river) on the Fraser River South Arm through the Project area between July 2010 and June 2011 (DNV 2012[16]), with tug-and-barge accounting for the most frequent vessel movements (48% of total traffic volume). Based on this, anticipated vessel movements associated with Project construction would represent approximately 1% of current annual marine traffic through the Project area.

During the first four years of construction, an average of two tug-and-barge movements per week is anticipated for delivery of construction material. During the third/fourth year of construction, delivery and installation of bridge deck segments is anticipated to involve one barge-and-tug movements per segment, resulting in a total of up to 40 movements. A safety vessel, comparable to a small recreational/pleasure vessel in size, will be present on the river to support tug and barge operations. During Tunnel

[16] 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

decommissioning, an average of 4 barges, with one support vessel, are likely to be present in the river for up to 5 days a week over an anticipated six-month period. While the use of marine-based equipment would be limited to the extent possible, bridge construction and Tunnel decommissioning would 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 commercial navigation, navigation for CRA fisheries and recreational navigation within the Project area.

*Operation*

During Project operation, no potential adverse effects on marine use were identified in the Application. Adverse effects on access to waterways are not anticipated during operation due to the clear span bridge design over the Fraser River and Deas Slough. Removal of the Deas Slough Bridge would eliminate structures in the slough that currently infringe on the local navigation channel. The current available air draft of approximately 2.5 m at the Deas Slough Bridge would be increased to approximately 20 m. The vertical and horizontal clearance dimensions of the navigation channel of the Fraser River crossing would be similar to those at the Alex Fraser Bridge and have been established in consultation with VFPA.

Key mitigation measures for preventing or minimizing the effect of the Project on marine use, as identified in the Application, include:

- Using a clear span bridge design which increases vertical and horizontal navigation clearance of the Fraser River South Arm and Deas Slough;
- Submission of a “Notice of Works” to address requirements under the NPA for construction activities that may interfere with marine use and establishing navigation protection zones during construction;
- Developing a marine access management plan that describes the measures to be implemented to minimized potential construction-related access effects on marine use;
- Scheduling Tunnel decommissioning during the least-risk timing window (July 16 to February 28) for the protection of juvenile salmon and eulachon;
- Scheduling the Deas Slough Bridge removal to occur during the least-risk window and primarily at night;
- On-going Aboriginal Group consultation 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; and

- Monitoring during construction to assess the implementation and effectiveness of the mitigation applied, including compliance with the “Notice of Works” and the marine access management plan.

The Proponent also committed to on-going engagement with a Marine User Group, which consists of marine stakeholders (e.g., VFPA, TC, and Canadian Coast Guard), marine users potentially affected by Project construction, commercial, recreational, and Aboriginal marine users, construction contractors, and representatives of marine communications and traffic services. The engagement is intended to support the development and implementation of the marine access management plan and would further refine 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.

### 5.3.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, several issues and potential Project effects in relation to marine use were raised by Working Group members and the general public.

*Vessel Traffic and Cumulative Effects*

Tsleil-Waututh Nation raised concerns about the anticipated vessel traffic increase, as presented in the Det Norske Veritas (DNV) Tanker Traffic Study (2012). In particular, concerns about whether the report was still current in stating that there would not be additional increases over the next 10 years, given all of the projects in the area. Concerns were also raised by several Working Group members, including Musqueam Indian Band, and the public that the plan to remove the Tunnel is part of a larger plan to dredge the South Arm Fraser River to deepen the channel and accommodate larger vessels. Several Working Group members, including Musqueam Indian Band, and the public expressed concerns related to the potential for further cumulative effects and industrialization of the Fraser River that could result from the Project.

> The Proponent confirmed the information presented in the Application was intended to provide an overview of existing conditions and trends in marine traffic within and adjacent to the Project alignment. The cited DNV Tanker Traffic Study document was the most current study on the subject that was available to the Proponent at the time of assessment. Any relevant, more current data that becomes available would be considered in developing the marine access management plan associated with Project construction as appropriate.

The Proponent confirmed that dredging to deepen the river and accommodate increased vessel traffic is not a component of the Project and that both EAO and the Proponent are unaware of any plans to dredge the river deeper. The Proponent clarified during the EA that the rationale for removing the Tunnel was to eliminate the future risk of damage to the new bridge and impact to shipping associated with significant future seismic activity; to meet the Ministry of Transportation and Infrastructure's best practice regarding management of obsolete infrastructure; and to provide opportunities to restore Fraser River habitat. In addition, the Proponent noted during the EA that removing the Tunnel would not result in changes to the size of vessels using the Fraser River South Arm channel as the top of the Tunnel is level with the bottom of the River. Other factors, including the Metro Vancouver water main to the west of the Tunnel, and the width of the river itself, limit the size of vessels that can navigate the river.

During the Working Group meeting in September 2016, a representative of VFPA confirmed that there are no plans to undertake capital dredging of the river and that it is not economically viable. In a letter[17] provided to EAO on November 15, 2016, VFPA again confirmed that VFPA currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel. VFPA also noted that projects proposing new dredging to accommodate vessels that are larger than what the existing navigation channel was designed to accommodate (known as capital dredging), would be subject to review under VFPA's Project and Environmental Review process.

*Disruption to Marine Navigation, Fisheries and Marine Access*

Early consultation with members of the Marine Users Group indicated that occasional closures of the deep draft channel for four to six hours would not adversely impact shipping, depending on the proposed hours of closure and whether or not it impacts the tidal window for movement of goods on the river. VFPA requested that the mitigation measures include efforts to ensure that any closures of the deep draft channel avoid high tide windows for deep-sea ships and be determined well in advance through consultation with VFPA, Pacific Pilotage Authority and Fraser River Pilots.

Musqueam Indian Band and Tsleil-Waututh Nation raised concerns that the Application did not include mitigation measures to address the effects on access to Aboriginal fisheries areas in the Project footprint during Project construction, including Tunnel

[17] VFPA's November 15, 2016 letter to EAO: https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

decommissioning. Several Aboriginal Groups noted that the assessment does not take into consideration the sometimes highly narrow and restricted fishing windows of opportunity provided by DFO (e.g., a 12 hour fishing window with only a few hours of advance notice). Musqueam Indian Band also requested a follow-up program to monitor changes to marine use resulting from Project construction and operation activities, in particular as it relates to Aboriginal fishing activities and also requested that a reasonably detailed conceptual plan be developed during the EA.

The Proponent responded that a detailed Tunnel decommissioning plan would be developed prior to decommissioning once a detailed construction method and schedule have been developed. This plan would provide additional detail regarding time required for key construction works which would allow for reconciling Project works and various marine uses that must be accommodated. The Proponent also committed to developing a marine access management plan that would accommodate all existing vessel traffic in the Project area during construction. Aboriginal Groups' input into the development and implementation of the plan would be critical to ensure that Aboriginal Groups' marine use and ability to exercise rights to fish in the vicinity of the Project can continue, and that narrow and restricted fishing windows can be accommodated, so that significant adverse effects are avoided.

The Proponent confirmed that a Marine Users Group would meet regularly prior to and during Project construction to identify potential access conflicts, and would participate in establishing processes and procedures to avoid potential conflicts, including communications protocol and notification requirements.

In September 2016, EAO also requested that the Proponent provide a draft terms of reference (TOR) for the Marine User Group and a draft outline for the marine access management plan during the Application Review phase. The Proponent has committed to consult with stakeholders and Aboriginal Groups on the draft TOR and further development of the marine access management plan.

The draft TOR for the Marine Users Group are intended to guide discussions between marine users and the Proponent during the construction phase of the Project in order to reconcile Project related construction activities and ongoing marine use activities. The TOR provides the mandate, membership and reporting requirements for the Marine Users Group. Up to the start of marine-based construction, the Proponent would continue to develop the TOR in collaboration with marine users, to ensure the process for managing marine access during construction meets the needs of all users.

The draft outline for the marine access management plan presents the type of information that would be included in the plan to be developed prior to the start of construction. The plan would include:

- Objectives of marine access management;
- Description of Project works, including schedule of identified marine based construction works;
- Description of Project-related marine traffic requirements and
- Description of procedures, including communications procedures, navigation procedures and emergency preparedness procedures.

EAO proposes a condition requiring the development of a marine access management plan, in consultation with the Marine Users Group and Aboriginal Groups that would:

- Identify existing and traditional navigational routes, fishing areas, habitat areas, harvesting areas, commercial shipping use, recreational and tourism use, Aboriginal Groups' use, and any associated timing windows;
- Describe how affected stakeholders and Aboriginal Groups would be informed of the anticipated Project schedule for marine-based activities during construction and potential interference with marine navigation as a result of marine-based construction activities;
- Demonstrate how any disruption caused by the construction of the Project to the access for members of Aboriginal Groups to carry out marine-based traditional use activities would be avoided or mitigated; and
- Describe methods to monitor the effects of the marine-based activities on marine users during construction.

EAO also proposes a condition requiring the Proponent to ensure that Project-related marine-based activities do not impede fishing during openings set by DFO, for the duration of such fisheries openings.

### 5.3.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the Project would result in the following residual adverse effects on marine use during construction:

- Disruption of access to waterways; and
- Increase in marine traffic volume and frequency.

Summarized below is EAO's characterization of the expected residual effects of the Project on marine use, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | High sensitivity / Low resilience | The Fraser River South Arm supports a variety of marine uses, including international and domestic shipping; 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 to the navigation channel can be considered to be relatively high. |
| Magnitude | Low-to-Moderate | Project construction is expected to have a low-to-moderate magnitude effect on access to waterways and marine traffic volume, due to marine-based equipment working in or transiting the Project area and marine-based construction activities including tunnel decommissioning. It is expected that marine users would experience access restrictions and occasional closures, and increased vessel traffic during construction. Full closures of the Fraser River South Arm navigation channel are not anticipated. |
| Extent | Local | Residual effects are generally expected to be limited to the approximately 2.5 km downstream and 5 km upstream of the Tunnel, and Deas Slough, although access restrictions would vary depending on nature of specific construction activity and on the tides and current. This would the upper bound of the zone where navigation may be affected during in-river construction. |
| Duration | Short-term | The residual effects would be limited to the construction phase. Project-related marine activity during Tunnel decommissioning is expected to last approximately 4 months. Installation of the bridge deck is expected to be undertaken in 2-3 day stretches per week, over 20 weeks. During this period, marine users would potentially be affected for approximately 2-3 days per week. |
| Frequency | Infrequent | Marine users are expected to be affected by a temporary disruption to access (approximately 2-3 times per week) and increases in marine traffic occasionally during Project construction. |
| Reversibility | Reversible | Residual effects will be reversed during Project operation (i.e., following completion of Project construction. |
| Likelihood | The likelihood is high of residual effects to Marine Use during Project construction due to 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. | |
| Significance | Considering the analysis above and having regard to the conditions identified in the TOC and CPD (which would become legally binding as a condition of an EAC), EAO is satisfied that the Project is not likely to have significant adverse residual effects on Marine Use. | |
| Confidence | There is a high level of confidence in the likelihood and significance determination. | |

### 5.3.5 Cumulative Effects Assessment

Residual effects that are anticipated during construction were considered in relation to other certain developments or activities, or reasonably foreseeable projects. During operation, no residual effects are anticipated.

The Project that is expected to interact temporally and spatially with the residual effects of disruption of access to waterways and increase in marine traffic volume and frequency during construction is the annual maintenance dredging along sections of the navigation channel within the Fraser River South Arm. VFPA performs annual maintenance dredging operations, which are managed in a way that minimizes adverse effects to marine users. Other reasonably foreseeable projects that may interact with the residual effects of the Project include the Vancouver Airport Fuel Delivery Project, the WesPac Tilbury Marine Jetty Project, the FortisBC Tilbury LNG Facility Expansion Project (future phase), the South Richmond Terminal Project, and the Pattullo Bridge Replacement Project. However, there is some uncertainty in the temporal and spatial overlap with these projects given the temporary nature of the residual Project effects and timing of these reasonably foreseeable projects. Although the Proponent noted there is a potential for temporal overlap with the construction phases of the Project and the Pattullo Bridge Replacement Project, the Pattullo Bridge is located east of the North Arm and South Arm confluence, and has an alternate route for river traffic in case there is a need for marine-based material delivery for the project during this period. Given the infrequent nature and reversibility of the residual Project effect, EAO believes that this cumulative effect would be low in magnitude and not significant for marine use.

### 5.3.6 Conclusions

Considering the assessment above and having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of an EAC), as well as applicable municipal, provincial and federal regulatory requirements, EAO is satisfied that the Project is not likely to have significant adverse effects on marine use.

## 5.4 Traffic

### 5.4.1 Background

Traffic was assessed in the Application and the potential effects were studied, to support the assessment of effects on terrestrial wildlife, atmospheric noise, air quality, land use, and human health.

The Application notes that although the Project would result in changes to traffic conditions, the primary objective of the Project is to address the existing adverse effects

of congestion on the movement of people and goods to contribute to a more efficient operation of the local and regional road network.

Since the opening of the Tunnel in 1959, regular monitoring by the Proponent shows that traffic demand and the needs of Highway 99/Tunnel users have changed substantially over time. Today, an average of approximately 80,000 vehicles use the Tunnel every day. The Application notes that traffic through the Tunnel will grow to approximately 100,000 vehicles per day by 2045 as a result of planned growth in population and employment within the region. The Application reports that, at present, traffic to Vancouver accounts for 40% of the total traffic through the Tunnel, while almost 60% of daily trips are between Richmond and communities south of the Fraser River.

The Project would involve changes to the Highway 99 corridor and related road, transit, and cycling and pedestrian networks and the Application assessed changes in future traffic volumes, traffic flows, origins and destinations, and travel mode choice. The Project would also include changes to existing transit infrastructure along the Highway 99 corridor that the Proponent notes are intended to result in travel time savings and improved travel time reliability.

The Project alignment extends from Bridgeport Road in Richmond to Highway 91 in Delta. The LAA considered the spatial extent of area of physical works proposed to be undertaken and includes the Highway 99 ROW from Bridgeport Road in Richmond to Highway 91 in Delta. Where the physical scope of the Project extends beyond the ROW to tie into connecting highways and roads, the LAA is widened to match the physical extent.

The RAA includes the Greater Vancouver region, as represented in TransLink's Regional Transportation Model (RTM). The RTM incorporates Metro Vancouver's future land use plans, population and employment growth forecasts, goods movement forecasts, changes that may be made to regional transportation infrastructure, and decisions that individuals and goods movers are likely to make regarding regional transportation travel and mode choices.

The Proponent conducted desktop studies, traffic data collection, and traffic forecast modelling. Traffic forecasting conducted in the Application is based on assumptions regarding the timing of the build out of land use plans, population and employment growth, and future changes to regional transportation infrastructure. Traffic volume forecasts used the State 0 version of the EMME2 RTM. TransLink provided the Proponent with the Beta version of the RTM, to which the Proponent made

modifications, which was then used for Project forecasting. TransLink's latest model release to date is the Phase 2.0 version, released in February 2015, which was not used for the Project. The EMME2 RTM is based on land use assumptions consistent with Metro Vancouver's Regional Growth Strategy.

The *Provincial Guidelines for Tolling* have been used as the basis for assumptions related to traffic forecasts that include tolling. The Port Mann Bridge tolling framework has been applied to the new proposed bridge, with the adjacent Alex Fraser Bridge and Highway 91 corridor considered as the free alternative.

The Application notes that there is inherent uncertainty in the predictive capacity of traffic models, particularly for tolled facilities, which they note have been mitigated by using multiple methodologies and considering a range of forecasts. In the case of the Proponent's recent experience at the Port Mann Bridge, traffic model forecasts predicted an increase in traffic on opening day which would grow substantially by 2021. In reality, a drop in overall traffic of approximately 14% was experienced and a much slower growth rate has been observed.

In consideration of the limitations and uncertainties involves in traffic forecasting, the Application includes a range of forecasts from various sources (Figure 4).




**Figure 4: George Massey Tunnel Replacement Bridge Range of Traffic Forecasts**

The **GMT Forecast** line shows anticipated AADT from the present to 2045 with the new tolled bridge in place and with adjustments to reflect current experience at the Port Mann Bridge. The forecast expects that the first-year daily traffic with the new bridge would be 71,000, representing a 14% drop from forecast volumes under continued Tunnel operation. Based on this growth, traffic demand at the new bridge is forecast to be 84,000 vehicles per day by 2045.

The **GMT (SDG Independent**) line shows AADT volumes based on independent forecasts developed by Steer Davies Gleave (SDG 2015) from the present to 2045, which indicates a slightly lower drop in opening-year daily traffic and a slightly different future growth rate when compared to the GMT Forecast line.

Given the variability in the forecasting, and to ensure a conservative assessment for EA purposes, the upper range of forecast values (TL-RTM untolled, 2030 With the Project) were used as it represents the highest potential volume of traffic. The “TL-RTM tolled, 2045 With the Project” forecasts were used to describe trends in traffic within the RAA

because they provide the best-available level of detail necessary for the required comparative analysis.

Current AADT volumes at nearby crossings were also estimated in the Application and are summarized in Table 10. The Application predicted that there would be an increase in AADT at nearby Fraser River crossings without the Project compared to current levels. The Application estimated that there would be a minor decrease in traffic with the Project at the Knight Street Bridge, Arthur Laing Bridge, and Oak Street Bridge.

The Application estimates that there is expected to be a 17% increase in daily traffic in 2045 at the Alex Fraser Bridge as a result of the Project, due to off-peak diversion (evenings and weekends) from tolling of the new bridge. The Tunnel is heavily congested during the peak hours in both directions and although the Application notes that the Alex Fraser Bridge has absorbed most of the growth over the last two decades due to capacity issues at the Tunnel, the Alex Fraser Bridge is less congested than the Tunnel. The Application also states that some users currently choose to take the Alex Fraser Bridge rather than the Tunnel because of Tunnel congestion, even though it takes them out of their way to do so, as is demonstrated by the origin-destination analyses the Proponent conducted in 2013 and 2014. In the future, it is expected that some midday, overnight, and weekend traffic would choose to use the Alex Fraser Bridge rather than the new bridge to avoid tolls, as there is available capacity at the Alex Fraser Bridge during these times.

**Table 10: Two-way Annual Average and Daily Traffic Volumes at the George Massey Tunnel Crossing and on Adjacent Fraser River Crossings, With and Without the Project**

| | 2014-2015 | 2045 | 2045 |
|---|---|---|---|
| **Crossing** | **Measured** | **Without Project** | **With Project and Tolled** |
| George Massey Tunnel / new bridge crossing | 81,000 | 100,000 | 72,000 |
| Alex Fraser Bridge | 107,000 | 120,000 | 140,000 |
| Knight Street Bridge | 92,000 | 94,000 | 93,000 |
| Arthur Laing Bridge | 76,000 | 90,000 | 91,000 |
| Oak Street Bridge | 80,000 | 87,000 | 85,000 |
| Knight + Laing + Oak | 248,000 | 271,000 | 269,000 |

The Application examined hourly traffic patterns at the Oak Street Bridge and in particular the potential effects on northbound rush-hour traffic flow conditions. Oak Street Bridge traffic volumes are reported to have dropped between 2010 and 2015 since the introduction of the Canada Line, although the intersection of Oak Street and 70$^{th}$ Avenue at the north end of the Oak Street Bridge is expected to remain congested for northbound rush-hour traffic in the future. Traffic conditions would be influenced by a

number of factors, including increases in traffic from regional population and economic growth, as well as future operation of the signal lights at 70th Street. The Application notes that northbound commuters who may change their preferred travel time to take advantage of potential time savings from the new bridge may result in longer queue lengths at Oak Street, if drivers choose to commute during the busiest part of rush-hour. The Proponent expects that the infrastructure included in the Project to support future transit improvement, in conjunction with tolling, would support and enable a mode shift towards greater use of transit and HOV vehicle traffic across the Oak Street Bridge.

### 5.4.2 Potential Project Effects and Proposed Mitigation Identified in the Application

*Construction*

During construction, in off peak periods, temporary effects to traffic may occur due to construction-related vehicles entering and leaving the Project area and interacting with regular traffic flows. Highway upgrades, reconstruction of interchanges and new bridge construction would introduce additional vehicles and equipment to the Highway 99 corridor.

Construction activities would also require lane closures or lowered speeds through active construction zones, which could have temporary effects to traffic. In addition, infrequent full highway closures may occur for specific construction activities, such as during bridge deck lifts over the Tunnel and approaches. The Proponent would schedule such closures for overnight periods or weekends when traffic volumes are lower, to minimize impacts. In these circumstances, traffic would be detoured to alternate routes and the Application predicts that temporary additional travel times of 6-12 minutes and temporary additional travel distances of 9 to 18 km may be incurred.

Temporary changes to transit routes and bus stop locations during construction have the potential to affect transit usage, travel times and reliability. Such changes could occur at different locations, at different times and for different durations depending on the specific construction activity being undertaken. Construction activities may also have temporary effects to users of existing cycling and pedestrian routes.

*Mitigation Measures during Construction*

The Application, notes that the Proponent has been carrying out construction activities along the Highway 99 corridor for over 50 years and has successfully completed recent nearby highway projects, such as the Port Mann Bridge/Highway 1 upgrades and SFPR. The specific mitigation measures during construction outlined below are based on this past experience.

The Application proposes the development of a construction traffic management plan to identify and address traffic management risks and approaches for managing traffic and communication with stakeholders and the public during construction. The plan would be developed in consultation with key stakeholders, including affected municipalities, emergency responders, and property owners. The plan would include traffic management strategies to minimize disruption and maximize predictability for Highway 99 travellers, cycling and pedestrian network users, and nearby residents. The plan would also outline traffic monitoring that would be conducted during construction to ensure prescribed levels of service for travellers are maintained. In addition, specific monitoring of travel times, traffic incidents, transit, cycling and pedestrian usage, and goods movement surveys would be carried out to verify the Project performance objectives related to traffic.

The Proponent notes that for peak-period traffic, current throughput rates and posted speeds would be maintained such that impacts to travel times and congestion-related delays are minimal. For construction activities that may require lane closures or lowered speeds through active construction zones, the Proponent would limit these activities to night time, off-peak period hours with at least one lane of traffic available in each direction. This mitigation strategy was implemented previously when seismic upgrades were performed on the Tunnel. Traffic volumes are low during these times such that delays to traffic are minor, typically a one to two minute delay over a 5 km travel distance. For infrequent full highway closures that may occur for specific construction activities, the Proponent would schedule such closures for overnight periods or weekends, when traffic volumes are lower, to minimize traffic impacts.

To mitigate potential effects to transit users, the Proponent would work with TransLink to maintain the current transit schedules and any temporary changes affecting routes or bus stop locations would be developed in conjunction with TransLink. The Application expects some disruption to transit schedules if infrequent full-closures for specialized activities necessitate a detour via Highway 91. Effects would be temporary, occurring at times when transit usage is generally lower. The Application does not anticipate that transit ridership levels or mode share for high-occupancy vehicles would be affected during the construction period.

To mitigate potential impacts to cyclists and pedestrians, the Proponent would maintain the existing shuttle through the tunnel, as well as any existing cycling or pedestrian pathways impacted during construction. Any temporary relocations would be developed in consultation with municipalities and stakeholder groups.

*Operations*

The Application estimates that as a result of the Project, including transit, cycling and pedestrian infrastructure improvements, roadway upgrades, and new interchanges, road congestion and travel reliability would be improved, resulting in a 25 - 35 minute per day in savings for the average commuter. The Application notes that Project improvements would support strategies to encourage mode shift to transit and carpooling through the provision of dedicated transit/HOV lanes between Bridgeport Road in Richmond and Highway 91 in Delta. Transit-only ramps at Bridgeport Road as well as integrated transit stops at Highway 17A and Steveston Highway would further improve the accessibility, efficiency, reliability, travel time and attractiveness of transit resulting in increased transit mode share on completion of the Project. Further, the Application states that integrated tolling would provide the mechanism for managing future traffic demand and support movement towards alternative modes of transportation.

Current congestion on the Highway 99 corridor has resulted in negative effects to traffic such as high accident rates, congestion related delays and short-cutting on adjacent municipal roads. During operations, the Application anticipates immediate positive effects from congestion relief including travel time savings, greater reliability of use, improved transit operations and removal of highway traffic on adjacent municipal roads. The Project would also include components to support improved performance on the Highway, including additional traffic cameras linked to the Proponent's Drive BC online traffic information and trip planning tool, traffic sensors and cameras to assist in providing a coordinated response to traffic accidents, and dynamic messaging to report delays or alternate routes.

With the Project in operations, there are expected to be greater active transportation opportunities for cyclists and pedestrians.

### 5.4.3 Potential Project Effects and Proposed Mitigation Identified during Application Review

During Application Review, the Working Group and the general public raised concerns regarding the potential effects to transportation infrastructure.

*Impact to City of Richmond Roads and Businesses*

Richmond raised concerns that although the Application included existing and forecast traffic volume information for Highway 99 interchanges and one municipal intersection (Steveston Highway-No. 5 Road) in Richmond, there was no analysis of the impacts of

this increased traffic on local roads and intersections upstream and/or downstream of the Project, and thus no identification of measures to mitigate any impacts. During the EA, Richmond requested forecast traffic volume data for locations in Richmond, as well as detailed analysis assumptions (e.g., lane capacity, number of lanes, traffic signal phasing, geometric characteristics) and outputs (e.g., level of service, volume/capacity ratios, queuing analysis, other capacity performance indicators) in order to assess traffic impacts on municipal roads. Richmond also suggested that the Proponent should be responsible for the funding and implementation of any necessary local road improvements to facilitate the impact of the increased traffic.

Richmond also requested an evaluation of the potential positive or negative economic impacts on businesses in the City of Richmond, in context of protecting or improving reliable accessibility to key commercial and industrial areas of Richmond. During the EA, EAO requested a memo from the Proponent that included additional traffic analysis at Steveston Highway and Number 5 Road.

> The Proponent provided a memo with further information regarding the traffic assessment. In this memo, the Proponent noted that the Tunnel is currently significantly congested during peak periods in both directions, which leads to further delays along the local Richmond road network for Tunnel-bound traffic. The RGS forecasts that Richmond's population and employment levels will increase at more than one percent annually in the future and that a substantial amount of the traffic growth in Richmond over the next three decades would occur with or without the Project.
>
> The Proponent noted that additional capacity on the Richmond portion of the Highway 99 corridor would provide congestion relief for a number of local Richmond roads, in particular for adjacent north-south municipal roads. Road improvements would include the new Steveston Highway interchange, the new Rice Mill Road connections, the improved Westminster Highway interchange, as well as further transit and road improvements along Highway 99 between the new bridge and Bridgeport Road. In this context, the Proponent notes that the Project would be mitigating existing and future congestion on the adjacent local road network by providing better traffic flow and road improvements.
>
> With regards to potential impacts to local businesses, the Proponent committed to continue to consult businesses that may be directly affected by Project-related activities including changes in access or potential traffic changes. Based on earlier engagement, the Proponent noted that several aspects of the Project

were developed specifically to address existing business impacts related to severe congestion on Highway 99:

- The new Rice Mill Road accesses, for example, were developed based on input from the local Richmond business community and discussions with municipal staff, and would help redistribute trucks and other traffic bound for the growing Ironwood commercial/industrial area to relieve pressure on the Steveston and No. 5 Road intersection providing substantial travel time savings;
- Reduced congestion on Highway 99 would lead to less spoilage/waste as a result of the improved reliability in getting perishable goods to market; and
- Increased efficiency of farming operations as a result of the improved travel times and improved access between farms on both sides of Highway 99.

EAO proposes a condition requiring a traffic and access management plan that would include measures for traffic control, traffic interruptions, and re-routing and how these measures would be communicated to stakeholders, municipalities and land users.

*Traffic Considerations Outside of the LAA at Other Bridge Crossings*

Metro Vancouver, Richmond, Vancouver Coastal Health, TransLink and Tsleil-Waututh Nation expressed concerns that the Project could affect broader regional and subregional travel patterns, such as trip origins and destinations, and queues on Oak Street Bridge, Knight Street Bridge, Queensborough Bridge, Arthur Laing Bridge, and the Alex Fraser Bridge. These groups requested that traffic analysis – in particular, an assessment of queue lengths – be conducted and expanded to include other crossings and the entire transportation network, and also requested that the Proponent propose any required mitigation measures. It was noted by Metro Vancouver that the Alex Fraser Bridge is currently at capacity during peak hours and that congestion could worsen at the Alex Fraser Bridge as a result of the Project, if future users of the proposed bridge choose an alternate route to avoid the toll.

In response to these concerns, the Proponent noted that although the Alex Fraser Bridge, Oak Street Bridge, Knight Street Bridge, and Arthur Laing Bridge were outside the LAA, the Application presented future traffic levels at each of these crossings both with and without the Project. The Proponent noted that traffic impacts of the Project on the Oak Street Bridge and other crossings would

be modest, and would be generally positive. However, even though the Proponent predicted modest benefits to traffic congestion at the Oak Street Bridge, it would be expected to remain congested in the future. Traffic conditions would be influenced by a number of factors, including increases in traffic from regional population and economic growth, as well as future operation of the signal lights at 70th Street.

Based on the Proponent's experience with the Port Mann Bridge, the newly tolled bridge is forecast to initially result in reduced daily traffic volumes, but an increase in peak hour traffic volumes, while simultaneously leading to an overall reduction in congestion-related queue lengths and delay times, with the exception of northbound traffic during the busiest part of rush hour. The Proponent noted that at Port Mann Bridge, some convergence of morning westbound traffic to the middle part of rush hour period has been experienced, as people travel at more convenient times, and they predict a similar trend at the new bridge. The Proponent predicted that traffic continuing on to Vancouver via the Oak Street Bridge may experience line-ups of a few minutes longer during the middle of rush hour, although any increases at the Oak Street Bridge during the busiest part of rush hour would be offset by travel time savings at the new bridge. In addition, traffic levels and delays at the Oak Street Bridge would be reduced during all other times of the day, and on weekends, because of reduced traffic levels due to tolling. Although the Oak Street Bridge is expected to remain congested in the future, traffic conditions would be influenced by a number of factors, including an increase in traffic from regional population and economic growth, as well as future operation of the signal lights at 70th Street.

With regards to the Alex Fraser Bridge, the Proponent stated that this bridge is currently congested during the peak hours in the peak direction. The Proponent also stated that some users choose to take the Alex Fraser Bridge instead of the Tunnel because of the Tunnel congestion, even though it takes them out of their way to do so. In the future, the Proponent expects that some midday, overnight, and weekend traffic would choose to use the Alex Fraser Bridge rather than the new bridge to avoid tolls, although there is available capacity at the Alex Fraser Bridge during these times.

The Proponent believes that, as demonstrated by the Port Mann Bridge experience, the new bridge would attract peak period traffic in both directions, reducing congestion at the Alex Fraser Bridge. The Proponent also noted that while the Port Mann Bridge's off-peak and weekend traffic volumes decreased with the introduction of tolls, peak-period traffic levels actually increased during

the morning westbound rush hour period. The Proponent explained that these trends reflect the less price-sensitive nature of commuter-related peak period traffic. A similar pattern of traffic reaction is expected at the new bridge, with peak period traffic being more willing to pay the toll, when the benefits of avoiding peak period congestion at Alex Fraser Bridge are highest.

The Proponent noted in a traffic memo of November 15, 2016 that the Proponent would work with local and regional partners on an ongoing basis to monitor the performance of the Project infrastructure and adjacent areas within the regional transportation network, in the context of the overall operation of the regional transportation network. The Proponent has committed to monitoring and reporting on operational phase traffic conditions, which would include: annual average daily traffic volumes (AADT), annual average weekly traffic volumes (AAWT), traffic profiles, transit ridership, and cyclist and pedestrian traffic.

EAO proposes a condition that would require the establishment of a transportation working group for the Highway 99 corridor. The Proponent would also be required to develop a Terms of Reference for the transportation working group in consultation with local governments, health authorities, TransLink and Aboriginal Groups. The condition would require the reporting of operations traffic conditions within the Highway 99 corridor, after the first and third year of operations, which would be submitted to the working group.

*Methodology and Modelling*

Comments were raised by the public, Richmond, Metro Vancouver, Penelakut Tribe, TransLink, Tsleil-Waututh Nation and Vancouver Coastal Health regarding the traffic modeling and methodology included in the Application. Members of the Working Group questioned the forecasts used to inform the estimates of Vehicle Kilometres Travelled (VKT), Vehicle Hours Travelled (VHT), mode share and bridge volumes in the Application and the associated level of confidence. Working Group members also commented on the variations in the traffic forecasts between TransLink, SDG and the Proponent's forecast. Whether the methodology used was the most currently available, what assumptions were used when conducting modelling, how regional planning was considered in the assessment, and whether adequate consideration was given to other regional initiatives or projects in the cumulative effects assessment.

The Proponent undertook traffic forecasting which included consideration of the Metro Vancouver RGS and other regional and community planning initiatives, including future commercial and industrial economic development opportunities,

as well as the anticipated population and employment growth for Richmond, Delta, and Surrey. Also captured in the traffic forecasting is the transportation priorities outlined in the Mayors' Council Vision, including the new four-lane Pattullo Bridge, Evergreen and Broadway rapid transit extensions, and light rail transit in Surrey and Langley.

As traffic forecasting in the Application was based on assumptions regarding the timing of build out of land use plans, population and employment growth, and future changes to regional transportation infrastructure, as well as decisions that individuals will make regarding transportation choices, the Proponent acknowledged the inherent uncertainty in the predictive capacity of traffic models and mitigated this uncertainty by using multiple methodologies and considering a range of forecasts.

Recognizing the uncertainty inherent with traffic modeling based on land use plans looking 30 years into the future, the Proponent noted that Project planning has considered a broad range of traffic projections. Forecast traffic volumes both with and without tolling have been developed based on an extensive multi-year program of data collection, traffic modelling, and independent review and validation. In assessing regional traffic impacts, including VHT and VKT, forecasts are based on TransLink's RTM tolled scenario, as the issues identified with the RTM tolling functionality are limited when assessed on a regional basis.

Contrary to what was requested by Metro Vancouver and TransLink during the EA, the Proponent noted in their memo of November 15, 2016 that it would be inappropriate to model a "no-other-investment" scenario which assumes that none of the infrastructure investments associated with the Mayor's Vision are implemented. The Proponent stated that modelling this scenario would be contrary to the MOTI's long-term commitment to acknowledging and supporting the mandates of other entities involved in land use and transportation planning. In addition, the Proponent noted that the Province has already committed financial resources to some of the projects identified within the Mayor's Vision and has indicated a commitment to future investments as the planning of specific projects is advanced.

*Consideration of Emergency Responders*

Concerns were raised by the public and Richmond related to impacts to road safety and emergency providers. It was raised that a potential increase in traffic volumes at local road intersections, which include locations with relatively higher rates of traffic crashes

(e.g., Steveston Highway-No. 5 Road), may lead to an increase in calls for service, potential rescue calls and possible longer response times due to increased traffic congestion on local roads.

During pre-Application consultation, emergency responders from Richmond and Delta expressed a strong preference for a new bridge over a tunnel option. The Proponent responded that several meetings with emergency responders in Richmond and Delta have been held over the last three years; during which emergency responders expressed their belief that the Project would provide substantial safety and improved emergency response benefits, including congestion relief (enabling faster response times), wider shoulders, and a forecast 35 % reduction in collisions.

The Proponent noted that the Project would help to improve the existing traffic situation on Highway 99, the Steveston Interchange and local Richmond roads and intersections. Elimination of traffic lights at the new Steveston Interchange would improve traffic flow for vehicles crossing Highway 99, improve the currently poor level of service at the Steveston Highway/No 5 Road intersection, and improve traffic safety and reduce traffic collisions. The Proponent committed to continue to work with emergency responders in ensuring that the final design enables first responders to respond to emergencies safely and efficiently.

During construction, the Proponent committed that the Highway 99 corridor and connecting interchanges would remain operational to current levels of service during the day and early evenings. The counter-flow system would be maintained during weekdays as per the current schedule. Traffic speed limits would be adjusted throughout the construction zone, to ensure that accident risks and collision rates do not increase from current levels, and if possible are reduced. The construction traffic management plan would include safety requirements to maintain a safe corridor at all times for travellers and workers.

EAO proposes a condition requiring the development of a traffic and access management plan that would include identification of how access would be provided for emergency vehicles where emergency vehicle and response personnel require passage through the Project area.

### 5.4.4 Characterization of Residual Effects

After considering all relevant proposed mitigation measures, EAO has identified the potential for the following residual adverse effect on traffic:

- Change in travel time during construction.

Based on its review and numerous discussions with the Proponent, Richmond, Delta, Metro Vancouver and other reviewers, EAO concludes there are no potential adverse effects during operations in the short term.

EAO acknowledges that in the long term, the operation of infrastructure projects are tied to population and economic growth, human preference, technological changes, economic conditions, tolling scenarios, future highway and transit projects, and other factors beyond the Proponent's control. While the Proponent has made assumptions regarding all of these factors to develop its Application and business case, the extent to which such assumptions may change in the future, they are more appropriately addressed through existing processes that focus on planning and operation of regional transportation systems, which is not inherently part of the EA process.

Summarized below is EAO's characterization of the expected residual effects of the Project on traffic, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Moderate resilience | The RGS forecasts that Richmond's population and employment levels will increase at more than 1% annually in the future and that a substantial amount of the traffic growth in Richmond over the next three decades would occur with or without the Project.<br><br>An average of 80,000 vehicles use the Tunnel every day, and without the new crossing, the Application notes that traffic through the Tunnel would grow to approximately 100,000 vehicles per day by 2045. Influences on transportation infrastructure along the Highway 99 corridor have changed, including origins and destinations within the corridor and the demand for greater transportation choice. While the Tunnel remains an important commuter crossing to City of Vancouver for south of the Fraser River residents, travel patterns within the Lower Mainland in general, and south of the Fraser River in particular, also have changed substantially since the Tunnel opened. |
| Magnitude | Low | For construction activities that may require lane closures or lowered speeds through active construction zones, the Proponent would limit these activities to night time and off-peak period hours with at least one lane of traffic available in each direction. Traffic volumes are low during these times such that delays to traffic are minor, typically a one to two minute delay over a 5 km travel distance. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | For infrequent full highway closures that may occur for specific construction activities, the Proponent would schedule such closures for overnight periods or weekends, when traffic volumes are lower, to minimize traffic impacts. |
| Extent | Local | An increase in travel time during construction is expected to occur within construction zones along the Highway 99 corridor, affecting the Project alignment, connecting Highways and cross streets. |
| Frequency | Frequent | Low magnitude effects would be frequent during the period of construction. |
| Duration | Short-term | Delays within the Project corridor are anticipated throughout the construction period. When lane closures or lowered speeds through active construction zones occur, the Proponent would limit these activities to nighttime, off-peak hours, where delays to traffic may result in a one to two minute delay. Infrequent highway closures would be scheduled for overnight periods or weekends and could result in additional travel time of 6 – 12 minutes. |
| Reversibility | Reversible | The adverse effect would be fully reversible upon completion of construction. |
| Probability | High | EAO is of the view that it is likely that there would be some traffic effects during construction. |
| Confidence | High | There is a high confidence in an increase in travel time along the Highway 99 corridor during construction. |

### 5.4.5 Cumulative Effects Assessment

TransLink's proposed Pattullo Bridge Replacement Project is undergoing an EA, with a planned construction period between 2019 and 2023 that would overlap temporally with the Project. As the planned Pattullo Bridge replacement is a new structure, some distance upstream of the existing bridge, the Application notes that traffic would be maintained on the current alignment throughout the construction period. Accordingly, there are no residual effects anticipated from the Pattullo Bridge replacement that could interact with residual construction-related effects of the Project on traffic.

### 5.4.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the Project is not likely to have significant adverse residual effects on traffic.

# 6 Heritage

## 6.1 Heritage Resources

### 6.1.1 Background

Heritage Resources were assessed as a VC due to the potential for the Project to have adverse effects on archaeological and historical heritage sites, objects, and features. The Application defines archaeological sites as sites that pre-date 1846, or sites that are undated and could pre-date 1846. Historical heritage sites are those that originated since 1846. In accordance with the B.C. *Heritage Conservation Act* (HCA), heritage resources include, but are not limited to:

- Artifacts, features, materials, or other physical evidence of human habitation or use prior to AD 1846;
- Burial places and human remains with archaeological or historical value;
- First Nations rock paintings or First Nations rock carvings that have archaeological or historical value; and
- Heritage wrecks (i.e., vessels or aircraft) or heritage objects from a heritage wreck.

The LAA includes the Project alignment, the maximum area within which potential direct and indirect Project effects on heritage resources are reasonably expected to occur, accounting for the site-specific and stationary nature of heritage resources. The RAA includes the Project alignment plus a one kilometer buffer.

The Project would be located where there is potential for interaction with currently-unidentified archaeological and heritage resources, including previously-unknown and unrecorded heritage sites potentially located in construction areas covered by existing infrastructure along the Highway 99 corridor, that could be encountered during Project activities. Aboriginal Groups also identified potential Project-related effects on heritage resources as an area of specific interest and were engaged in the heritage resources assessment with the Proponent from early stages.

### 6.1.2 Potential Project Effects and Proposed Mitigation Described in the Application

This section summarizes potential Project-related effects on heritage resources and key mitigation measures proposed in the Application.

The assessment of heritage resources included the following four indicators:

- Disturbance of archaeological sites, objects, and features that may affect site integrity;
- Disturbance of historical sites, objects, and features that are subject to protection under the HCA that may affect site integrity*;*
- Changes in the level of accessibility to archaeological sites, objects and features; and
- Changes in the level of accessibility to historical sites, objects, and features that are subject to protection under the HCA.

The Proponent conducted a desktop literature review and a field inventory of heritage resources to address known data gaps. The desktop literature review was undertaken to determine the heritage resource potential for the LAA and to identify key data gaps and areas of uncertainty in the LAA. The field inventory was undertaken to identify and evaluate heritage resources within the LAA, if present. Using information derived from the literature review, the LAA was analyzed to identify areas of relative archaeological potential and select field inventory locations. While the majority of the LAA is characterized as having low potential due to environmental constraints on human use or site preservation, 18 locations were considered for field inventory based on the literature review. Prior to commencing the field inventory, it was determined that two of the locations could not be examined due to existing environmental and infrastructure constraints. A total of 413 subsurface tests were conducted in 16 areas in the LAA during the field inventory.

No historical or archaeological heritage sites were identified within the LAA; therefore, no Project interactions or potential Project-related effects are anticipated. There is potential for currently-unidentified archaeological and heritage resources, including previously-unknown and unrecorded heritage sites in construction areas covered by infrastructure installed as part of the original development of the Highway 99 corridor, to be encountered during Project activities.

A historical village site located outside of the LAA but within 5 km of the Project was identified by Aboriginal Groups and areas for harvesting and spiritual practices were identified near the village site. Aboriginal Groups also identified areas adjacent to the

proposed new bridge footings, and in and around Deas Slough and Deas Island Regional Park, as potential archaeological sites and noted that mourning rituals may have been practiced at Deas Island and/or Westham Island. Aboriginal Groups also noted the existence of another shared village site on the Highway 99 corridor by Crescent Beach, where gathering and trading occurred.

The implementation of mitigation measures described in the Application follows the hierarchical approach of avoidance, minimization and reduction of unavoidable effects.

Measures to avoid potential effects have been or will be incorporated into Project considerations such as site and route selection, Project design, and construction and operation procedures and practices. Standard mitigation measures, BMPs, and construction and operation archaeological and heritage resources management plan will be implemented to minimize potential Project-related effects.

The archaeological and heritage resources management plan would be developed as part of the CEMP and would include a chance-find procedure to be implemented during construction activities that involve ground disturbance. The implementation of a chance-find procedure is consistent with regulatory requirements and recognized best practice, and is expected to address potential Project-related effects on previously-unidentified heritage resources.

Areas of archaeological potential that were inaccessible during the field inventory, or identified during subsequent field reconnaissance, would be reviewed against the detailed Project design to confirm if further assessment is needed. If required, further assessment of these sites would be undertaken under the terms and conditions of a HCA permit prior to or during Project construction.

### 6.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, several issues and potential Project effects in relation to heritage resources were raised by Working Group members.

Tsleil-Waututh Nation raised concerns regarding the comprehensiveness of the assessment of heritage resources conducted by the Proponent and subsequent assessment of interactions with candidate VC’s. Tsleil-Waututh Nation indicated knowledge of nearby heritage sites within their Consultation Area and expressed a view that the potential for interaction would be high. Tsleil-Waututh Nation noted that a comprehensive heritage resources assessment could not be completed until areas

blocked by infrastructure are available for a proper archaeological assessment prior to the development. Tsleil-Waututh Nation also noted that heritage resources are not limited to material remains of pre-contact or post-contact age, and that while spiritual places, traditional use locations, or resource areas are mentioned in the Application, they have not been assessed.

The Proponent stated that the scope of the heritage resources assessment includes archaeological sites and those historical sites, objects, and features that are subject to protection under the HCA. The Proponent also stated that no archaeological or historical sites were found within the Project alignment during the field inventory conducted as part of the assessment.

The Proponent indicated that an archaeological and heritage resources management plan would be developed as part of the CEMP and would include a chance-find procedure to be implemented during construction activities that involve ground disturbance. The chance-find procedure would outline actions to be taken by construction personnel if previously-unknown and unrecorded heritage resources, including those that may be present in areas covered by infrastructure installed as part of the Highway 99 corridor development, are encountered during Project construction.

The Proponent noted that the implementation of a chance-find procedure is consistent with regulatory requirements and recognized best practices, and is expected to address potential Project-related effects on previously-unidentified heritage resources. In the interim, the Proponent requested that Tsleil-Waututh Nation provide additional information on the location of heritage sites not currently identified in the heritage assessment to ensure that such areas are assessed prior to the start of construction.

EAO proposes a condition requiring the development of an archaeological and heritage resources plan that must be developed in consultation with Aboriginal Groups. The plan would include a description of the pre-construction archaeological and heritage surveys conducted at the site, the means by which Project personnel or contractors will receive training on chance find procedures, and measures to appropriately manage chance finds of archaeological or heritage resources during construction, including those that may be present in areas covered by infrastructure that may be unearthed or excavated.

### 6.1.4 Conclusions

Considering the above analysis having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of the EAC), EAO is satisfied that the effect of the Project on heritage resources would be negligible.

# 7 Health

## 7.1 Health

### 7.1.1 Background

Human health was assessed as a VC because the Project has the potential to affect human health along the Highway 99 corridor. The human health assessment focused on Project-related changes to the air quality and noise ICs, supported by a human health risk assessment (HHRA). The HHRA is supported by the assessment of potential effects to air quality and atmospheric noise as presented in the Application. A health impact assessment (HIA) was also completed to evaluate the potential influence of the Project on other determinants of human health. The potential effects to air quality are also assessed in section 4.1 (Air Quality) of this Report, while the potential effects of audible noise on people are assessed in section 5.2 (Land Use and Visual Quality).

The LAA for air emissions includes the Project alignment, plus 1 km on either side around the Project alignment. The RAA for air emissions includes the Lower Fraser Valley airshed. The LAA for noise includes the Project alignment, plus 500 m from either side of the Project alignment, except in the vicinity of the new bridge where it extends 1,600 m from either side of the Project alignment.

### 7.1.2 Potential Project Effects and Proposed Mitigation Identified in the Application

*Air Quality*

Chemical exposure limits, including contaminants present in air emissions, are established by regulatory agencies, including Health Canada, and risk quotients are used to assess potential health effects associated with exposure to air emissions. Risk quotients for contaminants of potential concern (COPCs) were calculated based on ambient air concentrations estimated through background air quality data analysis, and traffic and emissions model outputs. Using this methodology, risk quotient values equal to or below 1.0 indicate no adverse health effects are anticipated.

During construction, potential health effects due to exposure to COPCs are expected to be avoided through the implementation of best management practices for vehicle and equipment operation. BMPs and mitigation measures are discussed in section 4.1 (Air Quality) of this Report.

For operation of the Project, the HHRA considered inhalation exposure to COPCs, with emissions from vehicles travelling the Highway 99 corridor as the primary source for the Project. Similar to the air quality assessment, the influence of traffic patterns, volume, vehicle fleet composition, vehicle speed, fuel efficiency and distance travelled were considered in the HHRA. The HHRA included 51 receptors in four different types of land use areas (agricultural, commercial, residential and recreational) along the Project alignment; and considered inhalation exposure for existing conditions (2011) at these receptors, as well as two future scenarios (2031, with and without the Project).

Risk quotient values predicted for future conditions at the four different types of land use receptors were generally below 1 for both scenarios (with and without the Project); however, values for ‘with the Project’ were lower than ‘without the Project’ and lower than existing conditions. Results indicate an overall improvement in air quality in the LAA with the Project, and as a result, potential effects to human health due to emissions are not anticipated during operations.

*Noise and Vibration*

Noise monitoring was conducted at sensitive locations along the Highway 99 corridor to determine baseline conditions. Sensitive locations included residential areas, parks and non-residential areas (schools, and places of worship). Baseline conditions were then compared to predicted post-Project operational (traffic) noise exposures at the same locations. This comparison identified specific areas where noise levels are most expected to increase, and where mitigation measures would be warranted. For construction-related effects, a generic highway construction noise model was used to estimate noise levels.

Potential health effects were then assessed by comparing predicted noise levels with health-based guidelines. Such guidelines have been developed based on epidemiological studies that have demonstrated a link between exposure to noise and health effects. The health-based guidelines supporting the HRRA included the percentage of the community expected to be “highly annoyed” (%HA) or experience sleep impairment (sleep disturbance and awakenings) or speech interference. The potential for annoyance associated with ground-borne vibration was also examined. The

following summarizes the thresholds associated with the health-based guidelines supporting the HHRA:

- *Sleep impairment:* threshold for increased sleep disturbance is 45 dBA indoors and the threshold for increased sleep awakenings is 55 dBA indoors.
- *Speech comprehension:* threshold for reduced speech comprehension is 50 dBA for indoor receptors and 55 dBA for outdoor receptors.
- *%*HA*:* threshold for when a community is expected to be highly annoyed is 6.5%.
- *Vibration annoyance:* threshold for ground-borne vibration annoyance is 100 ground-borne vibration level (VdB).

During construction, there would be potential increases in noise and vibration levels associated with Project activities compared to existing conditions. Table 11 presents the estimated construction-related noise effects.

**Table 11: Overall Estimated Construction-Related Noise Effects**

| Type of Receptor | Existing Conditions (Average) | Maximum Temporary Construction Noise Levels | | | |
|---|---|---|---|---|---|
| | | Pile Driving (Range) | Pile Driving (Average) | Other Activities (Range) | Other Activities (Average) |
| Residential | 66.3 dBA $L_{dn}$ | 52 – 86 dBA $L_d$ | 72 dBA $L_d$ | 39 - 84 dBA $L_{dn}$ | 72 dBA $L_{dn}$ |
| Non-residential | 67.1 dBA $L_d$ | ---------- | ---------- | 62 – 76 $L_d$ | 71 dBA $L_d$ |
| Parks | 49 dBA $L_d$ | 52 – 65 dBA $L_d$ | 58 dBA | 37 – 56 dBA $L_d$ | 47 dBA |

**Note:** dBA = A-weighted decibel; $L_d$ = time-averaged daytime noise level; $L_{dn}$ = time-averaged day-night noise level

Without mitigation, noise thresholds for %HA, sleep impairment and speech comprehension, as well as thresholds for ground-borne vibration levels are likely to be exceeded at the majority of the receptor locations considered. However, since atmospheric noise predictions identify areas where noise exposures may be greatest, it is anticipated that with site-specific mitigation, the magnitude of the noise effects would be reduced, but not eliminated. Ground-borne vibration, due to pile driving, may also be perceptible at residences closest to the alignment. At the 4 residences where maximum predicted ground-borne vibration levels could exceed the annoyance criterion, the maximum noise levels range between 101 and 127 dBA.

During operations, and without mitigation, the Project is expected to increase noise levels by 1 to 4 dBA at most receptor locations. With mitigation, the Project is expected to result in noise levels similar to (or lower than) current conditions, at most locations. Details are presented in Table 12.

**Table 112: Comparison of Predicted Operations (2030) Noise Levels to Existing Noise Levels**

| Type of Receptor | Noise Levels | | |
|---|---|---|---|
| | Existing | Predicted Future (without mitigation) | Predicted Future (with mitigation) |
| Residential | $L_{dn}$: 51.5 to 75 dBA; average of 66.3 dBA | $L_{dn}$: 52.5 to 77.3 dBA; average of 68.3 dBA | $L_{dn}$: 53 to 72 dBA; average of 64 dBA |
| | $L_n$: 41.3 to 67.8 dBA; average of 59.2 dBA | $L_n$: 42.9 to 70.1 dBA; average of 60.2dBA | $L_n$: 43 to 65 dBA; average of 55 dBA |
| Non-residential (e.g. schools) | $L_d$: 61.7 to 71.8 dBA; average of 68.2 dBA | $L_d$: 65.3 to 75.2 dBA; average of 71.7 dBA | Ld: 60 to 70 dBA; average of 67 dBA |
| Parks | $L_d$: 45.9 to 58 dBA; average of 49.0 dBA | $L_d$: 49.5 to 61.7 dBA; average of 55.0 dBA | $L_d$: 49.5 to 61.7 dBA; average of 55.0 dBA |

**Note:** dBA = A-weighted decibel; $L_d$ = time-averaged daytime noise level; $L_n$ = time-averaged nighttime noise level; $L_{dn}$ = time-averaged day-night noise level

Currently, health indicator guidelines, especially those related to sleep disturbance, are already exceeded at most receptor locations, and future increases in noise levels would increase the likelihood or severity of effects without mitigation. However, with the implementation of the noise mitigation (such as noise barriers and noise control at sensitive receptors), the Project is anticipated to reduce noise levels below existing levels at most receptors.

Vibration effects associated with existing traffic levels are below annoyance thresholds, and the Project is expected to reduce existing vibrations with the new roadway.

The Ministry of Transportation and Infrastructure Noise Policy would determine whether noise environments in communities adjacent to the Project alignment ten years after completion of the Project warrant mitigation consideration. Predicted noise levels during Project operation were compared to the Noise Policy to identify locations where mitigation may be required. A total of 21 sites were identified for site-specific mitigation, and three sites were identified for potential site-specific mitigation. Mitigation measures listed in the Noise Policy include various methodologies that have proven to be effective in mitigating traffic-related noise impacts associated with comparable projects.

A noise management plan would outline mitigation measures to address noise effects during construction. This may include:

- Controlling noise at the source through the selection, appropriate operation, modification/enhancement and/or maintenance of equipment or processes;

- Controlling noise along the source-receiver path by blocking the dominant sound path between the noise source zone and noise-sensitive receptors, including use of noise shielding and barriers;
- Engaging the community on scheduling of particularly noisy activities; and
- Responding to community concerns about construction noise.

*Health Impact Assessment*

An HIA was undertaken to consider other health-related determinants outside of the HHRA and was used as a planning tool for the development of the Project. The HIA considered the influence of physical environmental factors (e.g., air quality); built environment factors (e.g., buildings, public spaces and transportation networks); livelihood factors (e.g., income and employment); social and community factors (e.g., social support and access to services); and lifestyle factors (e.g., diet, exercise and alcohol use).

Key findings from the HIA indicate that the Project would result in some health benefits related to overall reductions in air emissions, increased opportunities for active and public transportation, improved traffic safety, improved connectivity and access, improved emergency response, and economic development opportunities. Potential adverse health effects, such as noise, air quality effects, and disruption to access, would occur primarily during construction. These effects have been identified in the Application, along with proposed mitigation measures.

The HIA also considered some adverse effects that may be uniquely felt by Aboriginal Groups or vulnerable populations. The following determinants of health were considered in the HIA to understand health in an Aboriginal context: colonization, globalization, migration, cultural continuity, territory, access, poverty and self-determination. The HIA also recognizes that for Aboriginal Groups, the concept of health is holistic and centres on the interconnectedness of land, water, culture and identity. Some specific concerns raised by Aboriginal Groups include the potential effects to fish (and the quality of fish as a food source), as well as access to fishing sites. The Proponent committed to ongoing engagement to ensure that these groups do not disproportionately experience adverse effects.

### 7.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, several concerns and potential Project effects related to human health were raised by Working Group members:

*Noise Levels on the Fraser River*

Musqueam Indian Band raised concerns about the potential noise effects to users of the Fraser River. Musqueam Indian Band requested further information of the average construction and operational noise levels within 1,600 m in the vicinity of the river, as the Application does not differentiate between noise effects on land versus water.

The Proponent confirmed that estimated levels of construction noise presented in the Application apply to soft ground, and not over water. During the EA, the Proponent provided further information on the estimated noise levels over water between the noise source (construction of the bridge) and the receptors (users of the river, between 15 to 1,600 m from the construction zone). These noise levels are summarized in Table 13.

**Table 13: Predicted Noise Levels on the Fraser River during Construction**

| | Distance from the Bridge Construction Zone | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **15 m** | **30 m** | **50 m** | **100 m** | **200 m** | **400 m** | **800 m** | **1600 m** |
| **Estimated Construction Noise Levels Over Water (dBA)** | 80 | 77 | 75 | 72 | 67 | 61 | 55 | 49 |

For operations, due to the elevation of the main span of the proposed bridge over the river, the results from the noise modelling at land-based receptor locations were used to approximate levels at equivalent locations on the river and along its shoreline. No specific noise mitigation is proposed for the main span of the bridge, therefore Table 14 summarize the predicted noise levels along the Fraser River during operations (obtained by modelling 2030 traffic flows on the bridge deck):

**Table 14: Predicted Noise Levels on the Fraser River during Operations**

| **Estimated Operations Noise Levels Over Water (dBA)** | **Approximate Distance from the Proposed Bridge** | | | | |
|---|---|---|---|---|---|
| | **90 m** | **420 m** | **700 m** | **1200 m** | **1600 m** |
| | 56.5 | 56.7 | 52.9 | 48.7 | 44.6 |

Cowichan Nation Alliance and Penelakut Tribe raised a concern regarding the potential noise effects to users of Deas Island Regional Park, and noted that this site cannot be compared to other land uses in the area, as the use of this area requires lower levels of noise. Cowichan Nation Alliance noted that this would be especially true if their members re-establish residential use at the Tl'uqtinus village site and use the park for

gathering and knowledge transmission uses. Cowichan Nation Alliance questioned whether the noise assessment at Deas Island Regional Park used the same acceptable levels as residential and institutional allowable limits, or if acceptable levels were lowered when assessing noise effects on the park. They also raised a concern regarding low frequency noise (LFN) and how LFN radiated from land (diesel engines during construction) and water (tug boats during construction and the bridge during operations) may affect fish and wildlife, as well as human health and the experience of traditional harvesting. Since LFN was not assessed in the Application, Cowichan Nation Alliance requested that a comprehensive monitoring, reporting, and management planning process be implemented to respond to unanticipated LFN effects.

The Proponent responded that the Noise Policy (that guides noise assessments) provides mitigation for residential and institutional land uses where noise levels are expected to exceed thresholds. This policy does not include a threshold for highway traffic noise inside passive parks. However, the Proponent committed that should Cowichan Nation Alliance re-establish residential use at the site and use the park for gathering and knowledge transmission purposes in the future, the Proponent would engage in focused discussions with Cowichan Nation Alliance in relation to potential noise effects as a result of the Project.

In regards to LFN, the Proponent responded that tug boats and heavy construction equipment would create some LFN (defined by the International Organization of Standardization as noise at frequencies between 5 and 100Hz) during construction. The dominant components of noise generated by road traffic along bridges is generally well above the LFN range (i.e., above 100 Hz). In some cases, LFN may be generated by the interaction of vehicles with expansion joints on the bridge deck and radiated out. The Proponent noted that design specifications for the Project would include the requirement for proven noise-reduction features (e.g. noise blankets, sinus plates) to be built into the bridge expansion joints to avoid/minimize the generation of LFN during the operational phase. Because of this, the Proponent did not include LFN in the scope of assessment presented in the Application. The Proponent stated that for these reasons, it would not be necessary to undertake LFN monitoring.

EAO proposes a condition requiring the development of a noise management plan to address Project-related noise during construction and operations, which would include a noise monitoring and follow-up program, a communication program to inform communities potentially-affected by Project-related noise, and the means by which the Proponent would mitigate noise if the noise monitoring and

follow-up program indicate the minimum objectives specified in MOTI's Noise Policy have not been met.

*Consideration of Aboriginal Groups in the Health Assessment*

Penelakut Tribe, Tsleil-Waututh Nation and Musqueam Indian Band stated that the health assessment does not consider how the Project may affect specific populations, nor does it consider the potential effects to the cultural health of Aboriginal people.

The Proponent responded that the HIA acknowledges the potential for the Project to disproportionately or uniquely affect Aboriginal Groups and that it recognizes the high importance of the Fraser River to Aboriginal Groups as a major transportation and migration route, as well as an important source of food and cultural resources. Recommendations from the HIA have been integrated into the Application as mitigation in relevant VC sections or tied to future stages of consultation, including design. The Proponent also committed to consulting with Aboriginal Groups and key stakeholders in developing a marine access management plan to mitigate temporary impacts to marine use and Aboriginal fisheries access during construction.

*Scope and Methodology of the Health Impact Assessment*

Fraser Health, Penelakut Tribe, Tsleil-Waututh Nation and Vancouver Coastal Health raised concerns regarding the scope and methodology of the HIA. These Working Group members noted that the scope of the HIA was too limited, and that conducting only a desktop analysis was insufficient. Further, some Working Group members questioned why the findings and recommendation of the HIA were not fully integrated into the Application.

The Proponent responded that an HIA was undertaken at the recommendation of health authorities to better understand human health considerations associated with the Project, and to support ongoing Project planning and development. The Proponent stated that the HIA resulted in important conclusions to integrating broader health considerations into planning, constructing and operating the Project. The Proponent also noted that recommendations from the HIA have been integrated into the Application as mitigation measures in relevant VC sections or will be integrated in future stages of consultation, including consultation focused on future stages of design (e.g., safety and security considerations associated with at-risk populations residing under the bridge). The

conclusions of the HIA are supported by impact assessment work done that also supports the Application.

*Human Health Effects due to Air Quality*

Metro Vancouver expressed concern that analysis regarding potential air quality effects during Project construction was not included in the Application and that the health effects of construction-related emissions on air quality were not evaluated. In the absence of HHRA modeling of construction air quality effects, Metro Vancouver requested that quantitative evidence of the efficacy of best management practices applied to similar projects be provided. Metro Vancouver also requested that a more comprehensive discussion on changes in regional air quality due to traffic pattern changes be included in the HHRA. Fraser Health also raised a concern regarding the conclusions of the HHRA regarding air quality during operations, specifically the statement that Project-related improvements in local and regional air quality, primarily due to reductions in congestion-related idling, are anticipated to have a positive effect on human health. Fraser Health requested a more comprehensive discussion to support this statement.

The Proponent responded that they are committed to avoiding health effects due to potential construction-related change in air quality. The potential drivers of health concerns (e.g. fine particulate matter and $NO_2$) would be monitored at locations in the vicinity of active construction areas, and construction activities would be managed appropriately to avoid exceedance of health effects thresholds. For traffic pattern changes, the Proponent assumed that reduced emissions in the LAA would result in decreased airborne contaminants on a regional scale and that this trend is consistent with predicted improvements in air quality for many CACs as a result of improvements in emissions control technologies and fuel efficiency. As such, reductions in local and regional concentrations of CACs can be assumed to have a positive effect on human health.

During the EA, EAO requested that the Proponent provide an estimate of construction-related air emissions, the result of which is summarized in section 4.1.3 of this Report.

For the HHRA results for air quality during operations, the Proponent responded that a reasonable assumption is that reduced local emissions would result in decreased airborne concentrations of fine particulate matter, $NO_2$, and other transportation-related airborne contaminants on a regional scale. This general

trend is consistent with predicted improvements in air quality for many CACs as a result of improvements in emissions control technologies and fuel efficiency. On this basis, the Proponent noted that reductions in local and regional concentrations of CACs can reasonably be assumed to have a positive effect on human health, especially for those CACs for which epidemiological studies have suggested no identifiable “safe” threshold.

Richmond raised a concern that the air quality assessment did not properly consider the potential effects to users of the Gardens Agricultural Park and the planned child care facility that will be located on Number 5 Road adjacent to the park. Richmond noted that with the highway corridor shift to the west (and into the park), traffic would be brought closer to the centre where there will be sensitive receptors. Richmond requested that further analysis be conducted to consider the potential effects to these sensitive receptors.

The Proponent responded that the reduction of congestion in the LAA results in a reduction of vehicle emissions and a predicted improvement in air quality. The air quality model included a number of receptors at the Gardens Agricultural Park and adjacent child care facility. While not initially identified as a sensitive receptor in the human health assessment, a range of sensitive receptors and the maximum points of impingement were incorporated into the health risk assessment to ensure adequate assessment and protection of human health, including at the Gardens Agricultural Park and planned child care facility.

#### 7.1.4 Characterization of Residual Effects and Conclusions

After considering all relevant proposed mitigation measures, EAO concludes that the Project would result in the following residual adverse effects on health:

- Increase in noise levels during construction.

EAO’s characterization of the expected residual effects of the Project on health is summarized below, as well as EAO’s level of confidence in the effects determination (including their likelihood and significance).

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Moderate resilience | The Project area has moderate resiliency to noise disturbance as it is an urban area associated with a major highway corridor. However, there are a few receptor areas (residential areas, schools, places of worship, parks) adjacent to the Project alignment that are more sensitive to a change in the atmospheric noise environment. |
| Magnitude | Low | Individuals living at several locations within the LAA may experience increased annoyance, increased sleep impairment and reduced speech comprehension. It is expected that with the use of best practices and site-specific management (such as early installation of operations noise mitigation), noise effects would be reduced to low magnitude, but will not be eliminated. Noise levels would be within the typical levels encountered on industrial construction sites. |
| Extent | Local | An increase in noise during construction would be expected to be localized around the location of the activity. |
| Duration | Short-term | Potential noise effects during construction would be short-term, and the duration would vary between a few weeks (clearing and paving) to a few months (grading), depending on the activity. However, noise associated with the construction of the new bridge would last for approximately two years. |
| Reversibility | Reversible | The potential adverse effects would be fully reversible upon cessation of construction activities. |
| Frequency | Semi-continuous to occasional | Potential adverse effects are expected to be occasional or semi-continuous for construction. |
| Likelihood | The likelihood is high that the adverse health effects due to noise, which is discussed above, would occur during Project construction. | |
| Significance | Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the Project is not likely to have significant adverse residual health effects. | |
| Confidence | There is a moderate level of confidence in the likelihood and significance determination, as the anticipated construction-related noise levels after mitigation is implemented have not been estimated in the Application by the Proponent | |

### 7.1.5 Cumulative Effects Assessment

The Application noted that since construction-related health effects of the Project would be minimized to the extent practical using standard industry and best practices, no incremental cumulative change is expected.

### 7.1.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of the EAC), EAO is satisfied that the Project is not likely to have significant adverse residual health effects.

# 8 Accidents, Malfunctions and Effects of the Environment on the Proposed Project

## 8.1 Background

During construction and operation of the Project, unplanned events could result in potential effects to environmental, economic, social, health, or heritage values. Unplanned events could arise from accidents or malfunctions associated with Project activities, or environmental events or processes that could have adverse effects on the Project. The Application notes that improvements to traffic and transportation conditions as a result of the Project would lower the potential for accidents or malfunctions during the operations.

Potential unplanned events were assessed in the Application using a risk-based approach. The possible scenarios were risk-ranked based on the combination of the likelihood of the scenario arising and the potential consequence or severity of the scenario arising.

The following sections provide an overview of potential unplanned events associated with Project activities, the context within which they could arise, the potential impacts of each event and proposed key mitigation measures to address each event. Issues raised during Application review are summarized below, as well as EAO's conclusion on the significance of the risk posed by an unplanned event.

## 8.2 Accidents or Malfunctions

The following were considered in the Application as potential accidents or malfunctions that could occur during construction and operation of the Project:

- Spills of hazardous substances;
- Structural failure of a containment structure;
- Damage to utilities;
- Marine vehicle collision; and

- Failure of a Project component during operation.

### 8.2.1 Spills of Hazardous Substances

Spills present a risk primarily during construction, where a release or discharge of hazardous materials into the environment could occur. Without mitigation measures, spills of hazardous materials could affect fish and fish habitat, water quality, wetlands, riparian habitat, soils, wildlife and human health.

Key mitigation measures proposed in the Application to address spills include:

- Developing and implementing EMPs describing best practices for management and clean-up of hazardous spills, including reporting and monitoring requirements;
- Appropriate training of construction and maintenance personnel on spill prevention and management;
- Locating refuelling and maintenance areas a minimum of 30 m from any water bodies or sensitive areas; and
- Storing spill abatement equipment onsite.

The most likely spill scenario is the spill of relatively small amounts of fuels, lubricants, or other equipment fluids that may occur through refueling or leaks from machinery. Following the implementation of avoidance mitigation measures, the likelihood of a spill would be low. Although the occurrence of a small spill occurring is considered possible, the consequences would be minor due to the small volumes, localized impacts, and fairly short timeframe within which effects could be reversed by implementing the prescribed mitigation measures. Given the low likelihood and the minor consequences of a spill scenario, the risk is determined to be low.

### 8.2.2 Structural Failure of Containment Structures

The Application assessed the potential for structural failure of containment structures, which included culverts, ditches, detention ponds, or sediment containment structures resulting in localized flooding, erosion, sedimentation, or discharge of sediment-laden water into the aquatic environment during construction or operation.

The Proponent’s erosion and sediment control plan, as part of the construction and operations EMPs, would include well-established industry standard best practices. Measures to mitigate potential erosion or sedimentation resulting from structural failure of a culvert, ditch, or sediment containment structure include:

- Developing temporary drainage systems to receive, filter, and direct stormwater and runoff during construction;
- Storing waste material and soil in a manner that prevents possible entry into the aquatic environment;
- Installing silt fences and bio-filtration ponds/marshes;
- Protecting exposed soil by re-vegetating slopes; and
- Establishing an erosion and sediment control inspection and maintenance program.

The likelihood of structural failures is anticipated to be low. With the implementation of mitigation measures, the magnitude of sediment-laden water affecting the aquatic environment is considered low, as the extent is expected to be local, short-term and reversible.

### 8.2.3 Damage to Utilities

Underground utilities such as electricity, sewage, water, natural gas, jet fuel or telecommunications may be accidentally damaged during construction or maintenance activities, with a potential for related consequences to VCs such as those tied to the aquatic environment or to human health.

With the proper identification and protection of utilities prior to construction, the likelihood of accidental damage to utilities resulting in adverse effects to VCs is remote.

With the implementation of mitigation measures, the consequence of accidental damage to a utility is anticipated to be low to moderate, depending on the type of utility damaged and the extent of the damage. The overall risk of accidental damage to utilities during construction or operations is assessed to be low.

### 8.2.4 Marine Vessel Collision

A potential marine vessel collision during construction or marine vessel collision during operations maintenance could result in a localized and temporary disruption of marine use.

Mitigation measures would include training of equipment operators on the provisions of the marine access management plan related to marine vessel and equipment navigation rules, signage requirements, working under adverse marine conditions, or speed restrictions. The Proponent’s construction marine access management plan would include a communication program to inform marine users of activities and schedules of construction.

The likelihood and consequences of marine vessel collisions are considered low and therefore the overall risk for marine vessel collision is also low.

### 8.2.5 Structural Failure of Project Components

The potential for structural failure resulting from vehicle collision with components of the infrastructure was considered in the Application. The Project would be designed and built to withstand collision from vehicles without sustaining structural damage in accordance with current provincial and federal highway and bridge design standards. There are well established procedures in the provincial maintenance specifications manual that would ensure that appropriate action is taken in the event of an incident involving structural failure of Project components. Given the strict regulation and standards that apply to the design, construction, and operation of major infrastructure, there is a low likelihood of occurrence and a low to moderate consequence. The risk associated with structural failure during operations is considered to be low.

## 8.3 Effects of the Environment on the Project

The Application assessed the likelihood of the effects that environmental factors may have on the Project, and their consequences on relevant VCs, including: extreme weather, seismic events, erosion and scour, fire, extreme flood events, and climate change.

### 8.3.1 Extreme Weather

Potential effects of extreme weather events on the Project include high winds and heavy rain may result in increased erosion potential; flooding; decreased slope stability; and damage to roads, structures, and drainage facilities. Untreated runoff and debris entering watercourses or terrestrial habitat may affect fish and fish habitat, at-risk amphibians, marine mammals, and terrestrial wildlife. Accidents and malfunctions triggered by extreme weather events, resulting in release of deleterious or toxic substances into terrestrial or aquatic habitats, may also impact these VCs. Marine use may be affected by debris entering the Fraser River, and land use may be affected by flooding.

Bridge design would mitigate potential functionality issues due to snow and ice events. These design specifications include the requirement that no cables cross over traffic, as well as a snow and ice management system.

According to the Application, the design and construction of transportation infrastructure is strictly regulated by federal and provincial standards. The Project would be designed withstand extreme winds and extreme rainfall through stormwater management and

drainage infrastructure and to mitigate potential functionality issues that could occur during snow and ice events on the new bridge.

Given the relative stability in weather conditions in the Project area and the design and construction requirements of the Project components, the likelihood and consequence of an extreme weather-related effect is considered to be very low and therefore the risk would also be low.

### 8.3.2 Seismic Events

The Application assessed the potential for adverse effects related to natural seismic events that could result in structural damage, which may include: ground deformations, embankment approach fill deformation, structural change to the new bridge and soil liquefaction, resulting in structural damage to the new bridge, roads, banks, and dikes. Seismic events could also lead to breaches to the highway, flood control infrastructure, or utilities within the Project alignment, and a consequent increase in potential for erosion, scour or flooding and release of debris and toxic or deleterious substances into watercourses. Structural damage and related debris may cause traffic interruptions and impact aquatic habitat.

The Project would be designed to withstand greater seismic activity compared to existing conditions, following current international seismic design codes specific to the applicable seismic zone. Key design measures include: building Project components on densified ground, less susceptible to liquefaction, and, constructing the new bridge as a Lifeline Structure. In the event of an earthquake, a Lifeline Structure would sustain repairable damage following a 1-in-2,475 year return period seismic event.

Although the Project would be situated in a high risk area for seismic activities, the likelihood of damage to infrastructure components would be remote. In the event of a seismic occurrence, the consequence of damage is considered moderate to high, depending on the magnitude of the event; however, the likelihood of a seismic event occurring and resulting in significant, permanent damage to Project infrastructure is considered to be remote. The corresponding risk is considered low. The Application considered the probability of a tsunami very low, given that a tsunami generated from an earthquake along the Cascadia fault, located off the shore of Vancouver Island, would be substantially dissipated before it is propagated to the Delta or Richmond waterfront. The resultant tsunamis would not be of a magnitude that could cause any considerable damage to these areas.

### 8.3.3 Erosion and Scour

Erosion and scour, as described in section 4.2 of this Report (Hydrology), could cause changes to fish and fish habitat and result in impediments to marine traffic.

The likelihood and consequences of erosion and scour would be minimized by design and construction mitigation measures that include: avoiding exposure of bridge supports to running water through clear-span bridge design; the protection and reinforcement of river banks where required; construction of upland drainage ditches to withstand extreme weather events; and the implementation of construction and operation EMPs.

The likelihood of scour and erosion affecting the Project is remote and the consequence would be very low. The overall risk would also be low.

### 8.3.4 Fire

Given that the Project is located in an area of sparse vegetation and in the vicinity of water bodies, the likelihood of wildfire occurrence would be low. The high percentage of impermeable and inflammable surfaces would deem the potential consequence of a wildfire as very low. The risk of fire to the Project is considered low.

### 8.3.5 Extreme Flood Events

Richmond and Delta are susceptible to flooding due to their close proximity to water and low land elevation. However, both municipalities are surrounded by an extensive network of dikes that are designed to withstand a 1-in-200-year flood event. In addition to the dike networks, the two communities have extensive ditch, drainage, canal, culvert, and sewer networks designed to manage the highest volume of water expected to occur in a 100-year storm event.

Extreme flooding events may cause erosion, washouts or dike breach, damage to infrastructure and the debris moved by the water may affect the aquatic environment VCs as well as the use of agriculture lands.

Mitigation measures are proposed to protect the new bridge footings and the highway infrastructure and include the development of an emergency response and spill contingency plan and an erosion and sediment control plan containing provisions for addressing potential structural failure of a Project component, and sedimentation and runoff events.

The likelihood of an extreme flood event resulting in damage to Project components and in subsequent adverse effects to the environment is considered to be remote. The

consequence of an extreme flooding depends on the extent of the area impacted but in general is considered to be low.

### 8.3.6 Climate Change

Changes in climatic conditions may result in temperature rise, increased precipitation, more intense storms, and sea-level rise. The Application assessed the following potential future climate scenarios that could affect the Project:

- A 1.7°C predicted temperature raise by 2050 may extend and intensify runoff during spring time altering the hydrologic regime, including timing and duration of peak flows, which could lead to unexpected flooding events;
- Scientific studies predict that the 1-in-200-year to 1-in-500-year size floods may occur as often as every 50 years. As a result, extreme weather including extreme flooding events are expected to be more frequent; and
- An increase of 50-120 cm in sea level is predicted to occur by 2100. Intense storm surges and flooding events in the Fraser River delta may trigger erosion or washout of road bases, overwhelming of stormwater infrastructure, and reduction in clearance under the bridge.

Effects of potential future climate change could affect the aquatic environment, agricultural use, and marine use.

Mitigation measures included in the Project design considered the climate change hazards described above. Following the implementation of mitigation measures, the likelihood of adverse environmental effects due to climate change is considered low, the consequences very low and the overall risk, low.

## 8.4 Issues and Concerns Raised during Application Review

During the EA, Richmond indicated that they supported the construction of a median barrier along Highway 99 for mid-island flood protection, although their preference would be for raising the entire highway out of the flood plain.

> The Proponent responded that the Project includes a higher than standard median barrier design, with specifications to be determined during final detailed design. This measure was incorporated as a result of consultation with Richmond, and with the Richmond Farmers Institute, which expressed this as a preference to alternative options for a mid-island dike identified initially by Richmond.

Metro Vancouver also raised concerns regarding accidental damage during construction to Metro Vancouver utilities, such as the Lulu Island-Delta watermain, the River Road West watermain and the Brighouse Branch sewer.

> The Proponent responded that they are committed to minimizing risks to utilities, and that they would continue to work closely with Metro Vancouver through the progression of Project design to ensure Metro Vancouver is aware of Project activities so that Metro Vancouver can ensure the continued integrity of these utilities.
>
> EAO proposes a condition requiring the development of a construction environmental management plan that would include measures to mitigate any accidental breaches of onsite utilities by Project equipment.
> Potential accidental damage to the Lulu Island-Delta watermain is also assessed and discussed in section 4.2 on Hydrology.

No other key issues were raised by the Working Group or public with respect to accidents and malfunctions or effects of the environment.

## 8.5 Summary and Conclusions

Project design measures would lower the likelihood and reduce the severity of any accident, malfunction or effect of the environment on the Project. Prior to the commencement of construction activities, the Proponent would be required to develop an emergency response plan and EMP for construction that would address preparedness, prevention and response to an accident or malfunction or an effect of the environment on the Project. The Proponent's existing operations emergency response plan and operations EMP, in addition to the highway operations and maintenance protocols, would address these potential risks during the operations phase of the Project.

Based on the combination of Project design measures, implementation of the emergency response plan, EMP, and associated plans, and having regard to the conditions identified in the TOC and CPD (which would become legally binding as a condition of an EAC), EAO is satisfied that neither accidents or malfunctions nor effects of the environment on the Project are likely to pose significant risk to environmental, social, economic, health or heritage VCs associated with the Project.

# 9 Summary of Environmental Management Plans

EMPs would be required for phases of the Project to minimize adverse environmental effects throughout the Project's lifespan. The plans provide a framework to communicate and implement mitigation measures and BMPs, and to support compliance with applicable legislation, terms and conditions of permits, and approvals and authorizations issued in relation to the Project, including an EAC, if issued.

Management plans would be developed in consultation with appropriate regulatory agencies, Aboriginal Groups, and key stakeholders, as required. The Application outlined the following stand-alone plans that would be developed before construction:

- Construction Traffic Management Plan – This plan will outline measures to mitigate potential effects to traffic associated with Project construction. The plan will address land-based construction traffic, traffic control, and potential traffic hazards associated with construction.
- Marine Access Management Plan – This plan will outline the measures to avoid or minimize potential effects on marine use during marine-based construction activities, including traffic control and potential traffic hazards associated with the Project. The plan will be developed based on final design and construction approach for the marine-based components, including location of staging areas and navigation routes to and from the construction site.
- Air Quality and Dust Control Management Plan – This plan would outline mitigation measures to control and minimize dust and airborne emissions during construction.
- Agricultural Management Plan – This plan would outline measures to avoid or mitigate potential impacts to agricultural land and activities, including irrigation, drainage, farm infrastructure, and soil conservation and storage during construction.
- Contaminated Sites and Sediment Management Plan – This plan would guide the management of known or encountered contaminated sites within the Project area. It will be developed to ensure that imported material or fill is clean and that procedures are identified for selection of sites for disposal of excavated material.
- Emergency Response and Spill Contingency Plan – This plan will describe how personnel will prevent, prepare for, respond to, and clean up spills. The plan will also outline spill prevention measures and procedures to be undertaken for marine and terrestrial environments.

- Erosion and Sediment Control Plan – This plan will outline standard BMPs, and mitigation measures to prevent or minimize adverse effects to water quality in ditches and the marine environment.
- Fish and Fish Habitat Management Plan – This plan will be developed to protect fish and fish habitat, including aquatic, foreshore and riparian habitat, during construction. The plan will describe protection zones, regional least-risk timing windows that will be applied during specific Project activities, fish salvage and relocation activities, and will describe construction and post-construction fish and fish habitat monitoring requirements.

Some of the above plans would be required by provincial and federal agencies or authorities and a number of the EAC conditions proposed by EAO and discussed in other sections of this Report.

# PART C – ABORIGINAL CONSULTATION REPORT

## 10 EAO Consultation Process Overview

The Government of British Columbia is legally obligated to consult and, where necessary, accommodate asserted or established Aboriginal rights and title including treaty rights ("Aboriginal Interests") that may be impacted by provincial decisions. Where Aboriginal rights and title are asserted, an EA is not a rights-determination process. BC's assessment of the prima facie claim of any asserted Aboriginal rights or title is based on available information and is intended solely to inform the level of consultation required for each Aboriginal Group for the EA of a proposed project. A key objective of an EA is to identify potential adverse effects of proposed projects on Aboriginal Interests and identify measures to avoid, mitigate or otherwise appropriately address such effects.

On March 7, 2016, EAO issued a Section 11 Order which specified the consultation activities that both EAO and the Proponent would undertake with all Aboriginal Groups[18] potentially affected by the Project. EAO considered the overlap of the Project with each Aboriginal Group's asserted traditional territory or Treaty Lands, the nature of the potential effect on each Aboriginal Groups' Aboriginal Interests, and, where applicable, an initial assessment of the strength of claimed Aboriginal rights and title to determine the level of consultation it would undertake with each Aboriginal Group.

EAO consulted the following Aboriginal Groups listed in the Section 11 Order[19]:

[18] "Aboriginal Groups" means those aboriginal entities identified in Schedule B and Schedule C of the Section 11 Order for the proposed George Massey Tunnel Replacement Project, issued March 7, 2016, as defined in that Order, except for where conditions are being referenced, in which case it refers to Aboriginal Groups on Schedule B only.

[19] On January 6, 2016, EAO contacted Seabird Island Band and communicated EAO's view that, given the location and the nature of the components of the Project, EAO did not anticipate any potential adverse effects to the asserted or established Aboriginal Interests of Seabird Island Band, and that as such, Seabird Island Band had not been included in the list of Aboriginal Groups in the attached draft Section 11 Order for either Proponent-led or EAO-led consultation. EAO provided information about how to participate in the public comment periods and open houses for the Project and invited Seabird Island Band to provide comment or additional information regarding the potential for adverse impacts to their Aboriginal Interests or to discuss the EA, but did not receive a response.

Schedule B:

- Cowichan Tribes
- Halalt First Nation
- Katzie First Nation
- Kwantlen First Nation
- Lake Cowichan First Nation
- Lyackson First Nation
- Musqueam Indian Band
- Penelakut Tribe
    - Hwlitsum[20]
- Semiahmoo First Nation
- Squamish Nation
- Stz'uminus First Nation
- Tsawwassen First Nation
- Tsleil-Waututh Nation

Schedule C:

- People of the River Referrals Office

Aboriginal Groups listed on Schedule B of the Section 11 Order were provided with the following opportunities for consultation at the deeper end of the consultation spectrum including:

- Participation in the Working Group;
- Opportunities provided via written format and meetings to identify Aboriginal Interests that may be adversely affected by the Project and opportunities to discuss potential measures to avoid, mitigate, address or

[20] This reference to the Hwlitsum is not intended to signify any change in the position that the Province may have taken in other contexts in relation to the duty to consult with this group.

otherwise accommodate potential adverse effects on Aboriginal Interests, as appropriate;

- Opportunity to review and comment on key documents, including the draft Section 11 Order, Project Description and Key Areas of Study document, draft AIR, Application evaluation (screening), the Proponent's Application for an EAC, supplemental materials, EAO's draft Assessment Report, including the Aboriginal Consultation Report, the draft CPD and draft TOC;
- Opportunity to submit a document outlining the Aboriginal Group's views on the Assessment Report, TOC and CPD to be included in the package of materials sent to Ministers when the Project is referred for decision; and
- Additional measures for consultation and accommodation where appropriate.

Aboriginal Groups listed on Schedule C of the Section 11 Order were provided the following opportunities:

- Notification of key milestones, including: issuance of the Section 11 Order and any Section 13 Orders; timing of public comment periods, including open houses; issuance of the AIR; acceptance of the Application by EAO for review; when the final Assessment Report is referred to Ministers; and the decision of the Ministers;
- EAO's offer to meet and consider information from such Aboriginal Groups regarding Aboriginal Interests in the Project area and any potential adverse effects of the Project on such interests;
- Invitation to review and comment on EAO's draft Assessment Report; and
- Additional measures for consultation and accommodation where appropriate.

EAO has considered all comments and information received from Aboriginal Groups throughout the EA process. During all stages of the EA, issues, comments and concerns raised by Aboriginal Groups with EAO, submitted via correspondence or

raised directly at meetings including at Working Group meetings in relation to the Project were forwarded to the Proponent for tracking and response, as required.[21] Input from Aboriginal Groups was received through various avenues including participation in Working Group meetings, teleconferences, direct meetings with EAO and/or the Proponent, and written correspondence (letters or emails).

EAO has reviewed the adequacy of the Proponent's responses to all comments received from Aboriginal Groups on the Working Group (Schedule B Aboriginal Groups), recorded in the Working Group Issues Tracking Tables during the development of the draft AIR and on the Application for an EAC. EAO required the Proponent to update the Working Group Issues Tracking Tables and supporting technical memos as appropriate, and considered these in the development of this Report. Aboriginal Group representatives on the Working Group had opportunity to review the responses of the Proponent to comments. In addition, EAO offered to meet with all Aboriginal Groups directly to discuss any outstanding concerns.

A draft of this Report demonstrating how EAO considered all Aboriginal Groups' comments was provided to Aboriginal Groups on November 23 or November 24, 2016, for review and comment. Prior to that, an early draft of each Aboriginal Group-specific section for Part C was provided to Schedule B Aboriginal Groups for review, between September 24 and October 17, 2016. Comments on the draft Report and EAO's draft referral materials received up until January 16, 2016 have been considered in the final version of this Report.

# 11 EAO-Led Consultation Activities with Aboriginal Groups

This section provides an overview of consultation activities undertaken by EAO.

## 11.1 Working Group Activities

Aboriginal Groups on Schedule B of the Section 11 Order were invited to participate in the Working Group.

During the Pre-Application phase, EAO held two Working Group meetings in Vancouver:

[21] EAO notes that direct correspondence to EAO from an Aboriginal Group regarding the Project was not always shared with the Proponent, in which cases EAO provided a direct response to the Aboriginal Group.

- January 21, 2016 – provided an overview of the EA process, the Project and for working group members to engage in discussion with, and ask questions of, the Proponent and their technical consultants; provided an overview of proposed VCs for study and the draft AIR and to hear preliminary comments from working group members; and to discuss next steps in the EA, including the initial public comment period; and
- March 10, 2016 – provided further information to working group members on the EA process; provided an overview of the Proponent's revised draft AIR document, and the Proponent's responses to working group comments on the document; working group members engaged in discussion with the Proponent and their technical consultants; and next steps in the EA were discussed.

The screening of the Application started on May 30, 2016. EAO held a teleconference for the Working Group on May 11, 2016, to provide an overview of the Application evaluation (screening) process.

During Application Review which began on July 27, 2016, EAO held one Working Group meeting and a site visit:

- September 19, 2016 - site visit to tour the existing Tunnel, the Project alignment, and Deas Island (Richmond and Delta); and
- September 20-21, 2016 – provided further information to working group on the EA process; provided an overview of the Proponent's Application for an EAC, and responses to Working Group comments on the Application; provided working group members opportunity to engage in discussion with the Proponent and their technical consultants; and to discuss next steps in the EA.

EAO also held a teleconference for the Working Group on August 4, 2016, to provide an overview of the Application Review EA phase.

## 11.2 Government-to-Government Consultation

EAO provided the opportunity for government-to-government consultation to all Aboriginal Groups listed on the Section 11 Order to discuss their views on potential impacts of the Project on their Aboriginal Interests.

The sections below provide an overview of meetings with specific Aboriginal Groups. Key issues of concern raised by Aboriginal Groups related to Aboriginal Interests are discussed below, and concerns related to specific VCs are discussed in the VC-specific sections of this Report.

# 12 Proponent-Led Consultation Activities with Aboriginal Groups

This section provides an overview of consultation activities undertaken by the Proponent.

## 12.1 Capacity Funding

When a provincial agency is a proponent of a project going through a provincial EA under the British Columbia *Environmental Assessment Act* (the Act), that agency provides funding to Aboriginal Groups to support their involvement in pre-Application and Application Review phases in place of EAO providing such funding.

The Proponent entered into a Participation Funding Agreement covering the Initial Consultation (pre-EA) and Pre-Application phases for consultation, with all Schedule B Aboriginal Groups. The Proponent worked with Aboriginal Groups listed on Schedule B regarding their needs for capacity funding to facilitate their participation in the Application Review Phase. Funding for both phases included participation in technical reviews and analyses, involvement in ongoing consultation activities, and presentation of key information regarding their respective Aboriginal Interests. All Schedule B Aboriginal Groups have been engaged in the Application Review Phase.

## 12.2 Consultation Activities

As part of the Section 11 Order, EAO directed the Proponent to undertake certain procedural aspects of consultation during the EA with Aboriginal Groups listed on Schedule B of the Section 11 Order. The Section 11 Order also required the Proponent to develop and share drafts of an Aboriginal Consultation Plan and multiple Aboriginal Consultation Reports with the specified Aboriginal Groups at prescribed milestones during the EA. These documents were reviewed by Schedule B Aboriginal Groups and revised by the Proponent based on input received from and concerns expressed by Aboriginal Groups prior to being submitted to EAO. These documents enabled EAO to: understand the Proponent's consultation plans and subsequent efforts and the perspectives of the Aboriginal Groups related to those efforts; understand any issues and concerns identified by Aboriginal Groups to the Proponent; and to evaluate the

Proponent's consultation plan for subsequent consultation activities required with these Aboriginal Groups during Application Review.

From early 2014 through 2016, the Proponent used a number of communication and information sharing methods with Aboriginal Groups including: meetings with Chief and/or Council and/or staff and consultants; meetings with elders; conference calls; presentations; community meetings; site visits; written correspondence and telephone conversations; and participation in fieldwork. A complete description of the Proponent's consultation with Aboriginal Groups is provided in the Proponent's Aboriginal Consultation Reports and a summary of EAO's consultation with individual Aboriginal Groups is provided in section 14 of this Report. The Proponent-led activities involved:

- Developing individualized consultation plans, which were co-developed and reviewed by individual Aboriginal Groups;
- Discussion of potential adverse effects on Aboriginal Interests, and measures to avoid, mitigate, or otherwise accommodate, as appropriate, any adverse effects;
- Sharing of Project-related information including focused presentations on topics of interests and/or concern to Aboriginal Groups, and early drafts of EA documents;
- Funding for participation in Project consultation activities and EA process and for traditional use studies;
- Meeting with Aboriginal Groups' leadership, staff, consultants, elders and membership;
- Aboriginal Groups review of draft EA documents such as the Project Description and Key Areas of Study, draft AIR, Aboriginal Consultation Plan, and Aboriginal Consultation Reports;
- Response and follow up with Aboriginal Groups regarding the identification and resolution of issues;
- Engagement (with funding for capacity to engage) on economic benefits, contracting, education and training opportunities;
- Notifying Aboriginal Groups of submission of the Application and providing copies; and
- Conducting meetings to support review of the Application, address issues and concerns, refine mitigation measures, discuss Project-related benefits and opportunities (economic and non-economic), identify and plan follow-up strategies, and ensure additional consultation and engagement requirements or

commitments in relation to the Project's approval and construction are undertaken.

In addition, the Proponent participated in Working Group activities, including making presentations on the Project, participating in discussions at Working Group meetings, organizing a site tour for the Working Group, and tracking and responding to comments from Aboriginal Groups.

The Proponent signed capacity funding agreements with all Aboriginal Groups listed on Schedule B of the Section 11 Order up to the point of the Application Review phase, to assist with their participation in regulatory processes, gather Project-based traditional land use (TLU) information to inform the Application, and to understand the effects to Aboriginal Interests posed by the Project.

The Proponent provided funding for all Schedule B Aboriginal Groups to complete a traditional use study (TUS) or other mutually agreed to Project-related study. With the exception of Semiahmoo First Nation, all Schedule B Aboriginal Groups submitted studies.

Traditional use, traditional knowledge and other studies were submitted by Aboriginal Groups and informed the Application or were submitted after submission of the Application but have been considered by EAO. They are discussed in the Aboriginal Group-specific parts of section 14.

As mentioned previously, the Proponent provided Application Review Phase funding to each of the Aboriginal Groups listed on Schedule B of the Section 11 Order.

The Proponent has communicated to EAO that it is actively exploring opportunities to provide benefits (economic and non-economic) to Aboriginal Groups. Opportunities include: employment, training, and contracting, as well as participating in environmental enhancement components of the Project.

# 13 Potential Impacts of the Proposed Project on Aboriginal Interests

EAO sought input from each Aboriginal Group on the nature and scope of their Aboriginal Interests and how they might be impacted by the Project. A summary of the potential impacts is provided in the sections below. Key issues raised during the EA are described in each Aboriginal Group's section of this Report.

In considering potential impacts of Project-related activities on Aboriginal harvesting rights claims, the Crown has considered the following three components of Aboriginal rights:

- Biophysical factors: Consideration of potential effects on biophysical factors that are important for, or associated with the exercise of an Aboriginal harvesting right. This can include consideration of VCs relevant to the exercise of the right, the residual and cumulative effects analysis of those VCs, the species harvested by the Aboriginal group, relevant mitigation measures, and the efficacy of such mitigation measures;
- Specific sites or areas: Consideration of potential effects on specific sites of or areas of importance for traditional use, or sites or areas where the rights are exercised. This can include consideration of whether there are any traditional land or marine use sites identified overlapping or in proximity to the Project area, the number of such sites to the project, effects on the access to such sites, and effects on frequency or timing to access such sites, increased public access, relevant mitigation measures, and the efficacy of such mitigation measures; and
- Social, cultural, spiritual, experiential factors: Consideration of potential effects on social, cultural, spiritual and experiential aspects of the exercise of the right. This can include potential effects of the project on the experience of exercising rights in the area, effects on community health, on socio-cultural institutions, teaching and knowledge transfer, ceremonial/spiritual practices associated with the right, and the relative importance of the project area to the exercise of right.

In considering potential impacts of Project-related activities on Aboriginal title claims, the Crown has considered the following three components of Aboriginal title:

- Use and occupation: Consideration of potential alienation of an area, the degree of potential disturbance or functional effect of the potential disturbance associated with the Project, how the proposed decision might restrict community members' access to the area, and how the proposed decision might affect community members' enjoyment, experience, and use of the area, now and in the future;
- Decision-making: Consideration of whether the proposed decision would result in a new tenure or transfer of ownership to the area, the extent to which an Aboriginal community might be involved in the decision-making process, and whether the activity might be consistent/ inconsistent with any cultural/other objectives of the Aboriginal group for management in this area, now and in the future; and

- Economic benefits: consideration of whether the Project-related decision might affect a community's ability to derive direct and/or indirect economic benefits from the area, and how the proposed decision might affect a community's economic development aspirations for the area, now and in the future.

In regards to Tsawwassen First Nation, EAO has outlined its understanding of its obligations with regard to this EA in accordance with the common law and the Tsawwassen First Nation Final Agreement in section 14.14 of this Report.

## 13.1 Fishing

Aboriginal Groups identified several traditionally important fish species, including species of particular importance such as salmon, sturgeon, eulachon, trout and char as important sources of food accessed on the South Arm of the Fraser River. All of these species were considered in the development of indicators for the fish and fish habitat VC during pre-Application. The Proponent assessed potential effects of the Project on fish and fish habitat.

The South Arm of the Fraser River is an important area to many Aboriginal Groups, and several continue to participate in commercial fisheries in the lower Fraser River, in the general commercial fishery and under communal commercial licenses, deriving economic benefits from fishery revenues and employment-generated income. Aboriginal Groups also participate in fisheries for domestic and FSC purposes in the lower Fraser River in the vicinity of the Project. The primary method of fishing for FSC purposes in the Fraser River is by use of drift gill nets.

EAO considered the following key factors in assessing the potential impacts of the Project on an Aboriginal Groups' Aboriginal Interests associated with fishing:

- The assessment of potential effects of the Project on Aboriginal Groups' Aboriginal Interests associated with fishing is informed by the analysis of potential residual effects on relevant VCs. Potential effects, proposed mitigation, and residual effects are characterized in the hydrology (section 4.2), marine use (section 5.3), fish and fish habitat (section 4.3), human health (atmospheric noise) (section 7), and land use and visual quality (sensory disturbance, including visual quality and noise) (section 5.2) characterized in this Report;
- The magnitude of the residual effects on hydrology (river hydraulics and river morphology) is expected to be low in the Fraser River South Arm during Tunnel decommissioning, following implementation of proposed mitigation. The residual effects on hydrology are not expected to be significant;

- The magnitude of the residual effects on fish and fish habitat is expected to be low, given the implementation of standard management practices, conducting in-water works during least-risk fish windows and following implementation and effectiveness of proposed mitigation, as well as conditions discussed below including a proposed fish habitat offset plan and fish and fish habitat management plan. The likelihood of residual effects to fish and fish habitat due to crushing or entrainment or elevated levels of TSS is low. Likelihood of residual effects due to pulsed noise sources is low. Likelihood is high of measurable change in underwater noise during in-water construction and Tunnel decommissioning activities due to non-pulsed noise sources. Although there is potential for juvenile sturgeon to become entrained near areas of disturbance during sediment removal, fish populations are generally well-adapted to the turbid waters of the Fraser River, where they are often exposed to other sources of elevated TSS levels;
- A DFO authorization would be sought in situations where serious harm to fish cannot be avoided;
- Key fishing sites identified by Aboriginal Groups that overlap or are in proximity to the Project were considered in relation to past, present and anticipated future use of the area for fishing;
- EAO understands that an Aboriginal Group's fishing activities depend, in part, on the status and sensitivity of fish populations within their area of traditional use, the nature and timing of the disturbances, and the effectiveness of mitigation, and the extent to which the Project could affect an Aboriginal Group's access to, and use of the area;
- The magnitude of the residual effects on marine use is expected to be low-to-moderate regarding access to waterways and marine traffic volume, due to marine-based equipment working in or transiting the Project area and marine-based construction activities including Tunnel decommissioning. It is expected that marine users including Aboriginal Groups could experience access restrictions and occasional closures during Tunnel decommissioning, although a full closure of the Fraser River South Arm Navigation channel is not anticipated. There is a high likelihood of residual effects to Marine Use during Project construction due to marine-based equipment working within the Fraser River South Arm or Deas Slough, and marine-based equipment transiting through the Fraser River South Arm or Deas Slough. The residual effects on marine use are not expected to be significant;
- Aboriginal Group's navigation and access to fishing sites in the vicinity of the existing Tunnel and new bridge would be restricted for durations during Project

construction and Tunnel decommissioning in the Fraser River and Deas Slough, the geographic extent of which (2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough) overlaps with important fishing areas for Aboriginal Groups, including areas currently used by Musqueam Indian Band and the Tsawwassen Fishing Area. The construction and Tunnel decommissioning period would be short-term (depending on the final design and configuration of the bridge, bridge deck installation is expected to be undertaken over a period of approximately 20 weeks; within work weeks, installation of the bridge deck would take place over a few consecutive days (e.g., 2-3 days) during the week) and proposed conditions requiring further engagement with Aboriginal Groups (including marine users group), as well as avoiding impediments to fishing access during DFO fishing openings, are expected to mitigate some of the potential effects;

- EAO understands from Aboriginal Groups the potential dangers of gill netting activities in areas of increased/larger vessel traffic and potential obstructions to nets, as well as socio-economic costs when nets are lost;
- EAO understands from Aboriginal Groups that DFO fishing openings can be narrow and restrictive (e.g. a 12-hour fishing window with only a few hours of advance notice);
- Construction activities in the Project alignment may result in some disturbance to adjacent land uses, primarily due to temporary changes in access, which could result in temporary changes in scheduling for a short period of time to shore-based marina facilities in Deas Slough;
- Uptake of contaminants in edible resources from Project activities is not anticipated due to results of water quality and air quality assessments and predictions supported by findings of the Health Impact Assessment;
- The magnitude of the residual effects on human health (atmospheric noise) during construction is expected to be low, based on the location and construction activity. Noise levels would be managed by best practices and site-specific management and are anticipated to be within typical levels encountered on individual construction sites, on a short-term and semi-continuous to occasional basis for approximately two years. There is a high likelihood of residual effects on atmospheric noise conditions in the vicinity of the Project, however residual effects on human health from atmospheric noise are not expected to be significant;
- The magnitude of the residual effects on sensory disturbance (visual quality and noise) is expected to be low to moderate during construction and operations, with the more moderate effects at the south arm of the Fraser River and vicinity of the

new bridge. With the implementation of mitigation measures, sensory disturbance to nearby land users is generally expected to be low in magnitude for most of the Project alignment. However, at the Fraser River crossing, with the addition of the bridge, and the limited noise and visual mitigation measures that can be implemented for the bridge, the magnitude is expected to be moderate in degree, especially given the noticeable change in comparison with the existing Tunnel. There may also be potential temporary direct effects on quality of experience due to construction-related noise, as well as permanent increased noise from traffic (sensory disturbances) and visual disturbances; this would be most apparent within the respective LAAs for visual quality and atmospheric noise, and would be a long-term, continuous effect. There is a high likelihood of residual effects on sensory disturbance in the vicinity of the Project, however residual effects related to sensory disturbance are not expected to be significant;

- Potential changes are anticipated in both noise and visual conditions at receptors in Deas Island Regional Park and portions of the Millennium Trail, as well as on the water, due to the presence of the new bridge once in operation, which would impact quality of experience of fishing on the Fraser River.
- The Project design includes proposed mitigation to avoid or reduce potential adverse effects to VCs, and to Aboriginal Interests related to fishing. Examples of Project design mitigation include: a clear-span bridge across the Fraser River South Arm and Deas Slough, intended to avoid potential for long-term effects on hydraulics and morphology of the river and potential impact on navigation (and also minimizing construction-related effects on fish and fish habitat), or long-term residual effects on marine use post-construction; a stormwater runoff collection and management features that avoid any direct road runoff into the Fraser River; opportunities for re-establishing the original hydro-dynamics of the area; and proposed enhancement/restoration of habitat that supports fishing, creation of shading/protective areas for fish, or other measures resulting in net gain of fish habitat;
- The Project would be constructed in accordance with the habitat protection provisions of the *Fisheries Act*, DFO's *Measures to Avoid Causing Harm to Fish and Fish Habitat* (formerly DFO Operational Statements). Changes in and around a stream require notification or approval under Section 11 of the WSA, administered by FLNRO. The public's right to navigate the Fraser River South Arm and Deas Slough is protected by the NPA;
- EAO considers the effectiveness of the proposed mitigations to avoid and reduce potential effects to fish and fish habitat to be moderate to high;

- Aboriginal Group consultation by the Proponent will be ongoing to facilitate participation in development and implementation of mitigation measures to avoid, reduce, or otherwise manage potential Project-related effects on Aboriginal Interests, including Aboriginal fisheries activities; and
- The Proponent has proposed measures to enhance fish habitat within and adjacent to the Project alignment, and monitoring and managing the effectiveness of Project-related habitat enhancement features through a follow-up monitoring program, and has committed that offsetting opportunities would be designed to maintain or improve the productivity of CRA fisheries.

Proposed conditions of the EAC include:

- Requirement to engage with Aboriginal Groups on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of an Inter-Agency Working Group;
- Continued consultation by the Proponent with Aboriginal Groups regarding the development of the CEMP and with other plans as required by the EAC conditions, and requirement to provide Aboriginal engagement reports throughout implementation of monitoring and follow-up programs;
- Development of a water quality management plan;
- Development of a river bed and hydrology management plan;
- Development of a Lulu Island-Delta water main plan;
- Development of a drainage and stormwater management plan;
- Development of a fish and fish habitat management plan;
- Development of a fish habitat offset plan;
- Establishment of a marine users group, that would include Aboriginal Groups; however, EAO understands that the Proponent will continue to consult with Aboriginal Groups on how they want to be consulted with post-EA, including those who do not want to participate in the marine users group;
- Development of a marine access management plan;
- Requirement for the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the existing Tunnel;
- Development of an Aboriginal cultural awareness and recognition plan;
- Development of a noise management plan;
- Requirement to offer opportunities for members of Aboriginal Groups to participate in monitoring activities during Construction, including monitoring of

Construction activities that may affect traditional use and related environmental values;
- Retention of an Independent Environmental Monitor; and
- Requirement for the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies.

The potential impact of the Project on Aboriginal Interests associated with fishing for each Aboriginal Group is described in section 14 of this Report.

## 13.2 Hunting and Trapping

A number of wildlife species such as ducks, geese, as well as several bird and fur-bearer species that are traditionally important may be impacted by the Project. Species of interest that were identified by Aboriginal Groups were considered in the development of the key indicators for the terrestrial wildlife VC during pre-Application.

EAO considered the following key factors in assessing the potential impacts of the Project on an Aboriginal Group's Aboriginal Interests associated with hunting and trapping:

- The assessment of potential effects of the Project on Aboriginal Groups' Aboriginal Interests associated with hunting and trapping is informed by the analysis of potential residual effects on relevant VCs. Potential effects, proposed mitigation, and residual effects are characterized for the land use and visual quality (sensory disturbance, including visual quality and noise) (section 5.2), wildlife (section 4.4), human health (atmospheric noise) (section 7) marine mammals (section 4.3) sections of this Report;
- The magnitude of the residual effects on human health (atmospheric noise) during construction is expected to be low, based on the location and construction activity. Noise levels would be managed by best practices and site-specific management and are anticipated to be within typical levels encountered on individual construction sites, on a short-term and semi-continuous to occasional basis for approximately two years. There is a high likelihood of residual effects to human health from atmospheric noise; however the residual effects on human health from atmospheric noise are not expected to be significant. This was considered in relation to potential effects to individuals undertaking hunting and trapping in the vicinity of the Project during construction;
- The magnitude of the residual effects on sensory disturbance (visual quality and noise) is expected to be low to moderate during construction and operations, with

the more moderate effects at the south arm of the Fraser River and vicinity of the new bridge. With the implementation of mitigation measures, sensory disturbance to nearby land users is generally expected to be low in magnitude for most of the Project alignment. However, at the Fraser River crossing, with the addition of the bridge, and the limited noise and visual mitigation measures that can be implemented for the bridge, the magnitude is expected to be moderate in degree, especially given the noticeable change in comparison with the existing tunnel. There may also be potential temporary direct effects on quality of experience due to construction-related noise, as well as permanent increased noise from traffic (sensory disturbances) and visual disturbances; this would be most apparent within the respective LAAs for visual quality and atmospheric noise, and would be a long-term, continuous effect. There is a high likelihood of residual effects on sensory disturbance in the vicinity of the Project, however residual effects related to sensory disturbance are not expected to be significant;

- Potential changes are anticipated in both noise and visual conditions at receptors in Deas Island Regional Park and portions of the Millennium Trail, as well as on the water, due to the presence of the new bridge once in operation, which would impact quality of experience of fishing on the Fraser River. EAO understands that an Aboriginal Group's hunting and trapping activities depend, in part, on the status of wildlife populations within their area of traditional use. The LAA is intended to capture the direct and indirect impacts from the Project, while the RAA is intended to capture the area where the influence of other land uses and activities could overlap with Project-specific effects and result in cumulative adverse effects;
- Overall habitat disturbance from the Project would generally be relatively small as the majority of the Project footprint would occur on existing ROW.
- The magnitude of the residual effects to barn swallow and barn owl are expected to be moderate and low, respectively; however, there are not expected to be residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.
- There are not anticipated to be residual effects on marine mammals (specifically, harbor seals) resulting from the Project following mitigation and monitoring, including that related to underwater noise during construction;
- EAO considers the effectiveness of the proposed mitigations to avoid and reduce potential effects to terrestrial wildlife and marine mammals, combined with the conditions outlined in the TOC and the CPD to be high;

- The Proponent has proposed mitigations to avoid and minimize potential effects to terrestrial wildlife and marine mammals. The Proponent's proposed key mitigation measures are included in Part B of this Report;
- An Aboriginal Group's access to the Project area to hunt or trap may be restricted for a short period due to safety concerns during the construction period, or from disturbance to adjacent land uses, however the change in overall land use is not anticipated to be distinguishable from existing conditions or may be accommodated by minor changes in timing activities. Engagement with Aboriginal Groups during construction planning is expected to mitigate the majority of these short term effects; and
- Effects to terrestrial resources from adverse changes in air quality resulting from exposure to airborne contaminants is not anticipated given results of the Proponent's air quality assessment; similarly, uptake of contaminants in edible resources as a result of Project activities is not anticipated given results of the water quality and air quality assessments, which the Proponent indicated is supported by the findings of their health impact assessment.

The Proponent has proposed mitigations to avoid and minimize potential effects to wildlife and wildlife habitat, and other concerns associated with hunting activities raised by Aboriginal Groups. The Proponent's proposed key mitigation measures are included in Part B of this Report.

Proposed conditions of the EAC include:

- Continued consultation and engagement by the Proponent with Aboriginal Groups regarding construction scheduling, the development of the CEMP and other plans as required by regulatory authorities, and requirement to provide Aboriginal engagement reports throughout implementation of monitoring and follow-up programs;
- Requirement to engage with Aboriginal Groups on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of an Inter-Agency Working Group;
- Development of a marine mammal management plan;
- Development of wildlife and wildlife habitat plans during construction and operations;
- Development of a traffic and access management plan;
- Development of a noise management plan;
- Development of an Aboriginal cultural awareness and recognition plan;

- Requirement to offer opportunities for members of Aboriginal Groups to participate in monitoring activities during construction, including monitoring of Construction activities that may affect traditional use and related environmental values;
- Retention of an Independent Environmental Monitor; and
- Requirement for the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects effects if requested by federal, provincial or regional government agencies.

The potential impact of the Project on Aboriginal Interests associated with hunting and trapping for each Aboriginal Group is described in section 14 of this Report.

## 13.3 Gathering

Aboriginal Groups identified several plants species that are harvested for food, medicinal or other cultural purposes, and several gathering sites that could be impacted by the Project were identified by Aboriginal Groups. Plant species of interest that were identified by Aboriginal Groups were considered in the development of indicators for the vegetation VC during pre-Application. The Proponent assessed potential effects of the Project on non-agricultural vegetated ecosystems, including native vegetation, vegetation communities of concern, plant species of concern, and invasive plant species. The Project could result in the loss or alteration of native vegetation (including vegetation communities of concern and plant species of concern) and the introduction and spread of invasive plant species.

EAO considered the following key factors in assessing the potential impacts of the Project on an Aboriginal Group's Aboriginal Interest associated with gathering:

- The assessment of potential effects of the Project on Aboriginal Groups' gathering activities depends, in part, on the status of vegetation within their area of traditional use. Potential effects, proposed mitigation, and residual effects are characterized for vegetation (section 4.5), land use and visual quality (sensory disturbance, including visual quality and noise) (section 5.2), and human health (atmospheric noise) (section 7) sections of this Report;
- The nature and extent of effects would depend on the inherent sensitivity and prevalence of vegetation communities, the nature and timing of the disturbances, and the effectiveness of mitigation;
- The Project is located largely in a highly disturbed area, within the ROW of an active transportation corridor where vegetation is generally indicative of effects of

urban and agricultural development. Small portions within the Project alignment support native vegetation, which may include species or ecosystems that are considered to be at risk by provincial or federal regulators, or are of interest to Aboriginal Groups. No at-risk plant species were encountered during the field rare plant surveys, although Aboriginal Groups reported observations of two species of lupine: the native streambank lupine (*Lupinus rivularis*) and the introduced tree lupine (*Lupinus arboreas*). The Application noted there are no mapped occurrences of streambank lupine or critical habitat polygons within the Project alignment and no plants were observed during the at-risk plant surveys;

- EAO is satisfied that the Project would have negligible adverse effects on vegetation;
- The majority of Project-related disturbance to vegetation would occur during construction and would be confined primarily to the Project footprint, which includes the Highway 99 corridor. The most important at-risk ecosystems that have the potential to interact with the Project consist of cattail marshes, which may occur during construction, which is already highly disturbed. Project footprint effects on the cattail marsh near River road would be offset, through creation of comparable cattail marsh habitat within the Project alignment, resulting in no net loss of habitat. Other areas of potential disturbance would be revegetated with native cattails once construction is complete. The mitigation measures outlined above are expected to improve the quality and viability of the ecosystem and counteract potential effects of the small overlap with the proposed bridge support piers;
- The magnitude of the residual effects on human health (atmospheric noise) during construction is expected to be low, based on the location and construction activity. Noise levels would be managed by best practices and site-specific management and are anticipated to be within typical levels encountered on individual construction sites, on a short-term and semi-continuous to occasional basis for approximately two years. There is a high likelihood of residual effects to human health from atmospheric noise; however the residual effects on human health from atmospheric noise are not expected to be significant. This was considered in relation to potential effects to individuals undertaking gathering in the vicinity of the Project during construction;
- The magnitude of the residual effects on sensory disturbance (visual quality and noise) is expected to be low to moderate during construction and operations, with the more moderate effects at the south arm of the Fraser River and vicinity of the new bridge. With the implementation of mitigation measures, sensory disturbance to nearby land users is generally expected to be low in magnitude for

most of the Project alignment. However, at the Fraser River crossing, with the addition of the bridge, and the limited noise and visual mitigation measures that can be implemented for the bridge, the magnitude is expected to be moderate in degree, especially given the noticeable change in comparison with the existing Tunnel. There may also be potential temporary direct effects on quality of experience due to construction-related noise, as well as permanent increased noise from traffic (sensory disturbances) and visual disturbances; this would be most apparent within the respective LAAs for visual quality and atmospheric noise, and would be a long-term, continuous effect. There is a high likelihood of residual effects on sensory disturbance in the vicinity of the Project, however residual effects related to sensory disturbance are not expected to be significant;

- Potential changes are anticipated in both noise and visual conditions at receptors in Deas Island Regional Park and portions of the Millennium Trail, as well as on the water, due to the presence of the new bridge once in operation, which would impact quality of experience of fishing on the Fraser River. Indirect disturbance through the introduction of invasive alien plants via construction vehicles or equipment may also occur. During operations, Project activities (including routine maintenance) are not expected to affect these ecosystems;
- The Proponent has proposed habitat enhancement measures, including removal of invasive species and garbage from the marsh, and revegetation using native species as appropriate to improve habitat quality in the area surrounding the new bridge support piers; installation of an appropriate stormwater management system for the upgraded highway and the new bridge to avoid potential introduction of contaminants into the ecosystem through road runoff; and follow-up monitoring of the effectiveness of the enhancement efforts;
- Access restrictions impacting gathering activities could occur during construction, for a limited period in specific geographic areas. EAO understands that upon completion of construction, areas occupied by Tunnel components on land would be revegetated, affected trails would be reconnected, and shoreline areas would be restored. EAO also understands that access would be restored after construction;
- Effects to terrestrial resources from adverse changes in air quality resulting from exposure to airborne contaminants is not anticipated given results of the Proponent's air quality assessment; similarly, uptake of contaminants in edible resources as a result of Project activities is not anticipated given results of the water quality and air quality assessments, which the Proponent indicated is supported by the findings of their health impact assessment;

- The Proponent's Project design includes proposed mitigation to avoid and reduce potential adverse effects to VCs, and to Aboriginal Interests related to gathering. Examples of Project design mitigation include proposed restoration of the river shoreline (e.g., marshes, cattail ecosystems), including revegetation with culturally significant plants where possible;
- Key gathering sites identified by an Aboriginal Group that overlap or are in proximity to the Project were considered in relation to past, present and anticipated future use of the area for gathering; and
- EAO considers the effectiveness of the proposed mitigations to avoid and reduce potential effects to vegetation to be high.

The Proponent has proposed mitigations to avoid and minimize potential effects to vegetation, and other concerns associated with gathering activities raised by Aboriginal Groups. The Proponent's proposed key mitigation measures are included in Part B of this Report.

Proposed conditions of the EAC include:

- Continued consultation and engagement by the Proponent with Aboriginal Groups regarding construction scheduling, the development of the CEMP and other management and monitoring plans, and requirement to provide Aboriginal engagement reports throughout implementation of monitoring and follow-up programs;
- Development of a traffic and access management plan, which must include the means by which the Proponent would avoid or mitigate any disruption caused by the Project to the access for members of Aboriginal Groups to harvest medicinal and food source plants, or to carry out any other land-based traditional use activities;
- Development of a vegetation management plan for construction, which would include a description of how native plants will be incorporated into post-construction revegetation to support aquatic, riparian and terrestrial values, and describe how Aboriginal traditional knowledge and traditional use information has been incorporated;
- Requirement to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities, develop mitigation measures to avoid or minimize impacts, and share survey results including with Aboriginal Groups;

- Requirement to control invasive species during site preparation in advance of construction, construction and operations in accordance with MOTI's Best Practices for Managing Invasive Plants on Roadsides;
- Requirement to offer opportunities for members of Aboriginal Groups to participate in monitoring activities during Construction, including monitoring of Construction activities that may affect traditional use and related environmental values;
- Development of an Aboriginal cultural awareness and recognition;
- Development of a noise management plan;
- Requirement for the CEMP, developed in consultation with Aboriginal Groups, to include the means by which invasive plant management, revegetation, erosion and sediment control, and accidents and malfunctions (among others) will be addressed;
- Retention of an Independent Environmental Monitor; and
- Requirement for the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies.

The potential impact of the Project on Aboriginal Interests associated with gathering for each Aboriginal Group is described in section 14 of this Report.

## 13.4 Other Traditional and Cultural Interests

Tangible, semi-tangible, and intangible cultural heritage sites and places in the Project Area linked to the exercise of Aboriginal Interests, including the Fraser River itself, were reported by Aboriginal Groups. Aboriginal Groups identified a historical connection and continued or desired use of sites or places in the vicinity of the Project, and stated they would experience permanent disruption to experiences in the vicinity of the Project due to the presence of the new bridge.

Potential effects, proposed mitigation, and residual effects are characterized for heritage resources (section 6), human health, including atmospheric noise and air quality (section 7), marine use (section 5.3), and land use and visual quality (sensory disturbance, including visual quality and noise) (section 5.2), sections of this Report. While residual effects to visual quality are expected to be experienced within 1 km of the new bridge, the addition of a new feature to the landscape may affect quality of experience, including to cultural heritage, within and beyond 1 km. The magnitude of the

residual effects on sensory disturbance, including visual quality and noise, is expected to be moderate at the bridge crossing (low elsewhere throughout the corridor), although the residual effects on sensory disturbance including visual quality and noise are not expected to be significant.

The magnitude of residual effects on human health (atmospheric noise) during construction is expected to be low, based on the location and construction activity. Noise levels would be managed by best practices and site-specific management and are anticipated to be within typical levels encountered on individual construction sites, on a short-term and semi-continuous to occasional basis for approximately two years. There is a high likelihood of residual effects to human health from atmospheric noise; however the residual effects on human health from atmospheric noise are not expected to be significant. Such effects are important to consider in relation to whether Aboriginal peoples undertaking traditional and/or cultural activities in the vicinity of the Project could be potentially adversely impacted.

The magnitude of the residual effects on sensory disturbance (visual quality and noise) is expected to be low to moderate during construction and operations, with the more moderate effects at the south arm of the Fraser River and vicinity of the new bridge. With the implementation of mitigation measures, sensory disturbance to nearby land users is generally expected to be low in magnitude for most of the Project alignment. However, at the Fraser River crossing, with the addition of the bridge, and the limited noise and visual mitigation measures that can be implemented for the bridge, the magnitude is expected to be moderate in degree, especially given the noticeable change in comparison with the existing tunnel. There may also be potential temporary direct effects on quality of experience due to construction-related noise, as well as permanent increased noise from traffic (sensory disturbances) and visual disturbances; this would be most apparent within the respective LAAs for visual quality and atmospheric noise, and would be a long-term, continuous effect. There is a high likelihood of residual effects on sensory disturbance in the vicinity of the Project, however residual effects related to sensory disturbance are not expected to be significant;

Potential changes are anticipated in both noise and visual conditions at receptors in Deas Island Regional Park and portions of the Millennium Trail, as well as on the water, due to the presence of the new bridge once in operation, which would impact quality of experience of fishing on the Fraser River. While noise mitigation measures to address incremental noise changes related to construction are anticipated to largely address Project-related effects to quality of experience, where exercise of Aboriginal Interests overlap or are in proximity to known noise-sensitive locations, Project operation-related

effects related to changes in noise levels could have a measurable and permanent effect on the quality of experience at those locations for some Aboriginal Groups.

EAO is satisfied that the effect of the Project on human health to air quality would be negligible, and that the effect of the Project to human health from both air quality and atmospheric noise would be not significant.

Aboriginal Groups also identified areas within the new bridge footings in and around Deas Slough and Deas Island Regional Park as potential archaeological sites, and noted that cultural-mourning rituals may have been practiced at Deas Island and/or Westham Island. There are 14 recorded archaeological sites near the Project area, Project-related effects to archaeological heritage sites within the Project area are not expected as no sites were identified in the course of fieldwork, although the location of the sites may not always coincide with locations with intangible cultural value or meaning to Aboriginal Groups (e.g., spiritual or storied sites, named places). Physical alterations to the landscape, irrespective of whether it results in impacts to archaeological or historical sites, may still affect how this landscape is experienced culturally.

Potential changes in access to cultural sites and transportation routes may also result from instream and upland construction activities, as well as from footprint effects during operation.The Project would also be located where there is potential for interaction with currently-unidentified archaeological and heritage resources, including previously-unknown and unrecorded heritage sites potentially located in construction areas covered by infrastructure along the Highway 99 corridor, that could be encountered during Project activities. Aboriginal Groups also identified Project-related activities on heritage resources as an area of specific interest and were engaged in the heritage resources assessment with the Proponent from early stages.

Archaeological sites in BC are protected under the HCA, and FLNRO's Archaeology Branch is the agency responsible for administering the HCA and maintaining the Provincial Heritage Site Register. Section 13 of the HCA specifies that an individual (or corporation) must not "damage, excavate, dig in or alter, or remove any heritage object" from a heritage site, unless under a permit issued by the Minister pursuant to sections 12 and 14.

Avoidance is the primary mitigation recommended for the Project. If avoidance is not feasible, site-specific mitigation plans would be developed in accordance with the HCA, and in consultation with FLNRO (Archaeology Branch) and affected Aboriginal Groups. All site-specific mitigation measures for archeological sites would be established

following the provincially-regulated procedures and policies. The Proponent's proposed key mitigation measures are included in section 6 (heritage) of this Report.

The Proponent's mitigations include working to provide opportunities to incorporate Aboriginal heritage into the bridge design, signage, and naming, and to involve Aboriginal Groups in that process, or otherwise publicly recognizing Aboriginal Group's asserted traditional territories and histories in the Project area. A proposed archaeological - heritage resources management plan would be developed and would include chance-find procedures (see below). The implementation of a chance-find procedure is consistent with regulatory requirements and recognized good practices, and is expected to address potential Project-related effects on previously-unidentified heritage resources.

Proposed conditions of the EAC include:

- Continued consultation and engagement by the Proponent with Aboriginal Groups regarding construction scheduling, the development of the CEMP and other plans, as required by regulatory authorities, and requirement to provide Aboriginal engagement reports throughout implementation of monitoring and follow-up programs;
- Requirement to engage with Aboriginal Groups on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of an Inter-Agency Working Group;
- Requirement to offer opportunities for members of Aboriginal Groups to participate in monitoring activities during Construction, including monitoring of Construction activities that may affect traditional use and related environmental values;
- The development of a traffic and access management plan, which must include the means by which to avoid or mitigate disruption to the access for members of Aboriginal Groups to harvest medicinal and food source plants, or to carry out any other land-based traditional use activities;
- Development of a noise management plan;
- Development of an archaeological - heritage resources plan;
- Retention of an Independent Environmental Monitor;
- Development of an Aboriginal cultural awareness and recognition plan; and

- Requirement for the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies.

Confidence in the overall effects assessment is high, given that provincially required mitigation programs would be conducted and would be based on input from Aboriginal communities and regulatory bodies.

The potential impacts of the Project on archaeology and cultural heritage sites and features for each Aboriginal Group are described in section 14 of this Report.

## 13.5 Aboriginal Title

The Project, primarily through activities associated with construction, including the decommissioning of the Tunnel, has the potential to affect Aboriginal title claims, primarily related to construction. EAO has considered how the Project may impact each of the following three components of Aboriginal title claims overlapping the Project area: use and occupation, decision-making, and economic benefits. Mitigation measures relevant to address impacts to each component of Aboriginal title are also considered and described in the paragraphs that follow.

In considering potential Project impacts on the use and occupancy component of Aboriginal title claims, the Crown has considered the following factors:

- The majority of construction works would be confined to relatively small areas during the construction phase and are temporary in nature;
- The new bridge would be required to be constructed in such a way as to maintain access to the Fraser River for fishing and navigation during construction as well as operations, and the design of the bridge is clear span to minimize effects on marine access and aquatic resources;
- Existing uses of the areas along the Project corridor would generally not be precluded, as the majority of Project effects would be confined to a relatively small area around the Project corridor, which is a pre-existing corridor (EAO notes, however, that while the new bridge is within the existing transportation corridor, it would be a substantial change to the current Tunnel in place);
- Access to the Project area, and potentially nearby areas, during construction and Tunnel decommissioning would be temporally limited for safety reasons. Potential residual effects on VCs relevant to other related Aboriginal Interests -

characterized in this Report – range from negligible-to-low to moderate magnitude, and are not expected to be significant;

- By its nature, the new bridge would result in permanent changes to the landscape which could impact the use of the area by Aboriginal Groups in the vicinity of the Project, related in particular to visual, noise, light and other sensory disturbances and effects to the experience and enjoyment of their use of the area. Such effects would occur during construction and to a lesser extent, during operation; and
- The Proponent has proposed mitigation to avoid and minimize potential effects, which have been referenced and included in other sections of this Report. Key mitigations have included Project design – specifically, a clear-span design for the bridge, which would help to avoid permanent changes to access of the Fraser River and to disruptions in fishing activities or navigation of the river, as well as key conditions such as the Proponent's commitment to ensure that access to Aboriginal or commercial fisheries is not impeded by construction-related activities during DFO fishing window openings for such fisheries, and relevant monitoring and management plans.

In considering potential Project impacts on the decision-making component of Aboriginal title claims, the Crown has considered the following factors:

- The vast majority of the Project is occurring on Crown land, which will continue to be Crown land, with small parcels, the majority of which is ALR land to be purchased from private landowners;
- Both EAO and the Proponent have consulted with Aboriginal Groups, and ongoing consultation would be required with Aboriginal Groups via the proposed conditions in the case an EAC is issued, including the requirement for the Proponent to consult with Aboriginal Groups to develop and implement the traffic construction access management plan;
- Ongoing disagreements regarding both existing and proposed future use of the Highway 99 ROW have been vocalized by some Aboriginal Groups, which is discussed in more detail in section 14, which includes perspectives that the existing highway corridor constricts asserted Aboriginal rights and title;
- No change in governance structure or management processes that would detract from Aboriginal Group participation have occurred throughout the course of the EA;
- Aboriginal Groups raised concerns with how the Project could affect their ability to manage and make decisions over the Project area in accordance with their traditions, cultures and/or customs, now and in the future. Aboriginal Groups also

identified how the Project might be consistent or inconsistent with any cultural/other objectives in this area;

- Other concerns identified by Aboriginal groups included broader concerns in relation to perceived growth and industrialization of the Fraser River and concerned about cumulative effects to the Fraser River as a whole as well as the estuary;
- As described in section 10-12 and 14, EAO has attempted to undertake a principled, meaningful and responsive consultation process characterized by genuine efforts to acknowledge and document Aboriginal Groups' concerns as well as to identify ways to demonstrably address these concerns prior to, or as part of, the decision-making process. Throughout the Project review, Aboriginal Groups were provided with opportunities to describe their views of the nature and scope of potential impacts of the Project on their Aboriginal Interests and on mitigation or accommodations measures that could be applied to address those potential impacts. EAO's consultation process provided Aboriginal Groups with an opportunity to provide their perspective on the extent to which the Project affects their ability to manage and make decisions over areas impacted by the Project;
- Should the Project proceed, the Proponent would be required to continue consultation with potentially affected Aboriginal Groups, and to finalize the development of its plans and measures to reduce and mitigate the potential effects and to protect the environment and the resources that are of importance to and utilized by Aboriginal Groups. Ongoing consultation and/or notification with Aboriginal Groups listed in Schedule B of the Section 11 Order are identified in EAO's proposed conditions including: plan development; project status notification; involvement of Aboriginal Groups in construction monitoring; inter-agency working group; CEMP; site preparation in advance of construction; water quality; drainage and stormwater management; fish and fish habitat; fish habitat offsetting; marine mammals; wildlife – construction; wildlife – operations; vegetation – construction; vegetation – site habitat assessment surveys; agricultural use; river bed and hydrology management plan; Lulu Island-Delta water main management plan; noise management; marine users group; marine access; transportation working group for Highway 99; traffic and access management; archaeological - heritage resources; Aboriginal cultural awareness and recognition; and Aboriginal engagement reports. These mitigation measures, in addition to the proposed fisheries access condition, would reduce potential impacts on the ability of Aboriginal Groups to manage and make decisions over the area impacted by the Project. However, EAO understands that the Project may not be consistent with the management objectives of every Aboriginal Group potentially impacted by the Project.

In considering potential Project impacts on the economic benefits component of Aboriginal title claims, the Crown has considered the following factors:

- The existing Highway 99 ROW is not currently used for economic purposes by Aboriginal Groups, with exception of fishing activities which occur in and around the vicinity of the existing Tunnel;
- Some Aboriginal Groups have indicated that the Project, as a continuation of an existing corridor, may reduce Aboriginal Groups' economic development aspirations for areas in proximal areas as physical use of the Project footprint and adjacent areas would continue to be limited for any other physical works. EAO notes its view that this potential effect is not exacerbated or worsened due to the Project as the corridor would continue to exist with or without the Project; however, EAO has proposed conditions in related to access issues during construction;
- Several Aboriginal Groups expressed concern about potential adverse effects of the Project on fisheries, including active commercial fisheries interests. EAO has sought to address these concerns through a proposed condition that would require the Proponent to not impede Aboriginal fisheries during DFO fishing openings, to avoid interruptions to fishing activities;
- Many Aboriginal Groups expressed interest in Project-related economic, training, and business opportunities for Aboriginal Groups. EAO understands the Proponent is actively exploring opportunities to provide benefits (economic and non-economic) to Aboriginal Groups. Opportunities include: employment, training, and contracting, as well as participating in environmental enhancements components of the Project; and
- Mitigation measures associated with the ability of Aboriginal Groups to derive direct and/or indirect economic benefits if the Project is approved include EAO's proposed conditions associated with an Inter-Agency Working Group, Marine Users Group, marine access, fisheries access, traffic and access management, noise management, Aboriginal cultural awareness and recognition, Aboriginal engagement reports (which require description of what actions have been or will be taken to provide training, employment, business, and contracting opportunities to Aboriginal Groups), and involvement of Aboriginal Groups in construction monitoring, among others.

Based on the nature of the Project, which has few characteristics that would preclude access or other uses for the life of the Project besides those access and other uses which are already precluded by the existing Highway 99 corridor, and in consideration of concerns raised by Aboriginal Groups during consultation, conditions have been

proposed by EAO that would help support the mitigation of impacts to Aboriginal Groups' Aboriginal title in a number of ways:

- A number of the proposed conditions ensure greater opportunity for the ongoing participation of Aboriginal Groups in informing the development and implementation of the Project; and
- Several of the conditions require consideration and integration of Aboriginal use and practices into the development of mitigation.

The potential impacts of Project-related activities on Aboriginal title for each applicable Aboriginal Group are discussed in sections 14.

# 14 Impacts to Aboriginal Interest by Aboriginal Groups and EAO's Conclusions

The following sections consider the information received from each Aboriginal Group through consultation efforts during the EA process, and summarize the consultation and accommodation of potentially affected Aboriginal Groups in relation to the Project. Potential impacts of the Project on Aboriginal Interests are characterized in general terms in section 13 of this Report. Below, EAO outlines issues identified during the EA, provides additional background information specific to each of the Aboriginal Groups, and lays out its considerations and conclusions on the seriousness of potential impacts to the Aboriginal Interests of each of the Aboriginal Groups.

Impacts on Aboriginal Interests are assessed for each individual Aboriginal Group and for each category of rights. These impacts are described based on the level of seriousness of potential impacts from negligible to serious, defined as follows:

- Negligible impact – no detectable impact or any change from current conditions;
- Minor impact – ability to exercise the right is minimally disrupted;
- Moderate impact – ability to exercise the right has been diminished or disrupted; and
- Serious impact – ability to exercise the right has been significantly diminished.

In some cases, EAO has used hyphenated levels of impacts (e.g. minor-to-moderate), which indicate that the impacts fall between the two categories. When reporting on impacts for any one Aboriginal Group, EAO acknowledges that the impacts on the group always vary in time and space. That is, impacts on Aboriginal Interests in one area of a group's territory are not the same as elsewhere, and impacts during

construction are not the same as during operations. The impact assessment reported for each group is the greatest expected impact on the Aboriginal Interest as a result of routine Project construction and operations.

## 14.1 Cowichan Tribes

### 14.1.1 Context

Cowichan Tribes is a Central Coast Salish group, is a “band” under the *Indian Act,* and is a member of the Cowichan Nation Alliance and the Hul’qumi’num Treaty Group. Cowichan Tribes has engaged directly with the Proponent and EAO on this Project and also collectively as a member of the Cowichan Nation Alliance.

Currently, Cowichan Tribes’ main community is located in Duncan on the east coast of Vancouver Island, about 50 km south of Nanaimo, and some of their nine reserves are clustered southeast of Duncan. Cowichan IR 1 is within the City of Duncan, and Cowichan Tribes’ IRs 5, 6, 7 and 8 are located west of Duncan. Cowichan Tribes members historically spoke the Hul'qumi'num (pronounced “Hul-ka-MEE-num”) language. The largest band in BC, Cowichan Tribes’ registered population as of April 2016 was 4,870, which includes 2,790 living on-reserve and 2,080 living off-reserve.

The asserted traditional territory of the Cowichan Tribes generally includes parts of south-eastern Vancouver Island, the southern Gulf Islands, a portion of the Lower Mainland, and the waters of the Salish Sea to the Sunshine Coast including the lower portion of Howe Sound, Haro Strait, the Strait of Juan de Fuca and the South Arm of the Fraser River up to Yale.

Cowichan Tribes, as a member of the Hul’qumi’num Treaty Group, assert a territory of core Aboriginal title lands and a broader traditional fishing territory, as described in its Statement of Intent to the BC Treaty Commission. Of particular relevance to this Project, is the assertion of Aboriginal rights and title described as including “the south arm of the Fraser River, including Canoe Pass, up to and including Douglas Island, with lands on the north shore of the south arm up to Sapperton Channel (New Westminster), the islands in the south arm of the Fraser River and the south bank of the Fraser River along Canoe Pass up to Deas Island”22. Cowichan Nation Alliance clarified to EAO

[22] Hul’qumi’num Treaty Group Statement of Intent. BC Treaty Commission website. http://bctreaty.net/soi/soihulquminum.php (accessed August 26, 2016).

during the EA that this assertion of Aboriginal title includes the entire Project footprint, including the Steveston and Highway 17A interchanges.

Cowichan Tribes, along with other Island Halkomelem speaking groups, traditionally utilized the lands and waters on both sides of the Strait of Georgia. Locations of importance to Cowichan Tribes, with the other Cowichan Nation Alliance members, along the South Arm of the Fraser River in the vicinity of the Project include but are not limited to Tl'uqtinus, spanning the north shore from approximately opposite Tilbury Island and downstream towards Deas Island, and Hwlhits'um or Xwulit'sum, on Canoe Pass. Both of these areas are considered by Cowichan Nation Alliance member bands, including Cowichan Tribes, as ancestral village and resource sites. Cowichan Nation Alliance is working to re-establish a permanent land base at Tl'uqtinus for residential and/or commercial purposes.

### 14.1.2 Preliminary Strength of Claim Assessment

The entirety of the Project corridor is within the asserted traditional territory of the Cowichan Tribes.

In the ethnographic and historic sources, members of the Hul'qumi'num Treaty Group were often all referred to as "Cowichan". Occasionally "Cowichan" was also mistakenly used to refer to a broader group that included all of the Central Coast Salish or Halkomelem speaking people. This lack of clarity in the information means it is sometimes difficult to attribute historical references of "Cowichan" use to individual Aboriginal groups or collectives of particular Aboriginal groups.

However, where historical information indicates the presence and use of the Project area by Cowichan people in a manner that makes it unclear which Aboriginal group was being described, EAO has not used this information to undermine the exclusivity component of Aboriginal title for the Cowichan Tribes preliminary Strength of Claim assessment or other members of the Hul'qumi'num Treaty Group.

The information reviewed indicates that Cowichan Tribes people traditionally occupied multiple village sites on Vancouver Island in and around Cowichan Bay and along Cowichan River, on the Gulf Islands, and seasonally along the south arm of the lower Fraser. Cowichan Tribes has communicated to EAO their perspective that it is clear from ethnographic information that Tl'uqtinus, the village site on the south arm of the lower Fraser, was not a "seasonal camp".

It is understood that Cowichan people have historically been residents of Vancouver Island and other Gulf Islands, and fished the South Arm of the Fraser River for salmon and sturgeon, including prior to and around the time of contact below and upstream of the Project. Based on current case law and a review of the currently available information and on descendancy from the historic Cowichan people, EAO's preliminary assessment is that Cowichan Tribes has a **strong *prima facie* claim of Aboriginal rights** to fish, gather and hunt in the areas in proximity to the Project area, including the South Arm of the Fraser River.

In November 2014, Cowichan Tribes, Stz'uminus First Nation, Penelakut Tribe and Halalt First Nation filed an *Amended Notice of Civil Claim* seeking a declaration of Aboriginal title to an area described as the Tl'uqtinus Lands and fishing rights to the South Arm of the Fraser River. It is noted that the claimed Tl'uqtinus lands on Lulu Island on the South Arm of the Fraser River are 2 - 3 km upstream from the Project and do not overlap the Project footprint. The assessment of the strength of claimed Aboriginal title to the Project area was conducted to inform the scope of consultation regarding this Project. It is a preliminary assessment only, considering only information reasonably available at the time of consultation and is not based on an exhaustive review of all information and legal issues related to this potential claim, and does not reflect the Crown's opinion of whether the court will ultimately decide in favour of the First Nation in any litigation.

EAO is of the view that the available information suggests Cowichan people did not traditionally occupy the Project footprint with the intention of controlling this land, although given the relative proximity of the Project to the claimed village sites, an inference can be made that Cowichan people may have utilized this area for resource harvesting activities. Cowichan Tribes has noted their view that traditional use studies submitted to EAO and the Proponent regarding this Project provide information in contrast to EAO's conclusion, and showed that Cowichan people did occupy the Project footprint with intention of controlling the land, and did exercise exclusive control over it.

The Project footprint appears to be at the western edge of an area identified by ethno-historians as a boundary between the traditional territories of several different Aboriginal Groups: Musqueam Indian Band to the west and north, Tsawwassen First Nation to the southwest, and Kwantlen First Nation to the south and east. Some early ethnographers identified an area of land at the intersection of these traditional territories as not attributed to any Aboriginal Group. The information also indicates that the Fraser River and surrounding area was a particularly rich resource area and the sheer abundance of resources may have reduced the need or practicality of defending use by others. In fact, information indicates that multiple Aboriginal Groups may have fished, hunted and

gathered within the vicinity of the Project footprint, which raises questions regarding whether exclusivity of use of the Project area can be established by the Cowichan people. EAO notes that Cowichan Nation Alliance has communicated to EAO that it does not agree with these conclusions.

Based on the above and on a descendancy from the historic Cowichan people, EAO's preliminary assessment is that the Cowichan Tribes has a **moderate *prima facie* claim of Aboriginal title** to the Project footprint inclusive of the Highway 17A and Steveston Highway interchanges. EAO acknowledges that Cowichan Nation Alliance disagrees with this conclusion and is of the view that it has a strong *prima facie* claim of Aboriginal title to the Project area.

#### 14.1.3 Involvement of the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Cowichan Tribes' Aboriginal Interests, EAO is of the view that the duty to consult Cowichan Tribes lies at the mid-to-high end of the *Haida* consultation spectrum. Cowichan Tribes is listed in Schedule B of the Section 11 Order.

Cowichan Nation Alliance has raised concerns regarding the Crown's initial assessment of the strength of its asserted Aboriginal title claims, communicating its view that both the sufficiency and exclusivity requirements are clearly met to support a strong *prima facie* claim of Aboriginal title in the vicinity of the Project area. After corresponding with Cowichan Nation Alliance and/or Cowichan Tribes about this difference in views, EAO determined that while it did not agree that the strength of claim assessment should be changed, it would be appropriate to consult with Cowichan Tribes and the other Cowichan Nation Alliance members at the deep end of the Haida spectrum in an effort to address Cowichan Nation Alliance/Cowichan Tribes' concerns.

Cowichan Tribes was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Cowichan Tribes was also invited to attend Working Group meetings, site visits, and to meet with EAO staff directly.

The Proponent began consulting with Cowichan Tribes in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events has included 14 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Cowichan Tribes with two rounds of funding, one in pre-Application phase and the other in Application Review phase, to support their involvement.

A summary of the Proponent's engagement activities with Cowichan Tribes is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports.

An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| November 6, 2014 | Meeting (teleconference) | Initial meeting between Cowichan Tribes, Stz'uminus First Nation, EAO and the Proponent. The Proponent introduced the Project Description and Proposed Studies document; EAO outlined the EA process and consultation. |
| January 21, 2016 | Working Group meeting | Cowichan Tribes unable to attend (Cowichan Nation Alliance represented by Halalt First Nation). |
| February 5, 2016 | Meeting | Meeting between Cowichan Nation Alliance, Proponent and EAO to discuss Project concept, presentation of the draft AIR, Cowichan presentation of their asserted Aboriginal Interests, and EAO presentation of the EA process. |
| February 17, 2016 | Letter | Cowichan Tribes' provided comments on EAO's draft Section 11 Order. Concerns included: a request for Working Group meetings to be located on Vancouver Island; cumulative effects; and length of separate submissions from Aboriginal Groups at referral. EAO responded in writing to Cowichan Tribes on March 8, 2016, and finalized the Section 11 Order on March 7, 2016. |
| February 24, 2016 | Letter | Cowichan Nation Alliance comments on the draft AIR related to employment estimates, economic benefits, VC selection, traditional knowledge, cumulative effects, air and water quality, underwater noise, fish and fish habitat, and existing marine use. Responses were provided by the Proponent to all Working Group member comments on the draft AIR. |
| March 8, 2016 | Letter | EAO notified Cowichan Tribes of the final Section 11 Order and provided a response to comments from Cowichan Tribes on the draft Section 11 Order. |
| March 10, 2016 | Working Group meeting | Cowichan Tribes attended. |
| March 23, 2016 | Letter | Cowichan Nation Alliance provided round 2 comments on draft AIR. EAO responded to Cowichan Nation Alliance via letter on April 29, 2016. |
| March 29, 2016 | Letter | Responded to EAO's January 6, 2016 transmittal letters outlining EAO's initial strength of claim assessment for Cowichan groups and disagreeing with EAO's conclusions. EAO followed up with Cowichan Nation Alliance members at March 30/16 meeting, and responded via letter on April 25, 2016. |
| March 30, 2016 | Meeting | Meeting with Cowichan Nation Alliance members (except Stz'uminus First Nation) and the Proponent. Provided overview of what was covered at the March 10, 2016, Working Group meeting in Vancouver, reviewed the revised draft AIR and discussed EAO's strength of claim assessment. Cowichan Nation Alliance expressed interest and concern in economic benefits, including through procurement, for its members, and its views that economic impact on Aboriginal Groups should be a VC. |

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| April 25, 2016 | Letter | Responded to March 29, 2016 letter to Cowichan Tribes regarding EAO's initial strength of claim assessments. |
| April 29, 2016 | Letter | EAO responded to Cowichan Nation Alliance comments on the 2nd version of the draft AIR. Provided response to Cowichan Nation Alliance on: future planned use of lands and resources for Cowichan Nation Alliance members, cumulative effects assessment and Part C of the draft AIR. |
| May 11, 2016 | Letter | Cowichan Nation Alliance provided further details to accompany Cowichan Nation Alliance's second round of draft AIR comments, specifically, on future planned uses in the vicinity of the Project. |
| May 27, 2016 | Letter | Cowichan Nation Alliance Responded to EAO's letter of April 25, 2016, including the Fraser River Head Lease report that was provided at that time. Expressed concern about: the consultation process including that the BC report was not provided earlier to Cowichan Nation Alliance; EAO's initial strength of claim assessment, including EAO's interpretation of the Kennedy and Brealey reports); Cowichan Nation Alliance's views of its strong Aboriginal title claim; use of the term "Cowichan"; presence of other Aboriginal Groups in the vicinity of the Project footprint at 1846; Coast Salish land use patterns; Cowichan intention and capacity to control the land; impacts to Aboriginal title including adverse effects to Cowichan people's ability to manage and make decisions over land use, economic development aspirations for the land; a request for deep consultation and accommodation and concern about draft Part C of the Application. |
| June 15, 2016 | Email | Cowichan Tribes submitted comments during Application Screening. |
| July 6, 2016 | Email | Follow-up email sent by EAO regarding (extended) Application screening. EAO provided opportunity to submit comments on a revised version of Part C. |
| July 22, 2016 | Letter | EAO responded to Cowichan Nation Alliance's July 29, 2016 letter to the Proponent. Provided response to their comments on the revised Application, including noise thresholds at regional parks, regarding the cultural heritage management plan, air quality, and inclusion of discussion around Tl'uqtinus. |
| August 22, 2016 | Letter | EAO Responded to Cowichan Nation Alliance letter to EAO of May 27, 2016, regarding Crown consultation and EAO's initial strength of claim assessment, confirming that EAO retains its views from its initial strength of claim assessment of Aboriginal title. |
| September 6, 2016 | Letter | Penelakut Tribe submitted comments on the Application on behalf of Cowichan Nation Alliance (round 1). |
| September 7, 2016 | Letter | Cowichan Tribes submitted comments on the Application on behalf of Cowichan Nation Alliance (round 1). |
| September 19, 2016 | Working Group Site Tour | Cowichan Nation Alliance unable to attend. |
| September 20-21, 2016 | Working Group meeting | Cowichan Tribes (day 1) and Halalt First Nation (day 2) attended on behalf of Cowichan Nation Alliance by webinar; however, Cowichan Tribes communicated after the meeting that they had been unable to hear the audio |

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| | | well enough to participate in the meeting. |
| September 26, 2016 | Meeting | EAO meeting with Cowichan Nation Alliance post-Working Group meeting of Sept 20/21 and Cowichan Nation Alliance comments on the Application, particularly on air quality, noise, health, and fish and fish habitat. |
| September 30, 2016 | Email (attachment) | EAO invited Cowichan Tribes to comment on early draft section of Part C. |
| October 19, 2016 | Email (attachment) | Cowichan Tribes submitted comments on the Application on behalf of Cowichan Nation Alliance (round 2). |
| October 20, 2016 | Email (attachment) | Cowichan Tribes provided EAO with comments on early draft section of Part C. |
| October 21, 2016 | Email (attachment) | Penelakut Tribe submitted comments on the Application on behalf of Cowichan Nation Alliance (round 2). |
| November 22, 2016 | Email (attachment) | EAO invitation to Cowichan Tribes to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Cowichan Tribes to comment on EAO's draft Part C. |
| December 2, 2016 | Email (attachment) | Cowichan Tribes provided comments on EAO's draft referral package on behalf of Cowichan Nation Alliance. |
| December 13, 2016 | Email (attachment) | Cowichan Tribes provided comments on EAO's draft Part C on its own behalf as well as on behalf of Cowichan Nation Alliance. |
| January 5, 2017 | Email (attachment) | EAO response to Cowichan Tribes (Cowichan Nation Alliance members) response regarding EAO's draft referral package and Part C. |
| January 13, 2017 | Email (attachment) | Cowichan Tribes provided its separate submission to the Ministers to EAO on behalf of Cowichan Nation Alliance. |

### 14.1.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Cowichan Tribes during the EA:

*Methodology, Process and Consultation*

- Concern regarding the EA process and associated timelines throughout the process, noting early in the process its expectation that reasonable efforts would be made to accommodate Vancouver Island Aboriginal Groups on Schedule B's participation in Working Group events (EAO sought to address this issue by having webinar/teleconference options for all Working Group meetings, giving as much notice as possible regarding upcoming Working Group meetings, and offering to meet after or before every Working Group meeting with Cowichan

Tribes/Cowichan Nation Alliance on Vancouver Island, with or without the Proponent);

- Concern with timelines during the initial 30-day Working Group review of the Application (screening), to which EAO explained there would be additional opportunity for Working Group members to provide comment on the Application;
- Disagreed with the limitation of 5 pages on Aboriginal Groups' separate submission to Ministers regarding their views on the conclusion of the Assessment Report;
- Concern expressed regarding the lack of resources and funding for Aboriginal communities;
- Concern about the adequacy of the methodology to address social and cultural effects on Cowichan Tribes;
- Raised the issue that ethnographical content in reports did not accurately represent Cowichan Tribes' historical presence within the Project area;
- Noted that identification of requirements including international agreements or other agreements should be included in the Crown's constitutional obligations to Aboriginal Groups; and
- Expressed disagreement with EAO's methodology for consideration of cumulative effects on Aboriginal rights, including measurement against a pre-industrial baseline and an absence of a comprehensive study on cumulative effects on the Fraser River.

*Cultural and Social Impacts*

- Concern regarding contaminants and the sustainability of vital habitats that are necessary to support their members;
- Concern that Proponent used TransLink Regional Transit Model which assumes future transit infrastructure will be built;
- Concern about Aboriginal participation and Project-related opportunities, including: community preparedness; and cultural recognition and naming;
- Noted concerns regarding social effects of the Project on Cowichan Tribes' ability to transfer knowledge, language loss, dependency and social interaction, and ability to participate in socio-cultural practices; and
- Concern regarding the potential increase in traffic, in particular the roads around Tl'uqtinus lands, and consequent increase in associated noise and vibration due

to the increased capacity of the new bridge, as well as the choice of building materials in relation to noise and vibration.

*Health and Human Safety*

- Concern that Aboriginal health was not considered separately in a disaggregated manner in the Human Health section and that current conditions along the foreshore and in the Fraser River have not been properly considered;
- View that transit modelling assumptions are not conservative enough, with potential implications for human health effects related to air quality, including the assumption that vehicle emissions will be less in 2031 due to new technologies;
- Concerns about low frequency noise during construction and operation, noting its association with adverse effects to both human health and disturbance to wildlife and that it was a gap in the Application that low frequency noise was not assessed;
- Seasonal difference in noise effects would be required to better understand effects to traditional use; and
- Outstanding concerns about noise levels at Deas Island Regional Park.

### 14.1.5 Potential Impacts of the Project to Cowichan Tribes' Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Cowichan Tribe's Aboriginal Interests. These potential impacts are characterized by considering how the Project could affect several factors important to Cowichan Tribe's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this report;

- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Cowichan Tribes for the preparation and submission of Traditional Use, Traditional Knowledge or other studies. Cowichan Tribes worked with other Cowichan Nation Alliance members and submitted three TUSs.[23]

EAO considered all information available, including from public sources as well as relevant technical issues raised by Cowichan Tribes, in the following assessments of the potential impacts on the Project on Cowichan Tribes' Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Cowichan Tribes from available sources is described below.

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

Cowichan Tribes historically harvested the following species on the South Arm of the Fraser River: sockeye and pink salmon, sturgeon, shellfish, ducks/shorebirds and marine mammals. Dried clams were also traded. Areas within the wider Fraser River estuary were utilized by Hul'qumi'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.

Cowichan Tribes identified several concerns related to potential Project effects to fish and other marine resources including:

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[23] *Cowichan Nation Traditional, Current, and Planned Future Use of the George Massey Tunnel Replacement Bridge Project Area,* prepared by Candace Charlie for Cowichan Tribes, on behalf of the Cowichan Nation Alliance (August 9, 2015); *George Massey Tunnel Replacement Project: Cowichan Occupation and Use of the Project Lands*, prepared by Dorothy Kennedy for David Robbins of Woodward and Co., Counsel for the Cowichan Tribes, on behalf of the Cowichan Tribes (August 25, 2015); and *Historical Geography of Cowichan Land Use and Occupancy Lower Fraser River: Map Series and Report*, prepared for Woodward and Company and the Cowichan Tribes by Kenneth G. Brealey (May 31, 2010).

- Effects to fish and fish habitat, including species of cultural and economic importance such as eulachon, sturgeon and salmon (in particular, sockeye), from pile driving, blasting, and underwater noise generated by Tunnel decommissioning and construction activities, in the South Arm of the Fraser River as well as Deas and Green Sloughs;
- Least risk timing windows do not take into account critical timing for spawning salmon, trout and char migrating upstream through the Project footprint, including: pink, chum, Coho, Chinook, and sockeye salmon, coastal cutthroat and steelhead trout, Dolly Varden and bull trout;
- Operational effects of vibration from the bridge during operation, and road and bridge runoff, including from maintenance activities, on fish and fish habitat;
- Potential changes to the Fraser River South Arm and Deas Slough after removal of the Tunnel due to increased hard shoreline/riprap around Bridge supports which may adversely affect eulachon spawning;
- Concern regarding cumulative environmental effects on the Fraser River estuary, and that tunnel decommissioning could result in dredging and the potential for increased vessel traffic and larger vessels on the Fraser River.
- Baseline conditions for fish and fish habitat as they relate to Aboriginal Interests were not considered from a pre-contact perspective;
- Concerns related to river hydraulics, including: change in flow rates after Tunnel removal; whether extreme weather events had been adequately considered in the river hydraulics model;
- With regards to sediment and water quality, concerns included potential effects of run-off and drainage; the need for improved ditches to allow for less filtering of deleterious materials; use and disposal of dredged and other material in the river as well as general concerns related to dredging of the Fraser River;
- View that habitat offsetting plans should be discussed or finalized at the EA stage; and
- Contaminated sites were identified by Cowichan Nation Alliance as a concern, as were risk of potential accidents and malfunctions, including spills of hydrocarbons from refueling or leaks in construction equipment or vessels, including human waste, as well as spills from accidents during construction and operations.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Cowichan Tribes' concerns about potential effects to eulachon from the Project, eulachon were one of five sub-component species assessed. EAO considered that fish species of conservation concern including eulachon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity will not be adversely affected. Furthermore, EAO notes that the bridge supports would not be located in-stream during operations.

In regards to Cowichan Tribes' concerns about river hydraulics, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO discusses its assessment of potential effects of the Project on river hydraulics and river morphology in the lower Fraser River in section 4.2, and is of the view that residual effects to hydrology would not be significant. EAO has also proposed a condition requiring development of a river bed and hydrology management plan in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel"[24]. Any such future plans would be subject to review under the VFPA's Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the

[24] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

Cowichan Nation Alliance has previously reported that now filled-in sloughs and streams in or near Highway 99 once supported Coho and eulachon, which they traditionally harvested. Cowichan Nation Alliance reports that Tl'uqtinus was used year-round for harvesting purposes, although the information reviewed by EAO suggests use of the Fraser River may have been largely on a seasonal basis.

Members of the Cowichan Nation Alliance have been attempting to restore former fisheries within the Fraser River through DFO. Access to sockeye for members 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 Aboriginal Groups in 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 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 is in ongoing, active litigation over its asserted fishing rights on the South Arm of the Fraser River.

Cowichan Tribes identified several concerns with potential Project impacts relating to specific locations and access to fishing and marine harvesting activities including:

- Size of the RAA being too limited to account for potential adverse effects to migrating fish;
- Access to the Fraser River and the potential to displace or interfere with Aboriginal fishing; and

- Cowichan Tribes' use and navigation of the areas surrounding the Project, potentially effecting future ability to fish and to harvest, including in-water and upland of the South Arm of the Fraser River.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. Although there is potential for construction activities to impact future fishing activities at the claimed *Tl'uqtinus* Lands in the case that they overlapped temporally with construction, EAO understands that while Cowichan Tribes is interested in expanding their future fishing activities in the vicinity of the Project, current fishing activities are intermittent. EAO anticipates that any potential disruption to access to fishing areas for Aboriginal Groups would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure.

EAO also considered sections 5.2 (land use and visual quality, particularly sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural,

spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (sensory disturbance, including visual quality and noise), human health (atmospheric noise), and as discussed in section 13.1 of this Report, the Project is expected to result in Minor impacts to Cowichan Tribes' asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Cowichan Nation Alliance has previously reported that Highway 99 was built on what was once a prime harvesting location for deer, ducks, and geese, among other species. Along the Fraser River and Canoe Passas well as elsewhere in the asserted traditional territory brant goose, canvasback duck, common merganser, and mallard have been specifically identified as harvested species by Cowichan Tribes, and that this harvesting would have taken place in the fall. Canada goose, northern shoveler, and green-winged teal would have been available year-round. The south shore of Lulu Island, along the South Arm of the Fraser River, has been reported as a prime spot for trapping beaver, mink, and muskrat; bear, grouse, elk, squirrel, and porcupine were also hunted by the Cowichan people on the South Arm. Cowichan Tribes may also have hunted for mountain goat in the mountains of the lower Fraser River.

Cowichan Nation Alliance has also stated that its members revere bald eagles, which were not hunted. Elders of the Cowichan Nation Alliance members have indicated that eagle numbers in the Richmond area have been dwindling each year. Breeding habitat along the Highway 99 corridor on Lulu Island has been previously noted as a concern.

Cowichan Tribes identified concerns and comments related to potential effects to wildlife and wildlife habitat including:

- Effects on wildlife from degradation of air quality associated with the Project, particularly during construction;
- Vibration, light and noise effects were raised as having potential adverse effects on wildlife; and
- The bridge structure's effects on species such as waterfowl and migratory birds.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report. EAO has proposed conditions that require wildlife and wildlife habitat management plans for construction and operation as well as a marine mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed a condition requiring a drainage and stormwater management plan to be developed in consultation with Aboriginal Groups as well as a noise management plan. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

Cowichan Tribes identified concerns and issues related to specific locations and access to hunt and trap including:

- Their ability to harvest in the Project area; and
- Cowichan Tribes' use and navigation of the areas surrounding the Project, potentially affecting future ability to harvest, including in-water and upland of the South Arm of the Fraser River.

EAO understands that while Cowichan Tribes is interested in expanding their hunting and trapping activities within the vicinity of the Project, hunting and trapping are not currently taking place in the Project area by Cowichan Tribes.

Disruption of access to hunting and trapping areas could occur during construction, where construction may overlap temporally with future potential hunting and trapping activities. EAO anticipates that potential disruptions to access to future hunting and trapping areas would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

While EAO notes that sites of importance for Cowichan Tribes (including the Highway 99 corridor, along the Fraser River, and south shore of Lulu Island) overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application, EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Cowichan Tribes' asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal groups in the area.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations could affect quality of experience for Cowichan Tribes'

future potential hunting and trapping activities, although EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and that it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, particularly sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, land use and land use and visual quality (sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Cowichan Tribes' asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

Cowichan Nation Alliance report plants that were traditionally gathered include wild rose, rose hips, crabapples, elderberries, horsetail, Labrador tea, Indian hemp, trembling aspen, mock orange, Oregon grape, maple leaves, cranberries, blueberries, blackberries, wapato, bulrushes/reeds (stth'equn), as well as seaweed. Available information indicates that berries were traditionally harvested from bogs in the vicinity of the historic Tl'uqtinus site and fire was used to maintain open areas for the berry bushes from encroachment from pine trees.

Tree species available in the vicinity of the Fraser River and traditionally used by the Cowichan Tribes for manufacturing include crabapple, willow, alder, cottonwood, cedar, spruce, aspen, yew, hemlock, and vine maple.

Cowichan Tribes identified the following concerns and comments related to potential effects to traditional plants:

- Culturally important vegetative species should have been considered as VCs including species collected for: food, fibres in textiles and nets, building attributes, and construction of baskets, needles, and harpoons (e.g. mock orange, Oregon grape, crabapple, Labrador tea);

- Adverse effects on vegetation, including listed species-at-risk vegetation, including from new shading due to the Bridge, contaminated water run-off, contaminated debris from infrastructure, accidents and vehicles, garbage from increased traffic, air quality, and dust/smothering of vegetation;
- Potential effects to SARA-listed native streambank lupine from the Project and effects to at-risk plant species;
- Adverse effects on wetlands and watercourses due to stormwater and road runoff, as well as from vibrodensification impact; and
- Invasive plant species and proposed plans to manage their presence during construction and a request for culturally significant plants to be used in revegetation plans.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails would be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

Cowichan Nation Alliance report that in the marshy areas south of Canoe Passage near Brunswick Point – in the area of Xwulit’sum, or place for cutting (cattails) – as well as in the area of Tl’uqtinus and across the Fraser River on Tilbury Island, several varieties of

cattails and rushes (stth'equn) were once harvested, although these locations do not fall within the Project footprint. Berries and other plants were reportedly gathered and cultivated by the ancestors of the Cowichan Nation Alliance members at Tl'uqtinus, and were harvested from other locations in the Project area.

Available information indicates that berries were traditionally harvested from bogs in the vicinity of Tilbury Island and fire was used to maintain open areas for the berry bushes from encroachment from pine trees.

Cowichan Nation Alliance has indicated that they wish to see existing bogs on Lulu Island near the Highway 99 corridor – specifically, one near Williams Road and another near the Richmond Nature Park – protected to support future use of traditional resources, like berries and other bog ecosystem flora. At the Tl'uqtinus Lands, which is currently surrounded by blueberry farms, Cowichan Nation Alliance has raised the potential for former berry grounds to be re-established. EAO understands these areas to be outside of the Project corridor.
Cowichan Tribes identified the following concerns and comments with potential Project impacts relating to specific locations and access to gathering activities:

- Cowichan Tribes' ability to harvest in the Project area; and
- Cowichan Tribes' use and navigation of the areas surrounding the Project, potentially effecting future ability to harvest, including in-water and upland of the South Arm of the Fraser River.

EAO understands that Cowichan Tribes is interested in expanding their gathering activities in the vicinity of the Project; however, EAO understands that current gathering activities are not taking place. Cowichan Tribes has communicated to EAO that this cannot be said definitively, as Cowichan Nation Alliance was not provided with funding to consult with its entire membership and as a result cannot say for certain whether members are still harvesting in the area.

There is potential for construction activities to impact future potential access or gathering activities where construction may overlap temporally with future gathering activities. There is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO has also proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered that Tilbury Island and Hwlhits'um (Canoe Pass), sites of importance for Cowichan Tribes' traditional gathering, are outside both the LAA and RAA for vegetation.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at gathering areas could affect quality of experience for Cowichan Tribes' future anticipated activities. It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, particularly sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (sensory disturbance, including visual quality and noise), land use, and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Cowichan Tribes' asserted Aboriginal rights to gather.

<u>Impacts on Other Traditional and Cultural Interests</u>

Locations along the South Arm of the Fraser River of importance to the Cowichan Nation Alliance members in the vicinity of the Project include, but are not limited to, the Tl'uqtinus Lands, spanning the north shore from approximately opposite Tilbury Island downstream towards Deas Island, and Hwlhits'um or Xwulit'sum, on Canoe Pass. Both of these areas are considered by Cowichan Nation Alliance members as ancestral village and resource sites. Cowichan Tribes has specifically noted the importance of archaeological site DgRs-17, which EAO understands is associated with the Tl'uqtinus site.

Cowichan Tribes identified concerns and comments including:

- Potential impacts to Cowichan Tribes asserted title, rights and culture;

- Increase in noise levels and lack of related mitigation measures on Deas Island, as Cowichan Tribes and other Cowichan Nation Alliance members intention to use Deas Island Regional Park for cultural knowledge transmission in the future;
- Protection of archaeological and heritage resources, including intangible heritage sites and specific concern for any effects on the Tl'uqtinus site and potential archaeological values at interchanges from construction; and
- Cowichan Tribes expressed interest in participating in archaeological fieldwork and review of archaeological draft reports through the EA and consultation in any potential archaeological and heritage resource monitoring plan.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, particularly sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

In regards to concerns about increased noise levels on Deas Island, EAO understands that should Cowichan Nation Alliance re-establish residential and/or commercial use at their village site and use of Deas Island Regional Park for gathering and knowledge transmission purposes in the future, the Proponent will engage in focused discussions in relation to potential noise effects from the Project on Deas Island. EAO has proposed a condition requiring a noise management plan be development, which would include monitoring and adaptive management measures to ensure that noise effects are not greater than predicted in the Application.

There is not anticipated to be an overlap between Cowichan Tribes' archaeological and cultural heritage interests and the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

There is potential for changes to quality of experience at important locations for Cowichan Tribes, including Tl'uqtinus and Hwlhits'um (Canoe Pass), ancestral village sites, to occur, in particular in relation to changes in atmospheric noise during construction and operations, although EAO does not anticipate atmospheric noise to travel to the village sites, and visual conditions during operation. These effects are not fully mitigable or reversible. While effects on human health related to air quality and atmospheric noise are understood to have been a concern particularly at Cowichan Tribes' village site at Tl'uqtinus as it is hoped to be resettled at some point in the near

future, EAO notes it has proposed a condition requiring development of a noise management plan to address Project-related noise during construction and operations, which would include a noise monitoring and follow-up program and a communication program to inform communities potentially affected by Project-related noise.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at Tl'uqtinus, although less likely at Hwlhits'um.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Cowichan Tribes, such as spiritual or storied sites, or named places, potentially affected by the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (sensory disturbance, including visual quality and noise), human health (atmospheric noise and air quality), and land use, and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible–to-Minor impacts to Cowichan Tribes' other traditional and cultural interests.

Impacts on Asserted Aboriginal Title

Cowichan Nation Alliance has asserted Aboriginal title to not only the Tl'uqtinus Lands, but to the Project footprint including between the Highway 17A and Steveston interchanges. Cowichan Nation Alliance has expressed its view that their asserted

Aboriginal title includes the right to manage the land, determine the uses to which it can be put, and obtain any economic benefits from it. Cowichan Nation Alliance has advised that it is also working to re-establish culturally integral practices (e.g., harvesting fish, waterfowl, and plants) on the South Arm and at the mouth of the Fraser River, including at and about Tl'uqtinus, as well as a site on Tl'uqtinus for residential and/or commercial purposes. Cowichan Tribes indicated that future developments should include potential Cowichan Tribes Aboriginal title and rights resulting from established rights or a declaration of Aboriginal title.

Cowichan Tribes identified concerns and comments, including:

- Potential impacts to Cowichan Tribes asserted Aboriginal title, rights and culture;
- Effects on ability to enjoy and use title lands, including future use, from increased noise and light disturbance, obstruction of sunlight, and air pollution;
- Project footprint could impact Cowichan Tribes' ability to obtain lease income for benefit of future generations on their asserted Aboriginal title lands;
- Aboriginal participation and Project-related opportunities, including employment, training and contracting, economic development opportunities, and revenue sharing (from tolling);
- Potential air quality effects from the Project on the Tl'uqtinus site and Proponent's lack of modelling for construction-related emissions;
- Concern about air quality effects up river from the highway corridor near the Fraser River on Lulu Island, in the vicinity of the Tl'uqtinus site, including:
    - How the height of the bridge was considered in the air quality modelling; and
    - Request the LAA be extended 3  km downwind of the bridge;
- Re-establishment of a site on Tl'uqtinus site for residential and/or commercial purposes, and surplus land, including land recovery at Green Slough; and
- Effect of the Project on Cowichan Tribes' Aboriginal title, including the right to decide how the land will be used, occupy and possess the land including future use and future ability to control and benefit from the land; the economic benefits flowing from the land, and to pro-actively use and manage the land.

In regards to concerns about potential air quality effects in the vicinity of the Tl'uqtinus site, EAO requested the Proponent provide an estimate of predicted construction-related emissions for the Project.[25] EAO has also proposed a condition requiring the development of a CEMP that would include measures to mitigate and manage air quality during construction. Regarding concerns about the height of the bridge in air quality modelling, the Proponent provided an analysis which considered traffic emissions from an elevated bridge will disperse over a larger area, resulting in ambient concentrations that are lower in comparison to a source that is closer to the ground. The Proponent concluded there would be no exceedances of ambient air quality objectives at the Tl'uqtinus site.

EAO has considered how the Project may impact each of the following three components of Cowichan Tribes' Aboriginal title claims overlapping the Project area: use and occupation, decision-making, and economic benefits.

In regards to potential effects to Cowichan Tribes' use and occupation of the area, EAO considered that the majority of construction works would be confined to relatively small areas during the construction, be temporary in nature, and for the road improvements would be within a pre-existing corridor. The nature of the new bridge would result in permanent changes to the landscape which could impact the practice/expression of Aboriginal Interests in the vicinity of the Project. Impacts related to visual quality are not mitigable, although again they will be limited in geographic extent. The analysis of potential residual effects on VCs relevant to other related Aboriginal Interests are low to moderate magnitude, and are not expected to be significant.

Regarding the decision-making component of Aboriginal title, EAO has actively consulted Cowichan Tribes in an attempt to better identify, understand, and resolve concerns relating to Aboriginal title. EAO considered that the Proponent has provided and would continue to provide capacity funding to support meaningful participation in future consultation activities with the Proponent and in the regulatory process.

EAO notes that Cowichan Tribes and Cowichan Nation Alliance have shared their view that the Project will prolong and exacerbate existing barriers to benefitting economically from the Project area. EAO considered that the Proponent is actively engaged with Aboriginal groups to ensure that local Aboriginal communities benefit directly from the Project, including opportunities related to employment, training and contracting. The Proponent would also encourage and support the use of Aboriginal and local

[25] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=55

businesses by encouraging suppliers and subcontractors to adopt local procurement. EAO's proposed Aboriginal engagement report condition would also require the Proponent to include description of actions taken or planned to provide training, construction monitoring, employment, business, and contracting opportunities to Aboriginal Groups.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to social, economic, environment, heritage, and health VCs, and as discussed in section 13.5 of this Report, the Project is expected to result in Minor impacts to Cowichan Tribes' asserted Aboriginal title.

## 14.2 Halalt First Nation

### 14.2.1 Context

Halalt First Nation is a Central Coast Salish group, is a "band" under the *Indian Act,* and is a member of the Cowichan Nation Alliance and the Hul'qumi'num Treaty Group. Halalt First Nation has engaged directly with the Proponent and EAO on this Project and also collectively as a member of the Cowichan Nation Alliance.

Halalt First Nation's main community is located in Chemainus on southeast Vancouver Island. Of 212 registered members, 84 live on reserve, in addition to 64 non-registered members. Halalt First Nation members historically spoke the Hul'qumi'num (pronounced "Hul-ka-MEE-num") language.

The asserted traditional territory of the Halalt First Nation generally includes parts of South-eastern Vancouver Island, the southern Gulf Islands, a portion of the Lower Mainland, and the waters of the Salish Sea to the Sunshine Coast, including the lower portion of Howe Sound, Haro Strait, the Strait of Juan de Fuca and the South Arm of the Fraser River up to Yale.

Halalt First Nation, as a member of the Hul'qumi'num Treaty Group, assert a territory of core Aboriginal title lands and a broader traditional fishing territory, as described in its Statement of Intent to the BC Treaty Commission. Of particular relevance to this Project, is the assertion of Aboriginal rights and title described as including "the south arm of the Fraser River, including Canoe Pass, up to and including Douglas Island, with lands on the north shore of the south arm up to Sapperton Channel (New Westminster),

the islands in the south arm of the Fraser River and the south bank of the Fraser River along Canoe Pass up to Deas Island"[26]. Cowichan Nation Alliance clarified to EAO during the EA that it this assertion of Aboriginal title includes the Project footprint, including the Steveston and Highway 17A interchanges.

Halalt First Nation asserts that they, along with other Island Halkomelem speaking groups, traditionally utilized the lands and waters on both sides of the Strait of Georgia. Locations of importance to Halalt First Nation, along with the other Cowichan Nation Alliance members, along the South Arm of the Fraser River in the vicinity of the Project, include but are not limited to Tl'uqtinus, spanning the north shore from approximately Tilbury Island and downstream towards opposite Deas Island, and Hwlhits'um or Xwulit'sum, on Canoe Pass. Both of these areas are considered by Cowichan Nation Alliance member, including Halalt First Nation, as ancestral village and resource sites. Cowichan Nation Alliance is working to re-establish a permanent land base at Tl'uqtinus for residential and/or commercial purposes.

### 14.2.2 Preliminary Strength of Claim Assessment

The entirety of the Project corridor is within the asserted traditional territory of Halalt First Nation.

In the ethnographic and historic sources, members of the Hul'qumi'num Treaty Group were often all referred to as "Cowichan". Occasionally "Cowichan" was also used to refer to a broader group that included all of the Central Coast Salish or Halkomelem speaking people. This lack of clarity in the information means it is sometimes difficult to attribute historical references of "Cowichan" use to individual Aboriginal groups or collectives of particular Aboriginal groups.

However, where historical information indicates the presence and use of the Project area by Cowichan people in a manner that makes it unclear which Aboriginal group was being described, EAO has not used this information to undermine the exclusivity component of Aboriginal title for the Halalt First Nation's preliminary strength of claim assessment or other members of the Hul'qumi'num Treaty Group.

The information reviewed indicates that Halalt First Nation traditionally occupied multiple village sites on Vancouver Island in and around Cowichan Bay and along the Chemainus and Cowichan Rivers as well as the Gulf and Shoal Islands.

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[26] Hul'qumi'num Treaty Group Statement of Intent. BC Treaty Commission website. http://bctreaty.net/soi/soihulquminum.php (accessed August 26, 2016).

It is understood that Cowichan people have historically been residents of Vancouver Island and other Gulf Islands, and travelled annually to the South Arm of the Fraser River to fish for salmon, sturgeon, and other species, including prior to and around the time of contact below and upstream of the Project. Based on current case law and a review of the currently available information and descendancy from the historic Cowichan people, EAO's preliminary assessment is that Halalt First Nation has a **strong *prima facie* claim of Aboriginal rights** to fish, gather and hunt in the areas in proximity to the Project area, including the South Arm of the Fraser River.

In November 2014, Cowichan Tribes, Stz'uminus, Penelakut and Halalt First Nations filed an *Amended Notice of Civil Claim* seeking a declaration of Aboriginal title to an area described as the Tl'uqtinus Lands and fishing rights to the South Arm of the Fraser River. It is noted that the claimed Tl'uqtinus lands on Lulu Island on the South Arm of the Fraser River are 2 - 3 km upstream from the Project and do not overlap the Project footprint. The assessment of the strength of claimed Aboriginal title to the Project area was conducted to inform the scope of consultation regarding this Project. It is a preliminary assessment only, considering only information reasonably available at the time of consultation and is not based on an exhaustive review of all information and legal issues related to this potential claim, and does not reflect the Crown's opinion of whether the court will ultimately decide in favour of the First Nation in any litigation.

EAO is of the view that the available information suggests Cowichan people did not traditionally occupy the Project footprint with the intention of controlling this land, although given the relative proximity of the Project to the claimed village sites, an inference can be made that Cowichan people may have utilized this area for resource harvesting activities. Halalt has shared with EAO their view that it is irrefutable that Cowichan Nation Alliance utilized the area in question for resource harvesting activities.

The Project footprint appears to be at the western edge of an area identified by ethno-historians as a boundary between the traditional territories of several different Aboriginal Groups: Musqueam Indian Band to the west and north, Tsawwassen First Nation to the southwest, and Kwantlen First Nation to the south and east. Some early ethnographers identified an area of land at the intersection of these traditional territories as not attributed to any Aboriginal Group. The information also indicates that the Fraser River and surrounding area was a particularly rich resource area and the sheer abundance of resources may have reduced the need or practicality of defending use by others. In fact, information indicates that multiple Aboriginal groups may have fished, hunted and gathered within the vicinity of the Project footprint, which raises questions regarding whether exclusivity of use of the Project area can be established by the Cowichan

people. EAO notes that Cowichan Nation Alliance has communicated to EAO that it does not agree with these conclusions.

Based on the above, and on descendancy from the historic Cowichan people, EAO's preliminary assessment is that Halalt First Nation has a **moderate *prima facie* claim of Aboriginal title** to the Project footprint inclusive of the Highway 17A and Steveston Highway interchanges at the Project footprint. EAO acknowledges that Cowichan Nation Alliance disagrees with this conclusion and is of the view that it has a strong *prima facie* claim of Aboriginal title to the Project area.

14.2.3 Involvement of the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Halalt First Nation's Aboriginal Interests, EAO is of the view that the duty to consult Halalt First Nation lies at the mid-to-high end of the *Haida* consultation spectrum. Halalt First Nation is listed in Schedule B of the Section 11 Order.

Cowichan Nation Alliance has raised concerns regarding the Crown's initial assessment of the strength of its asserted Aboriginal title claims, communicating its view that both the sufficiency and exclusivity requirements are clearly met to support a strong prima facie claim in the vicinity of the Project area. After corresponding with Cowichan Nation Alliance about this difference in views, EAO determined that while it did not agree that the strength of claim assessment should be changed, it would be appropriate to consult with Halalt First Nation and the other Cowichan Nation Alliance members at the deep end of the Haida spectrum in an effort to address Cowichan Nation Alliance's concerns. Halalt First Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Halalt First Nation was also invited to attend Working Group meetings, site visits, and to meet with EAO staff directly.

The Proponent began consulting with Halalt First Nation in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events has included 14 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Halalt First Nation with two rounds of funding, one in Pre-Application phase and the other in Application Review Phase, to support their involvement.

A summary of the Proponent's engagement activities with Halalt First Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| January 21, 2016 | Working Group meeting | Halalt First Nation attended via teleconference (representing Cowichan Nation Alliance). |
| February 5, 2016 | Meeting | Meeting between Cowichan Nation Alliance, Proponent and EAO to discuss Project concept, presentation of the draft AIR, Cowichan presentation of their asserted Aboriginal Interests, and EAO presentation of the EA process. |
| February 19, 2016 | Letter | Halalt First Nation provided comments on EAO's draft Section 11 Order. Concerns included: information sharing; inclusion in sub-committee discussions; cumulative effects; and length of separate submissions from Aboriginal Groups. EAO responded in writing to Halalt on March 8, 2016 and finalized the Section 11 Order on March 7, 2016. |
| February 24, 2016 | Letter | Cowichan Nation Alliance comments on the draft AIR related to employment estimates, economic benefits, VC selection, traditional knowledge, cumulative effects, air and water quality, underwater noise, fish and fish habitat, and existing marine use. Responses were provided by the Proponent to all Working Group member comments on the draft AIR. |
| March 8, 2016 | Letter | EAO notified Halalt First Nation of the final Section 11 Order and provided a response to comments from Halalt First Nation on the draft Section 11 Order. |
| March 10, 2016 | Working Group meeting | Halalt First Nation attended (represented Cowichan Nation Alliance alongside Cowichan Tribes). |
| March 23, 2016 | Letter | Cowichan Nation Alliance provided round 2 comments on draft AIR. EAO responded to Cowichan Nation Alliance via letter on April 29, 2016. |
| March 29, 2016 | Letter | Responded to EAO's January 6, 2016 transmittal letters outlining EAO's initial strength of claim assessment for Cowichan groups and disagreeing with EAO's conclusions. EAO followed up with Cowichan Nation Alliance members at March 30/16 meeting, and responded via letter on April 25, 2016. |
| March 30, 2016 | Meeting | Meeting with Cowichan Nation Alliance members (except Stz'uminus First Nation) and the Proponent Provided overview of what was covered at the March 10, 2016, Working Group meeting, reviewed the revised draft AIR and discussed EAO's strength of claim assessment. Cowichan Nation Alliance expressed interest and concern in economic benefits, including through procurement, for its members, and its views that economic impact on Aboriginal Groups should be a VC. |
| April 29, 2016 | Letter | EAO responded to Cowichan Nation Alliance comments on the 2nd version of the draft AIR. Provided response to Cowichan Nation Alliance on: future planned use of lands and resources for Cowichan Nation Alliance members, cumulative effects assessment and Part C of the draft AIR. |
| May 11, | Letter | Cowichan Nation Alliance provided further details to accompany Cowichan |

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| 2016 | | Nation Alliance's second round of draft AIR comments, specifically, on future planned uses in the vicinity of the Project. Comments were shared with the Proponent to incorporate into the Working Group tracking table, and the AIR was finalized on May 24, 2016. |
| May 27, 2016 | Letter | Cowichan Nation Alliance Responded to EAO's letter of April 25, 2016. Expressed concern about: the consultation process including that the BC report was not provided earlier to Cowichan Nation Alliance; EAO's initial strength of claim assessment, including EAO's interpretation of the Kennedy and Brealey reports); Cowichan Nation Alliance's views of its strong Aboriginal title claim; use of the term "Cowichan"; presence of other Aboriginal Groups in the vicinity of the Project footprint at 1846; Coast Salish land use patterns; Cowichan Nation Alliance views on Cowichan intention and capacity to control the land; impacts to Cowichan Nation Alliance Aboriginal title including adverse effects to Cowichan people's ability to manage and make decisions over land use, economic development aspirations for the land; a request for deep consultation and accommodation and concern about draft Part C of the Application. |
| June 10, 2016 | Email | Halalt First Nation submitted comments during Application Screening. |
| July 16, 2016 | Email | EAO follow-up email regarding (extended) Application screening. Requested, if interested, to provide comments on a revised version of Part C (Halalt-specific section and general section) chapter. |
| July 22, 2016 | Letter | EAO responded to Cowichan Nation Alliance's letter to the Proponent. Provided response to their comments on the revised Application, including noise thresholds at regional parks, regarding the cultural heritage management plan, air quality, and inclusion of discussion around Tl'uqtinus. |
| August 22, 2016 | Letter | EAO Responded to Cowichan Nation Alliance letter to EAO of May 27, 2016, regarding Crown consultation and EAO's initial strength of claim assessment, confirming that EAO retains its views from its initial strength of claim assessment of Aboriginal title. |
| September 6, 2016 | Letter | Penelakut Tribe submitted comments on the Application on behalf of Cowichan Nation Alliance. |
| September 7, 2016 | Letter | Cowichan Tribes submitted comments on the Application on behalf of Cowichan Nation Alliance. |
| September 19, 2016 | Working Group Site Tour | Cowichan Nation Alliance unable to attend. |
| September 20-21, 2016 | Working Group meeting | Cowichan Tribes (day 1) and Halalt First Nation (day 2) attended on behalf of Cowichan Nation Alliance by webinar; however, Cowichan Tribes communicated after the meeting that they had been unable to hear the audio well enough to participate in the meeting. |
| September 26, 2016 | Meeting | EAO meeting with Cowichan Nation Alliance post-Working Group meeting of Sept 20/21 and Cowichan Nation Alliance comments on the Application, particularly on air quality, noise, health, and fish and fish habitat. |
| September | Email (attachment) | EAO invitation to Halalt First Nation to comment on early section of Part C. |

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|---|---|---|
| 30, 2016 | | |
| October 19, 2016 | Letter | Cowichan Tribes submitted comments on the Application (round 2) on behalf of Cowichan Nation Alliance. |
| October 21, 2016 | Letter | Penelakut Tribe submitted comments on the Application (round 2) on behalf of Cowichan Nation Alliance. |
| October 24, 2016 | Email (attachment) | Halalt First Nation submitted comments on early section of Part C. |
| November 22, 2016 | Email (attachment) | EAO invitation to Halalt First Nation to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Halalt First Nation to comment on EAO's draft Part C. |
| December 2, 2016 | Email (attachment) | Cowichan Tribes provided comments on EAO's draft referral package on behalf of Cowichan Nation Alliance. |
| December 13, 2016 | Email (attachment) | Cowichan Tribes provided comments on EAO's draft Part C on behalf of Cowichan Nation Alliance. |
| January 5, 2017 | Email (attachment) | EAO response to Halalt First Nation (Cowichan Nation Alliance) response regarding EAO's draft referral package and Part C. |
| January 11, 2017 | Email (attachment) | Halalt First Nation provided its separate submission to the Ministers for EAO |
| January 13, 2017 | Email (attachment) | Cowichan Nation Alliance provided its separate submission to the Ministers to EAO. |

### 14.2.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Halalt First Nation during the EA:

*Methodology, Process and Consultation*

- Concern regarding the EA process and associated timelines throughout the process (EAO sought to address this issue by having webinar/teleconference options for all Working Group meetings for this Vancouver based Project, giving as much notice as possible regarding upcoming Working Group meetings, and offering to meet after or before every Working Group meeting with Cowichan Nation Alliance on Vancouver Island, with or without the Proponent);
- Concern regarding the lack of resources and funding for Aboriginal communities;
- Concern about the adequacy of the methodology to address social and cultural effects on Halalt First Nation;
- Raised the issue that ethnographical content in reports did not accurately represent Halalt First Nation's historical presence within the Project area;

- Identification of requirements including international agreements or other agreements should be included in the Crown's constitutional obligations to Aboriginal Groups; and
- Disagreement with EAO's methodology for consideration of cumulative effects on Aboriginal rights, including measurement against a pre-industrial baseline, and concern with the absence of comprehensive study on cumulative effects on the Fraser River.

*Cultural and Social Impacts*

- Concern regarding the contaminants and sustainability of vital habitats that are necessary to support their members;
- Concern that Proponent used TransLink Regional Transit Model which assumes future transit infrastructure will be built;
- Concern about Aboriginal participation and Project-related opportunities, including: community preparedness; and cultural recognition and naming. Halalt First Nation noted concerns regarding social effects of the Project on Halalt First Nation's ability to transfer knowledge, language loss, dependency and social interaction, and ability to participate in socio-cultural practices; and
- Concern regarding the potential increase in traffic and consequent increase in associated noise and vibration due to the increased capacity of the new bridge, as well as the choice of building materials in relation to noise and vibration.

*Health and Human Safety*

- Concern that Aboriginal health was not considered separately in a disaggregated manner in the Human Health section and that current conditions along the foreshore and in the Fraser River have not been properly considered;
- View that transit modelling assumptions are not conservative enough, with potential implications for human health effects related to air quality, including the assumption that vehicle emissions will be less in 2031 due to new technologies; and
- Concerns about low frequency noise during construction and operation, noting its association with adverse effects to both human health and disturbance to wildlife and that it was a gap in the Application that low frequency noise was not assessed.

### 14.2.5 Potential Impacts of the Project to Halalt First Nation's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Halalt First Nation's Aboriginal Interests. These potential impacts are characterized by considering how the Project could affect several factors important to Halalt First Nation's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Halalt First Nation for the preparation and submission of Traditional Use, Traditional Knowledge or other studies. Halalt First Nation worked with other Cowichan Nation Alliance members and submitted three TUS[27].

EAO considered all information available, including from public sources as well as relevant technical issues raised Halalt First Nation, in the following assessments of the potential impacts on the Project on Halalt First Nation's Aboriginal Interests. A

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[27] *Cowichan Nation Traditional, Current, and Planned Future Use of the George Massey Tunnel Replacement Bridge Project Area,* prepared by Candace Charlie for Cowichan Tribes, on behalf of the Cowichan Nation Alliance (August 9, 2015); *George Massey Tunnel Replacement Project: Cowichan Occupation and Use of the Project Lands*, prepared by Dorothy Kennedy for David Robbins of Woodward and Co., Counsel for the Cowichan Tribes, on behalf of the Cowichan Tribes (August 25, 2015); and, *Historical Geography of Cowichan Land Use and Occupancy Lower Fraser River: Map Series and Report*, prepared for Woodward and Company and the Cowichan Tribes by Kenneth G. Brealey (May 31, 2010).

discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Halalt First Nation from available sources is described below.

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

Halalt First Nation historically harvested the following species on the South Arm of the Fraser River: sockeye and pink salmon, sturgeon, shellfish, and marine mammals. Dried clams were also traded.

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. Sockeye salmon and eulachon in particular could not be found in any river within Halalt First Nation's territory on Vancouver Island.

Halalt First Nation identified concerns related to potential Project effects to fish and other marine resources including:

- Effects to fish and fish habitat, including species of cultural and economic importance such as eulachon, sturgeon and salmon, from pile driving, blasting, and underwater noise generated by Tunnel decommissioning and construction activities, in the South Arm of the Fraser River as well as Deas and Green Sloughs;
- Least risk timing windows do not take into account critical timing for spawning salmon, trout and char migrating upstream through the Project footprint, including: pink, chum, Coho, Chinook, and sockeye salmon, coastal cutthroat and steelhead trout, Dolly Varden and bull trout;
- Potential changes to the Fraser River South Arm and Deas Slough after removal of the Tunnel due to increased hard shoreline/riprap around Bridge supports which may adversely affect eulachon spawning;
- Adverse effects to fish from increased light and noise due to increase in marine vessel traffic in response to the decommissioning and removal of the Tunnel;

- Concerns related to river hydraulics, including: change in flow rates after Tunnel removal; whether extreme weather events had been adequately considered in the River Hydraulics model; potential for contaminants in the tunnel and how this may affect tunnel decommissioning;
- With regards to sediment and water quality, concerns included potential effects of run-off and drainage; impacts of potential pollutants and contaminants within the Tunnel walls on the river if left in place; the need for improved ditches to allow for less filtering of deleterious materials; use and disposal of dredged and other material in the river as well as general concerns related to dredging of the Fraser River;
- View that habitat offsetting plans should be discussed or finalized at the EA stage; and
- Contaminated sites were also identified by Cowichan Nation Alliance as a concern, as were risk of potential accidents and malfunctions, including spills of hydrocarbons from refueling or leaks in construction equipment or vessels, including human waste, as well as spills from accidents during construction and operations.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Halalt First Nation's concerns about potential effects to eulachon from the Project, eulachon were one of five sub-component species assessed. EAO considered that fish species of conservation concern including eulachon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity will not be adversely affected. Furthermore, EAO notes that the bridge supports would not be in-stream. In regards to Halalt First Nation's concerns about river hydraulics, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO discusses its assessment of potential effects of the Project on river hydraulics and river morphology in the lower Fraser River in section 4.2, and is of the view that residual effects to hydrology would not be significant. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel"[28]. Any such future plans would be subject to review under the VFPA's Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

Cowichan Nation Alliance has previously reported that now filled-in sloughs and streams in or near Highway 99 once supported Coho and eulachon, which they traditionally harvested.

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[28] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

Halalt First Nation and Cowichan Nation Alliance report that Tl'uqtinus was used year-round for harvesting purposes, although the information reviewed by EAO suggests use may have been largely on a seasonal basis. Halalt First Nation also reported that the area was also specifically used by Halalt First Nation in July to fish for sockeye and pink salmon, from Canoe Pass at the mouth of the South Arm of the Fraser River to as far up as Hope, with other member nations of the Cowichan Nation Alliance.

Members of the Cowichan Nation Alliance have been attempting to restore former fisheries within the Fraser River through 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 Aboriginal Groups 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 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 is in ongoing, active litigation over its asserted fishing rights on the South Arm of the Fraser River.

Halalt First Nation participates in the Hul'qumi'num Fisheries Limited Partnerships (HFLP), a commercial fishing business, with Penelakut Tribe and Stz'uminus First Nation. Species harvested through this enterprise are crab (one Area H licence, outside the vicinity of the Project), prawn (two local/coast wide licences), halibut (one licence and annual TAC quota), herring (13 gillnet and 1 seine), rockfish (two Area Inside licences, which EAO understands may overlap the vicinity of the Project, targeting yelloweye, quillback, copper, china, and tiget), sablefish (annual TAC quota), and salmon (five Area E gillnet licences, which EAO understands may overlap the vicinity of the Project). Commercial fisheries for halibut and sablefish are generally undertaken off the west coast of Vancouver Island.

Halalt First Nation identified several concerns with potential Project impacts relating to specific locations and access to fishing and marine harvesting activities, including:

- Access to the Fraser River and the potential to displace or interfere with Aboriginal fishing;
- Concern that baseline conditions for fish and fish habitat as they relate to Aboriginal Interests were not considered from a pre-contact perspective; and

- Halalt First Nation's use and navigation of the areas surrounding the Project, potentially affecting future ability to fish and to harvest, including in-water and upland of the South Arm of the Fraser River.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. Although there is potential for construction activities to impact future fishing activities at the claimed *Tl'uqtines* Lands in the case that they overlapped temporally with construction, EAO understands that while Halalt First Nation is interested in expanding their future fishing activities in the vicinity of the Project, current fishing activities are intermittent. EAO anticipates that any potential disruption to access to fishing areas for Aboriginal Groups would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure.

EAO also considered sections 5.2 (land use and visual quality, particularly sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise),

and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (sensory disturbance, including visual quality and noise), human health (atmospheric noise), and as discussed in section 13.1 of this Report, the Project is expected to result in Minor impacts to Halalt First Nation's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Cowichan Nation Alliance has previously reported that Highway 99 was built on what was once a prime harvesting location for deer, ducks, and geese, among other species. Canada goose, northern shoveler, and green-winged teal would have been year-round. The south shore of Lulu Island, along the South Arm of the Fraser River, has been reported as a prime spot for trapping beaver, mink, and muskrat; bear, grouse, elk, squirrel, and porcupine were also hunted by the Cowichan people on the South Arm. The Cowichan Nation Alliance as a group has stated a desire to resume the harvest of traditional resources in the Project area.

Cowichan Nation Alliance has also stated that its members revere bald eagles, which were not hunted. Elders of the Cowichan Nation Alliance member groups have indicated that eagle numbers in the Richmond area have been dwindling each year. Breeding habitat along the Highway 99 corridor on Lulu Island has been previously noted as a concern.

Halalt First Nation identified concerns and comments related to potential effects to wildlife and wildlife habitat including:

- Effects on wildlife from degradation of air quality associated with the Project, particularly during construction;
- Vibration, light and noise effects were raised as having potential adverse effects on wildlife; and
- The bridge structure's effects on species such as waterfowl and migratory birds.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operation as well as a marine mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed a condition requiring a drainage and stormwater management plan to be developed in consultation with Aboriginal Groups as well as a noise management plan. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

Halalt First Nation identified concerns and issues related to specific locations and access to hunt and trap including:

- Halalt First Nation's ability to harvest in the Project area; and
- Halalt First Nation's use and navigation of the areas surrounding the Project, potentially affecting future ability to harvest, including in-water and upland of the South Arm of the Fraser River.

EAO understands that while Halalt First Nation is interested in expanding their hunting and trapping activities within the vicinity of the Project, hunting and trapping are not currently taking place in the Project area by Halalt First Nation.

Disruption of access to hunting and trapping areas could occur during construction, where construction may overlap temporally with future potential hunting and trapping activities. EAO anticipates that potential disruptions to access to future hunting and trapping areas would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

While EAO notes that sites of importance for Halalt First Nation (including the Highway 99 corridor, along the Fraser River, and south shore of Lulu Island) overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application, EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Halalt First Nation's asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations could affect quality of experience for Halalt First Nation's

future potential hunting and trapping activities, although EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and that it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, land use and visual quality (sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Halalt First Nation's asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

Cowichan Nation Alliance report plants that were traditionally gathered included wild rose, rose hips, crabapples, elderberries, horsetail, Labrador tea, Indian hemp, trembling aspen, mock orange, Oregon grape, maple leaves, cranberries, blueberries, blackberries, wapato, bulrushes/reeds (stth'equn), as well as seaweed. Available information indicates that berries were traditionally harvested from bogs in the vicinity of the historic Tl'uqtinus site and fire was used to maintain open areas for the berry bushes from encroachment from pine trees.

Halalt First Nation identified the following concerns and comments related to potential effects to traditional plants:

- Culturally important vegetative species should have been considered as VCs including species collected for: food, fibres in textiles and nets, building attributes, and construction of baskets, needles, and harpoons (e.g. mock orange, Oregon grape, crabapple, Labrador tea);
- Potential adverse effects on vegetation from shading due to the Bridge, contaminated water run-off, contaminated debris from infrastructure, accidents and vehicles, garbage from increased traffic, air quality, and dust/smothering of vegetation;

- Potential adverse effects to SARA-listed native streambank lupine from the Project at Deas Island Regional Park, and potential effects to at-risk plant species;
- Potential adverse effects on wetlands and watercourses due to stormwater and road runoff, as well as from vibrodensification impact;
- Invasive plant species and proposed plans to manage their presence during construction; and
- Culturally significant plants should be used in revegetation plans.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO has proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) would be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

Cowichan Nation Alliance report that in the marshy areas south of Canoe Passage near Brunswick Point – in the area of Xwulit'sum, or place for cutting (cattails) – as well as in the area of Tl'uqtinus and across the Fraser River on Tilbury Island, several varieties of cattails and rushes (stth'equn) were once harvested, although these locations do not fall within the Project footprint.

Berries and other plants were gathered and cultivated by the ancestors of the Cowichan Nation Alliance member bands at Tl'uqtinus, and were harvested from other locations in the Project area.

Cowichan Nation Alliance has indicated that they wish to see existing bogs on Lulu Island near the Highway 99 corridor – specifically, one near Williams Road (which runs perpendicular to Highway 99) and another near the Richmond Nature Park (bisected by Highway 99 at Westminster Highway) – protected to support future use of traditional resources, like berries and other bog ecosystem flora. At Tl'uqtinus, which is currently surrounded by blueberry farms, Cowichan Nation Alliance has raised the potential for their former berry grounds to be re-established.

Halalt First Nation identified the following concerns and comments with potential Project impacts relating to specific locations and access to gathering activities:

- Halalt First Nation's ability to harvest in the Project area; and
- Halalt First Nation's use and navigation of the areas surrounding the Project, potentially effecting future anticipated ability to harvest, including in-water and upland of the South Arm of the Fraser River.

EAO understands that Halalt First Nation is interested in expanding their future gathering activities in the vicinity of the Project, however current gathering activities are not taking place.

There is potential for construction activities to impact future potential access or gathering activities where construction may overlap temporally with future gathering activities. There is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO understands that upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails would be reconnected, and shoreline areas restored after construction. EAO has also proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered that Tilbury Island and Hwlhits'um (Canoe Pass), sites of importance for Halalt First Nation's traditional gathering, are outside both the LAA and RAA for vegetation.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at gathering areas could affect quality of experience for Halalt First Nation's future anticipated activities. It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Halalt First Nation's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

Locations along the South Arm of the Fraser River of importance to the Cowichan Nation Alliance members in the vicinity of the Project include, but are not limited to, the Tl'uqtinus Lands, spanning the north shore from approximately opposite Tilbury Island, downstream towards Deas Island, and Hwlhits'um or Xwulit'sum, on Canoe Pass. Both of these areas are considered by Cowichan Nation Alliance members as ancestral village and resource sites.

Halalt First Nation has specifically noted the importance of archaeological site DgRs-17, which EAO understands includes part of the Tl'uqtinus site.

Halalt First Nation identified concerns and comments including:

- Potential impacts to Halalt First Nation's asserted title, rights and culture;
- Increase in noise levels on Deas Island, as Cowichan Nation Alliance members intend to use Deas Island Regional Park in the future;

- Protection of archaeological and heritage resources, including intangible heritage sites and specific concern for any effects on the Tl'uqtinus site and potential archaeological values at interchanges from construction;
- Halalt First Nation expressed interest in participating in archaeological fieldwork and review of archaeological draft reports throughout the EA and consultation in any potential archaeological and heritage resource monitoring plan; and
- Cowichan Nation Alliance raised concerns about potential health effects (air quality and noise) to future residents of the Tl'uqtinus village site which they intend to re-establish. They noted the site cannot be compared to other land uses in the area, as the use of these areas requires lower levels of noise.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

In regards to concerns about increased noise levels on Deas Island, EAO understands that should Cowichan Nation Alliance re-establish residential and/or commercial use at their village site and use of Deas Island Regional Park for gathering and knowledge transmission purposes in the future, the Proponent will engage in focused discussions in relation to potential noise effects from the Project on Deas Island. EAO has proposed a condition requiring a noise management plan be development, which would include monitoring and adaptive management measures to ensure that noise effects are not greater than predicted in the Application.
There is not anticipated to be an overlap between Halalt First Nation's archaeological and cultural heritage interests and the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

There is potential for changes to quality of experience at important locations for Halalt First Nation, including Tl'uqtinus and Hwlhits'um (Canoe Pass), ancestral village sites, to occur, in particular in relation to changes in atmospheric noise during construction and operations, although EAO does not anticipate atmospheric noise to travel to the village sites, and visual conditions during operation. These effects are not fully mitigable or reversible. While effects on human health related to air quality and atmospheric noise are understood to have been a concern particularly at Halalt First Nation's village site at Tl'uqtinus as it is hoped to be resettled at some point in the near future, EAO notes it

has proposed a condition requiring development of a noise management plan to address Project-related noise during construction and operations, which would include a noise monitoring and follow-up program and a communication program to inform communities potentially affected by Project-related noise.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at both Tl'uqtinus, although less likely at Hwlhits'um.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Halalt First Nation, such as spiritual or storied sites, or named places, potentially affected by the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise and air quality), and land use, and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Halalt First Nation's other traditional and cultural interests.

Impacts on Asserted Aboriginal Title

Cowichan Nation Alliance has asserted Aboriginal title to not only the Tl'uqtinus Lands, but to the Project footprint including between the Highway 17A and Steveston interchanges. Cowichan Nation Alliance has expressed its view that their asserted

Aboriginal title includes the right to manage the land, determine the uses to which it can be put, and obtain any economic benefits from it. Cowichan Nation Alliance has advised that it is also working to re-establish culturally integral practices (e.g., harvesting fish, waterfowl, and plants) on the South Arm and at the mouth of the Fraser River, including at and about Tl'uqtinus, as well as a site on Tl'uqtinus for residential and/or commercial purposes.

Cowichan Nation Alliance has stated that it asserts Aboriginal title to not only the Tl'uqtinus Lands, but to the area including the Project footprint. Cowichan Nation Alliance has expressed its view that this Aboriginal title includes the right to manage the land, determine the uses to which it can be put, and obtain any economic benefits from it. This is also related to the Project's impact on Cowichan Nation Alliance's ability to use and navigate the areas surrounding the Project. Cowichan Nation Alliance has advised that it is also working to re-establish culturally integral practices (e.g., harvesting fish, waterfowl, and plants) on the South Arm and at the mouth of the Fraser River, including at and about Tl'uqtinus. Halalt First Nation have suggested throughout the environmental assessment that significant economic accommodation is necessary due to the potential adverse effects outlined on Cowichan Nation Alliance member's asserted Aboriginal title.

Halalt First Nation identified concerns and comments including:

- Effects on ability to enjoy and use title lands, including future use, from increased noise and light disturbance, obstruction of sunlight, air pollution, including from increased traffic through the corridor;
- Project footprint could impact Halalt First Nation's ability to obtain lease income for benefit of future generations on their asserted Aboriginal title lands;
- Aboriginal participation and Project-related opportunities, including employment, training and contracting, economic development opportunities, and revenue sharing (from tolling);
- Potential air quality effects from the Project on the Tl'uqtinus site and Proponent's lack of modelling for construction-related emissions;
- Concern about air quality effects up river from the highway corridor near the Fraser River on Lulu Island, in the vicinity of the Tl'uqtinus site, including:
    - How the height of the bridge was considered in the air quality modelling; and
    - Request the LAA be extended 3  km downwind of the bridge;

- Re-establishment of a site on Tl'uqtinus site for residential and/or commercial purposes, and surplus land, including land recovery at Green Slough; and
- Effects of the Project on asserted Aboriginal title, including the right to decide how the land will be used, occupy and possess the land; the economic benefits flowing from the land, and to pro-actively use and manage the land.

In regards to concerns about potential air quality effects in the vicinity of the Tl'uqtinus site, EAO requested the Proponent provide an estimate of predicted construction-related emissions for the Project.[29] EAO has also proposed a condition requiring the development of a CEMP that would include measures to mitigate and manage air quality during construction. Regarding concerns about the height of the bridge in air quality modelling, the Proponent provided an analysis which considered traffic emissions from an elevated bridge will disperse over a larger area, resulting in ambient concentrations that are lower in comparison to a source that is closer to the ground. The Proponent concluded there would be no exceedances of ambient air quality objectives at the Tl'uqtinus site.

EAO has considered how the Project may impact each of the following three components of Halalt First Nation's Aboriginal title claims overlapping the Project area: use and occupation, decision-making, and economic benefits.

In regards to potential effects to Halalt First Nation's use and occupation of the area, EAO considered that the majority of construction works would be confined to relatively small areas during the construction, be temporary in nature, and for the road improvements would be within a pre-existing corridor. The nature of the new bridge would result in permanent changes to the landscape which could impact the practice/expression of Aboriginal Interests in the vicinity of the Project. Impacts related to visual quality are not mitigable, although again they will be limited in geographic extent. The analysis of potential residual effects on VCs relevant to other related Aboriginal Interests, particularly the wildlife and wildlife habitat, fish and fish habitat, vegetation, and heritage VCs - characterized in this Report – are low to moderate magnitude, and are not expected to be significant..

Regarding the decision-making component of Aboriginal title, EAO has actively consulted Halalt First Nation in an attempt to better identify, understand, and resolve concerns relating to Aboriginal title. EAO considered that the Proponent has provided

[29] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=55

and would continue to provide capacity funding to support meaningful participation in future consultation activities with the Proponent and in the regulatory process.

EAO notes that Halalt First Nation and Cowichan Nation Alliance have shared their view that the Project will prolong and exacerbate existing barriers to benefit economically from the Project area. EAO considered that the Proponent is actively engaged with Aboriginal groups to ensure that local First Nation communities benefit directly from the Project, including opportunities related to employment, training and contracting. The Proponent would also encourage and support the use of Aboriginal and local businesses by encouraging suppliers and subcontractors to adopt local procurement. EAO's proposed Aboriginal engagement report condition would also require the Proponent to include description of actions taken or planned to provide training, construction monitoring, employment, business, and contracting opportunities to Aboriginal Groups.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to social, economic, environment, heritage, and health VCs, and as discussed in section 13.5 of this Report, the Project is expected to result in Minor impacts to Halalt First Nation's asserted Aboriginal title.

## 14.3 Katzie First Nation

### 14.3.1 Context

Katzie First Nation is a Central Coast Salish group culturally and linguistically associated with the Stó:lō; however, Katzie First Nation operates independently of the broader Stó:lō Nation in its legal and political representations.

The main Katzie First Nation community resides on Katzie IR 1, on the north bank of the Fraser River, west of Port Hammond, and south of the town of Pitt Meadows. Katzie First Nation has four other reserves on the south bank of the Fraser River, on the south shore of Barnston Island, at the lower end of Pitt Lake, and the Katzie First Nation cemetery south of Lougheed Highway. Of 570 registered Katzie First Nation members, 315 live on reserve. The Project area does not overlap any current or former Katzie First Nation reserve lands, although does overlap the southwestern portion of Katzie First Nation's asserted traditional territory.

Katzie First Nation's ancestral language is the downriver dialect of Həl̓q̓əmin̓əm (pronounced "Hul-ka-MEE-num"), and Katzie First Nation reports that they are among the most inland speakers of this "downriver" dialect of Mainland Halkomelem. Katzie

First Nation have described their traditional territory as “extending south from the headwaters of the Pitt River to encompass Pitt Lake, Pitt Polder, a portion of the Fraser River, and south east to encompass the Nicomekl and Serpentine Rivers”.

Katzie First Nation is currently at the Agreement-in-Principle (Stage Four) in the BC Treaty Commission Six-Stage process. Within this process, Katzie First Nation has filed a Statement of Intent (SOI) identifying an area described as its traditional territory.

Katzie First Nation reported to the Proponent that it has Aboriginal Interests that are known to overlap or lie in the vicinity of the Project corridor, which includes the Fraser River and other waterways within the Fraser River estuary, including the Nicomekl and Serpentine Rivers. Katzie First Nation has identified past and ongoing effects that have altered and reduced use over time.

### 14.3.2 Preliminary Strength of Claim Assessment

The majority of the Project corridor, approximately 20 km, on the southeast end, including the location of the new bridge, is within the asserted traditional territory of Katzie First Nation.

Katzie First Nation’s traditional territory was understood by ethnographers as including Pitt Lake, Pitt River, and a segment of the Fraser River from near the mouth of the Pitt River to Haney. While some information suggests that Katzie First Nation was historically located in the vicinity of the South Arm of the Fraser River around Pitt River, and the Fraser River was an important travel corridor for Katzie First Nation people, there are no ethnographic or historical accounts indicating use or occupation by Katzie First Nation at contact or 1846 of the Project area or the waters of the South Arm of the Fraser River near the Project corridor.

EAO’s preliminary assessment is that Katzie First Nation has a **weak–to-moderate *prima facie* claim of Aboriginal rights to fish** in the South Arm of the Fraser River in proximity to the Project area, and a **weak *prima facie* claim of Aboriginal rights to hunt and gather** in the vicinity of the Project area.

There is no information to indicate that Katzie First Nation occupied the Project area with sufficiency or exclusivity at around 1846 to support a claim to Aboriginal title to the Project footprint.

### 14.3.3 Involvement in the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Katzie First Nation's Aboriginal Interests, EAO is of the view that the duty to consult with Katzie First Nation lies at the low end of the *Haida* consultation spectrum. Katzie First Nation is listed in Schedule B of the Section 11 Order.

Katzie First Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Katzie First Nation was invited to attend Working Group meetings on January 21, March 10, and September 20-21, 2016, and was invited to attend site visits and to meet with EAO staff directly. Katzie First Nation did attend the September 20-21 Working Group meetings, but to date EAO has not received any comments or responses to meeting requests and invitations from Katzie First Nation throughout the course of the EA.

The Proponent began consulting with Katzie First Nation in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events has included 8 face-to-face meetings, email exchanges and phone calls, including a meeting via phone between Katzie First Nation, the Proponent and EAO. The Proponent provided Katzie First Nation with two rounds of funding, one in Pre-Application phase and the other in Application Review Phase, to support their involvement.

A summary of the Proponent's engagement activities with Katzie First Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| November 7, 2014 | Phone | Meeting between Katzie First Nation, EAO and the Proponent. Proponent introduced the Project Description and Proposed Studies document; EAO outlined the EA process and consultation. |
| October 4, 2016 | Email (attachment) | EAO invitation to Katzie First Nation to comment on early section of Part C. |
| October 14, 2016 | Letter | Katzie First Nation comments on the Application, including: protection of fisheries and wildlife values; importance of using native species in planting requirements; interest in specific management plans; archaeological protocols; and concern about underwater construction noise and vibration on migrating salmon. |
| October 18, 2016 | Meeting (teleconference) | Meeting between EAO, the Proponent, Semiahmoo First Nation, Katzie First Nation, and Kwantlen First Nation. EAO provided an update on the status of the EA, and the three First Nations communicated concerns with regards to the EA process, |

| | | |
|---|---|---|
| | | including consultation and funding, discussion of cumulative effects, interest in management and monitoring plans. |
| November 22, 2016 | Email (attachment) | EAO invitation to Katzie First Nation to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Katzie First Nation to comment on EAO's draft Part C. |

### 16.3.2 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Katzie First Nation during the EA:

*Methodology, Process and Engagement*

- Concern about the adequacy of the EA methodology, timelines associated with the EA process, as well as the effectiveness and nature of the EA process and volume of EAs currently underway;
- Concern about lack of resources and funding for Aboriginal communities;
- Need for capacity funding and funding for a TUS;
- Need for proposed management plans to require review to ensure Katzie concerns are addressed; and
- Katzie First Nation also expressed concern with the Proponent's procurement strategy and has requested further dialogue with respect to business opportunities. EAO understands the Proponent acknowledged the concern and committed to continue to work with Katzie First Nation in an effort to address this and any other Project-related concerns.

*Cultural and Social Impacts*

- Concern about the length of time tolls are in place; and
- Concern about congestion at the Richmond-Vancouver border.

*Environmental Effects*

- Concern regarding potential for accidents and malfunctions associated with the Project, specifically, spills of hydrocarbons from refuelling or leaks in construction equipment/vessels;
- Cumulative effects were also a concern, including:

    - Potential effects on Aboriginal rights;
    - Absence of a comprehensive study of cumulative effects on the Fraser River; and
    - Overlapping construction periods on the Fraser River from the Highway 99 corridor to Katzie First Nation; and
- View that mud sharks should have been included in baseline studies.

*Health and Human Safety*

- Concern about potential for suicide attempts from the new bridge, pointing to their experience with the Golden Ears Bridge being in proximity to their community, and noted the need for appropriate safety/suicide fencing on the new structure;
- Potential impacts of noise from pile driving and blasting; and
- Potential for falling snow and ice from the bridge.

### 14.3.4 Potential Impacts of the Project on Katzie First Nation's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Katzie First Nation's Aboriginal Interests. These potential impacts area characterized by considering how the Project could affect several factors important to Katzie First Nation's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Katzie First Nation for the preparation and submission of Traditional Use, Traditional Knowledge or other studies. Katzie First Nation submitted a traditional use study entitled: George Massey Tunnel Replacement: Katzie First Nation First Nation Traditional Use Study.

EAO considered all information available, including from public sources as well as relevant technical issues raised by Katzie First Nation in the following assessments of the potential impacts of the Project on Katzie First Nation's Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Katzie First Nation from available sources is described below.

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

Katzie First Nation report that freshwater clams, Eulachon, sturgeon, sockeye, and dog salmon were fished historically by Katzie First Nation in their traditional territory. Sockeye is described as Katzie First Nation's most valuable resource.

Katzie First Nation identified several concerns related to potential effects to fish and fish habitat, including:

- Potential for contaminants in the Tunnel to affect Tunnel decommissioning;
- Use and disposal of dredged and other, material in the river as well as general concerns related to dredging of the Fraser River; and
- Potential effects to fish and fish habitat and spawning grounds, including:
    - Species of cultural and economic importance such as eulachon, sturgeon, and salmon;
    - Due to change in flow rates after Tunnel removal and need to undertake monitoring, and potential effects of run off and drainage; and
    - Potential effects of light, underwater noise and vibration generated by Tunnel decommissioning and other construction activities on migrating salmon.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Katzie First Nation's concerns regarding underwater noise effects on fish, EAO also considered that fish species of conservation concern have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity would not be adversely affected. EAO notes that this pathway was considered in EAO's Report. In regards to Katzie First Nation's concerns about potential effects to white sturgeon from the Project, sturgeon was one of five sub-component species assessed. EAO considered that fish species of conservation concern including white sturgeon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity will not be adversely affected.

Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel"[30]. Any such future plans would be subject to review under the VFPA's Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a noise management plan be developed in consultation with Aboriginal Groups. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies.

[30] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

Fishing remains central to Katzie First Nation. Approximately one third of registered members of Katzie First Nation reportedly licenced to fish during openings on the Fraser River. An estimated 120 Katzie First Nation vessels use the Fraser River to harvest fish annually. Their fishing area is in the vicinity of their communities, upstream of the Project. Since 2004, the Application noted that Katzie First Nation appear to have been licenced to fish upstream from the Project corridor in the vicinity of their communities 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 by year.

Areas within the wider Fraser River estuary were also traditionally utilized by Hul'qumi'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.

Katzie First Nation identified specific issues and concerns with potential Project impacts relating to specific locations and access to fishing and marine resource harvesting activities:

- Protection of their ability to harvest within the Project area;
- Facilitation of barges and larger vessels in the South Arm of the Fraser River channel;
- Potential interference with Aboriginal fisheries during decommissioning of the Tunnel and the importance of working closely with communities to ensure negative effects are avoided;
- Potential impacts from construction and demolition of structures within Katzie First Nation's traditional territory on the ability of community members to participate in traditional activities on the land and water, specifically fishing in and around the Project area;
- Effects of construction and decommissioning-related barging activities on Katzie First Nation fishing activities and on the test fishery (A desire for the joint development of construction and demolition operations and mitigation plans to address this specific issue during the summer and fall fishing season; and
- Requirement to protect fisheries values identified by DFO and the Ministry of Environment.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. EAO has not received information from Katzie First Nation indicating fishing activities occur within this 7.5 km stretch of the river, and as such does not anticipate potential for construction activities to impact access to Katzie First Nation fishing activities. Furthermore, EAO anticipates that any potential disruption to access to fishing areas for Aboriginal Groups to fishing areas within the 7.5 km stretch of river described above would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure, and this is not expected to affect Katzie First Nation, as EAO understands Katzie First Nation is not currently fishing in this area.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise), and as discussed in section 13.1 of this Report, the Project is expected to result in Negligible impacts to Katzie First Nation's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Deer, elk, mountain goat, black bear, some smaller fur-bearing animals (e.g., beaver, marten, mink, and raccoon), seals, and waterfowl have been identified by Katzie First Nation as hunted in the past.

Katzie First Nation identified the following concerns and comments related to potential effects to wildlife and wildlife habitat, including:

- Potential light and noise effects on wildlife;
- Potential effects of the bridge structure on species such as waterfowl and migratory birds;
- Impact of laydown areas on terrestrial wildlife; and
- Requirement to protect wildlife values identified by the Ministry of Environment.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operation as well as a marine mammal management plan be developed in consultation with Aboriginal Groups.

Katzie First Nation reports that they have limited areas over which they can still hunt and discharge firearms given land development in their territory. EAO understands from the Application that Katzie First Nation did express concerns to the Proponent related to protection of its ability to harvest within the Project area. EAO understands that Katzie harvests waterfowl on the north and east aspects of Barnston Island, having voluntarily stopped the practice on the south side to limit public concerns.

Katzie First Nation identified the following concerns and comments related to specific locations and access to hunting and trapping activities:

- Protection of their ability to harvest within the Project area; and
- Potential impact from construction and demolition of structures within the Katzie First Nation traditional territory on the ability of community members to participate in traditional activities on the land.

EAO understands from the Application that Katzie First Nation expressed concerns related to the protection of its ability to harvest within the Project area, however EAO notes that no specific sites of importance for Katzie First Nation are understood to overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application. EAO anticipates that potential disruptions to access to hunting and trapping areas for any Aboriginal Groups currently participating in such activities would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Katzie First Nation's asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, marine mammals, land use and visual quality (specifically sensory disturbance, including visual quality and noise), and human health man health(atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible impacts to Katzie First Nation's asserted Aboriginal rights to hunt and trap.

<u>Impacts on Plant Gathering</u>

Summer harvest of roots and berries were important for the provision of nutritional and cultural sustenance for Katzie First Nation. Harvesting of plants was not restricted to the summer months, often also occurring in fall. Seasonally flooded lands in Katzie First

Nation's traditional territory provided them with an abundance of bogs and marsh plants; two of the most important were the cranberry and wapato.

Other plants identified as traditionally harvested by Katzie First Nation include, but are not limited to, bog blueberries, strawberries, salmonberries, blackberries, blackcaps, thimbleberries, red and blue huckleberries, Saskatoon, salal-berries, the fruit of the crab-apple, oso plum, and black haw. Katzie First Nation reports that they also gathered cedar bark for use in manufacturing clothes and other household items.

Katzie First Nation identified concerns related to potential effects to vegetation, including invasive plant species and proposed plans to manage presence during construction.

Potential adverse effects to vegetation are considered in section 4.4 of this Report, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests. EAO is of the view that the Project does not have the potential to affect vegetation species which EAO understands pertain to Katzie First Nation's asserted Aboriginal rights to gather.

EAO has also proposed a condition requiring the development of a vegetation management during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails would be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

Katzie First Nation reports that cranberry harvesting areas included the mouth of the Alouette River, around Sturgeon Slough, and at Widgeon Creek. Wapato was reportedly harvested on the flats north of Sturgeon Slough and around Siwash Island on the west bank of Pitt River.

Katzie First Nation identified issues and concerns with potential Project impacts relating to specific locations and access to plant harvesting activities:

- Protection of their ability to harvest within the Project area;
- Inclusion of culturally significant plants in planting plans, and need for riparian planting requirements to identify use of native species only; and
- Opportunity for Katzie First Nation in the identification of plants, and planting work.

No information was provided that indicates Katzie First Nation traditionally gathered plants from within the Project area. EAO also considered that other gathering areas for Katzie First Nation are understood to be outside both the LAA and RAA for vegetation. Furthermore, there is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO has proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible impacts to Katzie First Nation's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

Katzie First Nation has reported that the practice of traditional use, including use and activity areas, spiritual and ceremonial sites, named locations, and cultural landmarks, are all considered to be, in addition to archaeological sites, part of Katzie First Nation cultural heritage. Katzie First Nation has described their landscape as sacred, and the role of harvesting resources within this territory as an important means of strengthening family relations and transmitting knowledge and values to new generations. Katzie

First Nation has remarked that, as access to their territory declines, each opportunity to continue practicing traditional activities becomes even more significant.

Katzie First Nation identified concerns and comments regarding archaeological and cultural heritage interests including:

- Interest in opportunities for cultural recognition and naming;
- Protection of archaeological and heritage resources, including intangible heritage sites, that are known to exist or may be discovered within the Project area;
- Participation in archaeological fieldwork and review of archaeological draft reports;
- Concern that the Proponent's archaeological consultant will not work effectively with Aboriginal Groups based on experience on past projects; and
- View that ground disturbance work requires archaeological assessments prior to earthworks to the satisfaction of Katzie First Nation to ensure no impact to traditional or special sites in accordance with the HCA.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

There is not anticipated to be an overlap between Katzie First Nation's archaeological and cultural heritage interests with the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

There is potential for changes to quality of experience at unspecified important locations for Katzie First Nation to occur, in particular in relation to changes in atmospheric noise during construction and operations, and visual conditions during operation. These effects are not fully mitigable or reversible. EAO does not anticipate sites of importance to Katzie First Nation to be affected based on currently known information.
It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality

would extend beyond 1  km of the bridge. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at sites of importance to Katzie First Nation; however, as previously noted EAO does not know of any such sites in close proximity to the Project.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Katzie First Nation, such as spiritual or storied sites, or named places, potentially affected by the Project, although EAO is unaware of any such sites in the vicinity of the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise and air quality), and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible impacts to Katzie First Nation's other traditional and cultural interests.

## 14.4 Kwantlen First Nation

### 14.4.1 Context

Kwantlen First Nation is a Central Coast Salish group whose main community resides on McMillan Island 6, in the Fraser River just north of Fort Langley. Kwantlen First Nation has 269 registered members, 70 of whom live on one of six reserves, centered on the area of confluence between the Stave River and the Fraser River. Kwantlen First Nation also shares the *Pekw'Xe:yles* (Peckquaylis) reserve, approximately 2  km upstream of the Mission Bridge, with 20 other Stó:lō Nations. None of these reserves overlap the Project area.

Kwantlen First Nation's asserted traditional territory extends from the watershed of the Stave River in the north to the international border in the south, taking in the northeastern part of Boundary Bay, the Serpentine, Nicomekl, and Salmon Rivers, as well as the Fraser River upstream of Tilbury Island to the Nicomen Slough, near Chilliwack. This asserted territory overlaps the portion of the Project area at its westernmost extent (i.e., between Highway 17 and Highway 91), but does not overlap the Project area at the location of the new bridge or north of the Fraser River.

Kwantlen First Nation, while ancestrally a Hən̓q̓əmin̓əm (pronounced "Hul-ka-MEE-num") speaking Nation, has been affiliated with the Stó:lō Tribal Council since 2005, when the organization formed out of a separation from the Stó:lō Nation. The Stó:lō speak the "Upriver" form of Halkomelem or *Halq'eméylem*. Kwantlen First Nation consults on Kwantlen interests independently of the Stó:lō Tribal Council, under the leadership of a Hereditary Chief and two-member appointed council that has been in place since 1993. Like other members of the Stó:lō Tribal Council, Kwantlen First Nation is not currently involved in treaty negotiations; however, in March 2012, Kwantlen First Nation reached a three-year agreement with the Province on forest resource consultation and revenue-sharing agreement.

Since 2011, the economic arm of Kwantlen First Nation has operated as Seyem' Qwantlen Business Group, representing five limited partnerships owned by the Nation, and providing services principally in the areas of contracting (construction, excavation, and earthworks), on and off reserve land development, and resource management (fisheries, forestry, and archaeology).

### 14.4.2 Preliminary Strength of Claim Assessment

Approximately 8 km of the Project corridor is within the asserted traditional territory of Kwantlen First Nation, at the southeast end of the corridor, not including the Fraser River. Kwantlen First Nation's asserted territory does include the Fraser River, however, approximately 4 km upstream of the corridor at the Fraser River.

EAO has recently become aware that Kwantlen First Nation shared a Project-specific asserted traditional territory in 2015 with the Proponent which overlaps the entire Project footprint (Kwantlen First Nation 2015). Kwantlen First Nation indicated that they would like this Project-specific asserted territory to be used in consideration for the Project area. The traditional use information that accompanied this assertion has been incorporated, where appropriate, into section 14.4.5 of this Report. It is EAO's view that appropriate consultation opportunities have been provided to Kwantlen First Nation for this EA.

The core of Kwantlen First Nation territory is understood to be around New Westminster in proximity to the South Arm of the Fraser River. Kwantlen people, at the time of contact, are also understood to have travelled, fished for eulachon, salmon and sturgeon, and harvested plant resources along the lower Fraser River, south to Boundary Bay.

EAO's preliminary assessment is that Kwantlen First Nation has a **strong *prima facie* claim of Aboriginal rights** to fish, gather, and hunt in areas within Kwantlen First Nation's territory that are in proximity to the Project corridor.

There is no information to indicate that Kwantlen First Nation occupied the Project area with sufficiency or exclusivity at around 1846 to support a claim to Aboriginal title to the Project footprint.

14.4.3 Involvement in the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Kwantlen First Nation's Aboriginal Interests, EAO is of the view that the duty to consult with Kwantlen First Nation lies at the low–to-mid end of the *Haida* consultation spectrum. Kwantlen First Nation is listed in Schedule B of the Section 11 Order.

Kwantlen First Nation's request to use their extended traditional territory boundary should not trigger further consultation as Kwantlen First Nation has participated and provided comments on the Project within the expanded area.

Kwantlen First Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Kwantlen First Nation also attended Working Group meetings on January 21, March 10, and September 20-21, 2016, and was invited to attend site visits and to meet with EAO staff directly.

The Proponent began consulting with Kwantlen First Nation in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events have included 3 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Kwantlen First Nation with two rounds of funding, one in Pre-Application phase and the other in Application Review Phase, to support their involvement.

A summary of the Proponent's engagement activities with Kwantlen First Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| November 18, 2014 | Meeting | Meeting between Kwantlen First Nation, EAO and the Proponent. |
| February 18, 2016 | Letter | Kwantlen 1st round of comments on the draft AIR. |
| March 18, 2016 | Email | EAO responded to Kwantlen First Nation's comments on the draft AIR, outlined the process in the current review of the draft AIR (version 2), as well as: responded to Kwantlen's concerns about cumulative effects assessment methodology and concerns about cumulative effects in the lower Fraser. |
| October 4, 2016 | Email (attachment) | EAO invitation to Kwantlen First Nation to comment on early draft section of Part C. |
| October 18, 2016 | Meeting (teleconference) | Meeting between EAO, the Proponent, Semiahmoo First Nation, Katzie First Nation, and Kwantlen First Nation. EAO provided an update on the status of the EA, and the three First Nations communicated concerns with regards to the EA process, including consultation and funding, discussion of cumulative effects, interest in management and monitoring plans. |
| October 21, 2016 | Letter (attached report) | Kwantlen First Nation comments on Application (round 2), including concerns about the EA process to date and interest in the forthcoming archaeological management plan. Letter included a report outlining concerns on the Application related to: cumulative effects assessment; sediment and water quality; effects and underwater noise; fish and fish habitat; terrestrial wildlife; and the fish and fish habitat plan. |
| November 22, 2016 | Email (attachment) | EAO invitation to Kwantlen First Nation to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Kwantlen First Nation to comment on EAO's draft Part C. |
| January 6, 2017 | Email (attachment) | Kwantlen First Nation provided EAO a Project-specific asserted traditional territory. |
| January 10, 2017 | Email | EAO provided Kwantlen First Nation proposed changes to EAO's draft Part C to reflect the information received on January 6, 2017. |

### 14.4.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Kwantlen First Nation during the EA:

*Methodology, Process and Engagement*

- Communicated their view that the methodologies for assessing cumulative effects are too narrow in scope and suggested a more holistic approach;
- Concern about the EA methodology's ability to sufficiently address social and cultural effects;
- Concern over inclusion of Aboriginal Groups with weaker strength of claims to the Lower Fraser River in consultation for the Project, and of the view that Aboriginal consultation plans, involvement of Aboriginal Groups in work and procurement opportunities should take into account that some Aboriginal Groups have stronger strength of claim than others;
- Emphasized importance for appropriate use of information shared as relates to confidentiality and dissemination;
- Interest in capacity funding as well as TUS funding; and
- Kwantlen First Nation also expressed concern with the Proponent's procurement strategy and has requested further dialogue with respect to business opportunities. EAO understands the Proponent acknowledged the concern and committed to continue to work with Kwantlen First Nation in an effort to address this and any other Project-related concerns.

*Environmental Effects*

- Concern regarding the use and disposal of dredged and other material in the river and general concerns related to dredging of the Fraser River and the conservation and protection of the Fraser River ecosystem as a whole;
- Concern regarding potential effects related to the salt wedge on the Fraser River; and
- Concern regarding cumulative effects, including:
    - View that cumulative effects should be considered beyond the construction window for the Project, including in relation to the removal of the Tunnel;
    - Development on the lower Fraser River and the need from Kwantlen First Nation's perspective for a regional study to address this matter; and
    - Potential changes in amount and type of commercial traffic and associated risks.

### 14.4.5 Potential Impacts of the Project to Kwantlen First Nation's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Kwantlen First Nation's Aboriginal Interests. These potential impacts area characterized by considering how the Project could affect several factors important to Kwantlen First Nation's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Kwantlen First Nation for the preparation and submission of the traditional use study: *Kwantlen Land Use and Occupation in the Vicinity of Highway 99*.

EAO considered all information available, including from public sources as well as relevant technical issues raised by Kwantlen First Nation in the following assessments of the potential impacts of the Project on Kwantlen First Nation's Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.
A summary of the information about Kwantlen First Nation from available sources is described below.

<u>Impacts on Freshwater Fishing, and Marine Fishing and Harvesting</u>

Kwantlen First Nation report that fishing is the resource harvesting activity most frequently practiced by its members on the Fraser River, with salmon being the key species. Other species of interest harvested throughout their traditional territory include

eulachon, herring, smelt, halibut, eulachon, trout, and sturgeon. Kwantlen First Nation also reports harvesting a variety of bivalves and other seafood.

Kwantlen First Nation identified several concerns related to potential effects to fish and fish habitat, including:

- Potential effects to fish and fish habitat and spawning grounds, including:
    - Potential light and noise effects;
    - Species of cultural and economic importance such as eulachon, sturgeon, and salmon;
    - Potential effects of pile driving, blasting and underwater noise generated by Tunnel decommissioning and other construction activities, particularly on migrating salmon, and concern that no significant mitigation is proposed on this matter during Tunnel decommissioning;
    - Potential effects on Fraser River flow rates after Tunnel removal;
    - Potential effects of run off and drainage; and
    - Entrapment of white sturgeon in the Fraser River South Arm during dredging;
- View that further field sampling could result in confirmed presence of additional CRA fish bearing ditches, and that fish salvage should be completed prior to work in all ditches as a proactive, precautionary measure;
- Concerns regarding means by which water sampling was undertaken, including representativeness of timeframe and conditions taken during;
- Concern water turbidity conditions may exceed Ministry of Environment water quality guidelines, and view that acceptable levels should be established;
- Final destination of dredged material, and redistribution from sedimentation during construction including in the Strait of Georgia; and
- Importance of habitat restoration and Kwantlen First Nation's interest in participating in all aspects of such works.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Kwantlen First Nation's concerns regarding underwater noise effects on fish, EAO notes that this pathway was considered in EAO's Report. In regards to Kwantlen First Nation's concerns about potential effects to white sturgeon from the

Project, sturgeon was one of five sub-component species assessed. EAO considered that fish species of conservation concern including white sturgeon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity would not be adversely affected. In regards to concerns about redistribution from sedimentation, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies.

Kwantlen First Nation is among the numerous Aboriginal Groups involved in the Lower Fraser River salmon fishery under FSC licences issued by DFO. Kwantlen First Nation is 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; and appear to fish in this area for Chinook, sockeye, and chum salmon and eulachon. Kwantlen First Nation

has also reported use of the upper intertidal area of Mud Bay, at the northeastern aspect of Boundary Bay, for shellfish harvesting.

Areas within the wider Fraser River estuary were also utilized by Hul'qumi'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.

Kwantlen First Nation identified several concerns regarding potential effects relating to specific locations and access to fishing and marine resource harvesting activities:

- Protection of the ability to harvest within the Project area;
- Access to the Fraser River and the potential to displace fishing vessels;
- Potential interference with Aboriginal fisheries during decommissioning of the Tunnel and the importance of working closely with communities to ensure negative effects are avoided; and
- Potential effects of construction and decommissioning-related barging activities on Kwantlen First Nation fishing activities and on the test fishery.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. EAO has not received information from Kwantlen First Nation indicating fishing activities occur within this 7.5 km stretch of the river, and as such does not anticipate potential for construction activities to impact access to Kwantlen First Nation fishing activities. Furthermore, as EAO previously noted, Kwantlen First Nation's asserted traditional territory begins approximately 4 km upstream of the Tunnel. EAO also anticipates that any potential disruption to access to fishing areas for Aboriginal Groups to fishing areas within the 7.5 km stretch of river described above would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities

during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure, and this is not expected to affect Kwantlen First Nation, as EAO understands Kwantlen First Nation is not currently fishing in this area.

EAO notes that due to the proximity of the southeast end of the Project corridor and Mud Bay (at the Highway 99/Highway 91 interchange), there is a possibility of overlap between residual effects to human health from atmospheric noise during construction for several months and Kwantlen First Nation shellfish harvesting areas in Mud Bay, if Kwantlen First Nation members are harvesting within 500 m of the Project alignment.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise, and as discussed in section 13.1 of this Report, the Project is expected to result in Negligible impacts to Kwantlen First Nation's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Kwantlen First Nation reportedly hunted deer, elk, mountain goats and other small game (e.g., ducks, geese, and grouse), and trapped beaver and martin.

Kwantlen First Nation identified the following concerns and comments related to potential effects to wildlife and wildlife habitat, including:

- Potential light and noise effects and effect of the bridge structure on wildlife and species such as waterfowl and migratory birds;
- Potential increased Barn Owl mortality due to vehicle risk and need for further study;
- Need to undertake monitoring of raptor nests during construction;
- Potential underwater noise effects to marine mammals, including concern that no significant mitigation is proposed during Tunnel decommissioning;
- Potential impacts to terrestrial wildlife related to sediment release and downstream accumulation in wetlands and the Fraser River estuary;
- Concern about the feasibility of bubble curtains to protect marine mammals in the Fraser River and Deas Slough; and
- Reliance on a marine mammal management plan to minimize risks of underwater noise to marine mammals without noting specific guidelines in the Application, and interest in the plan including maximum percentage of time underwater levels are permitted to exceed thresholds.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report. EAO acknowledges that it does anticipate residual effects to barn owls from the Project, due to correlated increase in collision risk for barn owl, although this is considered to be a negligible increase from existing conditions, and is not considered a risk to population survival due to proposed mitigation measures which have proven effective on Highway 17.

EAO has also proposed conditions that require wildlife and wildlife habitat management plans during construction and operation as well as a marine mammal management plan be developed in consultation with Aboriginal Groups, which will require presence of a Qualified Professional in observing and reporting marine mammal presence during construction in areas where marine mammals may be exposed to underwater sound at levels that can result in potential injury, include specification of mitigation measures for underwater noise during construction that will prevent or reduce behavioural change or

injury to marine mammals. EAO has also proposed a condition requiring a noise management plan.

Stave River, a tributary of the Fraser River, is said to have been important to Kwantlen First Nation for hunting and trapping and as a training area for youth.

EAO understands from the Application that Kwantlen First Nation expressed concerns related to the protection of its ability to harvest within the Project area, However, EAO notes that no specific sites of importance for Kwantlen First Nation are understood to overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application. EAO anticipates that potential disruptions to access to hunting and trapping areas for any Aboriginal Groups currently participating in such activities would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Kwantlen First Nation's asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to wildlife, land use and visual quality (specifically sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible impacts to Kwantlen First Nation's asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

Kwantlen First Nation concerns related to potential effects to vegetation, including:

- Invasive plant species and proposed plans to manage presence during

construction; and

- Inclusion of culturally significant plants in planting plans and opportunity for Kwantlen in the identification of plants, and planting work.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect vegetation species which EAO understands pertain to Kwantlen First Nation's asserted Aboriginal rights to gather.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

Kwantlen First Nation have identified a former berry/plant (specifically cranberry) gathering area at a bog located in the eastern and northern portion of Lulu Island, along the south bank of the North Arm of the Fraser River. EAO understands that this former berry area does not overlap with the Project area.

While Kwantlen First Nation communicated to the Proponent their concerns that potential Project impacts could adversely affect their ability to harvest within the Project area, no information was provided that indicates Kwantlen First Nation traditionally gathered plants from within the Project area. EAO also considered that other gathering areas for Kwantlen First Nation are understood to be outside both the LAA and RAA for vegetation. Furthermore, there is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing

Highway corridor and currently inaccessible. EAO has proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible impacts to Kwantlen First Nation's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

Kwantlen First Nation has reported that they understand their cultural heritage sites to include "any geographically-defined site (on land or water) used for the purposes of settlement, occupation, cultural use, resource gathering, transportation, or similar activity," and note that while these sites "may lack the physical evidence of human-made artifacts or structures," they are still of cultural significance. Kwantlen First Nation says that some of the "most highly significant" cultural heritage sites are associated with fishing on the Fraser River.

Kwantlen First Nation has identified several traditional transportation routes to the east of the Project corridor (which EAO understands do not overlap with the Project corridor), including, but not limited to:

- A trail from the head of Mud Bay to the South Arm of the Fraser and to *Kikait* (*q'əq'yet*), across from New Westminster;
- A trail/canoe route leading from the Fraser River at the west end of Barnston Island to the Serpentine River, leading to Mud Bay;
- A trail/canoe route from the Fraser River along the Salmon River then overland to the Serpentine River, leading to Mud Bay;
- The Nicomekl River itself;
- A trail/canoe/portage route from the mouth of the Salmon River at the Fraser River to its source, then by portage to the upper forks of the Nicomekl River,

and downriver to the mouth of the Nicomekl River (i.e., Black Spit or *stetaq*); and

- A trail leading from the headwaters of the Nicomekl River southward across Langley Prairie to Campbell River, then following this river to its mouth at Semiahmoo Bay.

Kwantlen First Nation identified concerns and comments regarding archaeological and cultural heritage interests including:

- Protection of archaeological and heritage resources, including intangible heritage sites;
- Social effects of the Project on the ability to transfer knowledge, language and participate in socio-cultural practices;
- The inclusion of Indigenous place names of the areas in and around the Project;
- Protection of cultural and archaeological sites that are known to exist or may be discovered within the Project area; and
- Participation in archaeological fieldwork and review of archaeological draft reports, and consultation with Aboriginal Groups on any archaeological management plans.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

There is not anticipated to be an overlap between Kwantlen First Nation's archaeological and cultural heritage interests with the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests. There is potential for changes to quality of experience at unspecified important locations for Kwantlen First Nation to occur, in particular in relation to changes in atmospheric noise during construction and operations, and visual conditions during operation. These effects are not fully mitigable or reversible, however EAO does not

anticipate sites of importance to Kwantlen First Nation to be affected based on currently known information.

It is understood that residual visual quality effects are anticipated within 1  km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1  km of the bridge. Furthermore, as previously stated, EAO understands Kwantlen First Nation's asserted traditional territory on the Fraser River to begin approximately 4 km upstream from the existing corridor across the Fraser River. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at sites of importance to Kwantlen First Nation; however, as previously noted EAO does not know of any such sites in close proximity to the Project.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Kwantlen First Nation, such as spiritual or storied sites, or named places, potentially affected by the Project, although EAO is unaware of any such sites in the vicinity of the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise and air quality) and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible impacts to Kwantlen First Nation's other traditional and cultural interests.

## 14.5 Lake Cowichan

### 14.5.1 Context

Lake Cowichan First Nation is a Hul'qumi'num-speaking Central Coast Salish Lake Cowichan First Nation's membership takes descent from Ditidaht (Nuu-chah-nulth) ancestors and *Hul'qumi'num'* ancestors known as the Somenos (or Saumni, Samena, Saumina and other variations), one of seven village groups comprising the Cowichan Tribes. Their community is based on a single reserve on the northeastern shore of Cowichan Lake, approximately 30 km west of Duncan (on the east coast of Vancouver Island), and less than 20 km east of Nitinat Lake (on the west coast of Vancouver Island). In 1860, the community was significantly affected by a smallpox epidemic; the population has remained small, with only 12 or 20 registered members living on reserve.

Lake Cowichan First Nation have stated that Cowichan Lake has always been their primary home, and that their traditional territory is centered on the lake, taking in surrounding lands, streams, and other waters, including the uppermost part of the Cowichan River. They have also stated that their use of this territory has continued to the present day. Lake Cowichan First Nation is part of the Hul'qumi'num Mustmiuhw, a group of six Vancouver Island First Nations that together form the Hul'qumi'num Treaty Group.[31]

Based on their affiliation with the Hul'qumi'num Treaty Group, Lake Cowichan First Nation has asserted a larger, collective traditional territory with the other member First Nations of that group. The asserted traditional territory of the Hul'qumi'num Treaty Group members generally includes parts of South-eastern Vancouver Island, the southern Gulf Islands, a portion of the Lower Mainland, and the waters of the Salish Sea to the Sunshine Coast, including the lower portion of Howe Sound, Haro Strait, the Strait of Juan de Fuca and the Fraser River up to Yale.

The members of the Hul'qumi'num Treaty Group collectively assert a traditional territory of core Aboriginal title lands and a broader traditional fishing territory, as described in its Statement of Intent to the BC Treaty Commission. Of particular relevance to this Project, is the assertion of Aboriginal rights and title that include "the south arm of the Fraser River, including Canoe Pass, up to and including Douglas Island, with lands on the north shore of the south arm up to Sapperton Channel (New Westminster), the

[31] The other members of the Hul'qumi'num Treaty Group include Cowichan Tribes, Halalt First Nation, Penelakut Tribe, Stz'uminus First Nation and Lake Cowichan First Nation.

islands in the south arm of the Fraser River and the south bank of the Fraser River along Canoe Pass up to Deas Island" [32].

Lake Cowichan First Nation, along with other Island Halkomelem speaking groups, traditionally utilized the lands and waters on both sides of the Strait of Georgia as part of a seasonal round. The Aboriginal title lands claimed by the Hul'qumi'num Treaty Group includes *Tl'uqtinus*, spanning the north shore from approximately opposite Deas Island to opposite Tilbury Island. A Lake Cowichan community member recently stated that they have not used any resources from the George Massey Tunnel area since 1960, but that they do occasionally access the area.

### 14.5.2 Preliminary Strength of Claim Assessment

The entirety of the Project corridor (approximately 25 km) runs through the asserted traditional territory of the Lake Cowichan First Nation, as collectively asserted with the members of the Hul'qumi'num Treaty Group. It is understood from the information reviewed that members of Lake Cowichan First Nation are descended from Ditidaht and Cowichan (Somenos) individuals, with traditional territory suggested to have been located in the Lake Cowichan and Skutz Falls area.

In the ethnographic and historic sources, members of the Hul'qumi'num Treaty Group were often all referred to as "Cowichan". Occasionally "Cowichan" was also used to refer to a broader group that included all of the Central Coast Salish or Halkomelem speaking people. This lack of clarity in the information means it is sometimes difficult to attribute historical references of "Cowichan" use to individual Aboriginal Groups or collectives of particular Aboriginal Groups. However, where historical information indicates the presence and use of the Project area by Cowichan people in a manner that makes it unclear which Aboriginal group was being described, EAO has not used this information to undermine the exclusivity component of Aboriginal title for the Lake Cowichan First Nation preliminary strength of claim assessment or other members of the Hul'qumi'num Treaty Group.

It is understood that Cowichan people have historically been residents of Vancouver Island and other Gulf Islands, and travelled annually to the South Arm of the Fraser River to fish for salmon and sturgeon, including prior to and around the time of contact below and upstream of the Project. EAO's preliminary assessment is that Lake Cowichan First Nation has a **strong *prima facie* claim of Aboriginal rights** to fish,

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[32] Hul'qumi'num Treaty Group Statement of Intent. BC Treaty Commission website. http://bctreaty.net/soi/soihulquminum.php (accessed August 26, 2016).

gather and hunt in the areas in proximity to the Project area, including the South Arm of the Fraser River.

It is noted that the claimed village sites (Tl'uqtinus) on Lulu Island on the South Arm of the Fraser River that were seasonally occupied by Cowichan people are 2 – 3 km upstream from the Project and do not overlap the Project footprint. EAO is of the view that the available information suggests Cowichan people did not traditionally occupy the Project footprint with the intention of controlling this land, although given the relative proximity of the Project to the claimed village site, an inference can be made that Cowichan people may have utilized this area for resource harvesting activities. The Project footprint appears to be at the western edge of an area identified by ethno-historians as a boundary between the traditional territories of several different Aboriginal groups: Musqueam Indian Band to the west and north, Tsawwassen First Nation to the southwest, and Kwantlen First Nation to the south and east. Some early ethnographers identified an area of land at the intersection of these traditional territories as not attributed to any Aboriginal group. The information also indicates that the Fraser River and surrounding area was a particularly rich resource area and the sheer abundance of resources may have reduced the need or practicality of defending use by others. In fact, information indicates that multiple Aboriginal groups may have fished, hunted, and gathered within the vicinity of the Project footprint, which raises questions regarding whether exclusivity of use of the area can be established by the Cowichan people.

Based on the above, and descendancy from the historic Cowichan people, EAO's preliminary assessment is that Lake Cowichan First Nation has a **moderate *prima facie* claim of Aboriginal title** to the Project footprint.

### 14.5.3 Involvement of the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Lake Cowichan First Nation's Aboriginal Interests, EAO is of the view that the duty to consult Lake Cowichan First Nation lies at the mid-to-high end of the *Haida* consultation spectrum. Lake Cowichan First Nation is listed in Schedule B of the Section 11 Order.

Lake Cowichan First Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Lake Cowichan First Nation was also invited to attend Working Group meetings, site visits, and to meet with EAO staff directly.

The Proponent began consulting with Lake Cowichan First Nation in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events has included 14 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Lake Cowichan First Nation with two rounds of funding, one in pre-Application phase and the other in Application Review phase, to support their involvement.

A summary of the Proponent's engagement activities with Lake Cowichan First Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| November 10, 2014 | Meeting (teleconference) | Initial meeting between Lake Cowichan First Nation, Lyackson First Nation, EAO and the Proponent. The Proponent introduced the Project Description and Proposed Studies document; EAO outlined the EA process and consultation. |
| January 21, 2016 | Working Group meeting | Lake Cowichan First Nation did not attend. |
| March 10, 2016 | Working Group meeting | Lake Cowichan First Nation did not attend. |
| September 19, 2016 | Working Group Site Tour | Lake Cowichan First Nation did not attend. |
| September 20-21, 2016 | Working Group meeting | Lake Cowichan First Nation attended. |
| October 3, 2016 | Email (attachment) | EAO invitation to Lake Cowichan First Nation to comment on early section of Part C |
| November 22, 2016 | Email (attachment) | EAO invitation Lake Cowichan First Nation to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Lake Cowichan First Nation to comment on EAO's draft Part C. |

### 14.5.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Lake Cowichan First Nation:

*Methodology, Process and Consultation*

- View that they required funding for participation in EAO's process in addition to funding provided by the Proponent;
- Interested in funding for a TUS (which was provided);

- Emphasized the importance of appropriate use of information which they shared with the Proponent as it relates to confidentiality and dissemination; and
- Importance of continued engagement with Aboriginal Groups on matters of importance to them and on the success of mitigation and enhancements, including the importance of reporting out on post-construction monitoring, to be provided via meetings and in writing.

*Cultural and Social Impacts*

- Importance of maintaining and protecting traditional historical access to the Project area was highlighted, including future aspirations of Ts'uubaasatx to learn about and exercise their asserted rights in the Project area as the community grows (EAO understands a focus has been on Vancouver Island but it is a priority to re-invigorate cultural use in the Project area);
- Members expressed interest in not only maintaining and asserting their asserted Aboriginal right to camp, hunt, fish, and otherwise move about in the area of the Tunnel, but also hope that the area will be restored in the future as a healthy habitat that can be utilized for food gathering purposes;
- Interested in ensuring their right to access and harvest within the Project area is maintained;
- Noted an interest in opportunities for cultural recognition and naming;
- Expressed concern regarding the potential increase in traffic and consequent increase in associated noise and vibration due to the increased capacity of the new bridge, as well as concerns about increased congestion at the Richmond-Vancouver border; and
- Concern about socio-economic impacts related to the length of time tolls are in place for the new bridge.

*Environmental Impacts*

- Concern regarding congestion and air quality issues, and noted their support for improved transit and anything that reduces idling; and
- Concerns related to accidents and malfunctions including spills of hydrocarbons from refueling or leaks in construction equipment/vessels, including human waste, as well as spills from accidents during construction and operations.

*Health and Human Safety*

- Concerns about potential adverse effects from noise due to pile driving and blasting, as well as from increase in traffic, and consequent increase in associated noise and vibration due to the increased capacity of the new bridge.
- Concerns about socio-economic impacts of the Project and health, including concerns that the presence of a new bridge would result in increased suicide attempts; and
- Concern that the creation of areas of increased criminal activity, particularly attraction of shadow populations/marginalized groups. Elders expressed concern that bridge footings and covered areas would create new locations of use by drug users and sex workers.

### 14.5.5 Potential Impacts of the Project to Lake Cowichan First Nation's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Lake Cowichan First Nation's Aboriginal Interests. These potential impacts are characterized by considering how the Project could affect several factors important to Lake Cowichan First Nation's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Lake Cowichan First Nation for the preparation and submission of the following TUS: *Ts'uubaasatx Interests: George Massey Tunnel.*

EAO considered all information available, including from public sources as well as relevant technical issues raised by Lake Cowichan First Nation, in the following assessments of the potential impacts of the Project on Lake Cowichan First Nation's Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Lake Cowichan First Nation from available sources is described below.

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

Lake Cowichan First Nation report that species harvested historically on the South Arm of the Fraser River included salmon, sturgeon, eulachon, shellfish, and marine mammals (particularly seals). Dried clams and other foodstuffs (e.g., camas) were traded to other Aboriginal Groups.

Areas within the wider Fraser River estuary were also utilized by *Hul'qumi'num'*-speaking peoples for fishing salmon, sturgeon, groundfish, and other marine resources on the foreshore (e.g., Roberts Bank, 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 within their trans-Georgia Strait settlement round.

Lake Cowichan currently participates in the Hul'qumi'num Fisheries Limited Partnership, a commercial fishing business, along with Cowichan Nation Alliance member groups and Lyackson First Nation. Species harvested under commercial licences through this enterprise are crab, prawn, halibut, herring, rockfish, sablefish, and salmon. Commercial fisheries for halibut and sablefish are generally undertaken off the west coast of Vancouver Island.

Lake Cowichan First Nation identified several concerns related to potential effects to fish and fish habitat and water quality:

- Potential effects related to species of cultural and economic importance such as eulachon, sturgeon and salmon;
- Concern about use and disposal of dredged and other material in the Fraser

River as well as general concerns related to dredging of the Fraser River;

- Potential effects including mortality from pile driving, blasting and underwater noise generated by Tunnel decommissioning and other construction activities, including effects to migrating salmon;
- Fraser River flow rates after Tunnel removal, and potential effects of run off and drainage to water quality;
- Impacts of the River from potential pollutants and contaminants on the Tunnel walls are left in place; and
- Potential light and noise effects.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Lake Cowichan First Nation's concerns regarding underwater noise effects on fish, EAO notes that this pathway was considered in EAO's Report. In regards to Lake Cowichan First Nation's concerns about potential effects to white sturgeon from the Project, sturgeon was one of five sub-component species assessed. EAO considered that fish species of conservation concern including white sturgeon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity will not be adversely affected. In regards to concerns about redistribution from sedimentation, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. The Proponent has also communicated to EAO that the dredged material would be appropriate for beneficial use and that Disposal at Sea is not considered. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the

Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

Lake Cowichan First Nation reportedly followed a seasonal round of resource use and regional settlement that took them from their winter residences on Vancouver Island and the Gulf Islands across the Strait of Georgia to the Fraser River estuary, where they resided for all or part of the annual salmon runs (April to through October), or, in some instances, year-round. Seasonal movements reportedly involved the relocation of entire households, including house planks and supplies, from location to location within the collective traditional territory, between three and five times annually. Within this round, the Fraser River estuary has been described as the "most important economically".

Access to sockeye for Hul'qumi'num Treaty Group member nations for FSC purposes is said to be provided annually by 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. In those years, the specific locations in the South Arm in which member First Nations of the Hul'qumi'num Treaty Group fished for 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).

DFO management areas to which Lake Cowichan FSC licences apply are not specified in their latest available fisheries agreement with DFO; however, Lake Cowichan's agreement mentions sockeye, which does not occur in the Cowichan River system. DFO records for communal FSC licences in the Fraser River downstream of the Port Mann Bridge do not suggest that Lake Cowichan has had recent access to fisheries in this area; Lake Cowichan have reported however, that one of their FSC fishers has obtained fish at the mouth of the Fraser River and Roberts Bank area in two of the last three years. Two species of salmon have been targeted at Roberts Bank – sockeye and spring – with approximately 20-50 of each species harvested annually (spring through fall).

Lake Cowichan First Nation identified specific issues and concerns with potential Project impacts relating to specific locations and access to fishing and marine resource harvesting activities:

- Lake Cowichan First Nation's ability to harvest within the Project area and values, including related to subsistence fishing, anticipated to be directly impacted by Project construction and operation;

- Access to the Fraser River and potential for Project construction to displace fishing vessels and Lake Cowichan First Nation fishing activities, as well as the importance of working closely with communities to ensure negative effects are avoided; and
- Post-construction monitoring and sharing information with Aboriginal Groups.

Disruption of access to fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. There is potential for construction activities to impact future fishing activities in the vicinity of the area north of the Tunnel, EAO understands that current fishing activities are intermittent. EAO understands however that Lake Cowichan First Nation is interested in expanding their fishing activities in the vicinity of the Project. EAO also anticipates that any potential disruption to access for Aboriginal Groups to fishing areas within the 7.5 km stretch of the river described above would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure, and that is not expected to affect

Lake Cowichan First Nation, as EAO understands Lake Cowichan First Nation is not currently fishing in this area.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise), and as discussed in section 13.1 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Lake Cowichan First Nation's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

The Proponent reported past, present, and desired future hunting and trapping activities in the Project area specifically by the Lake Cowichan First Nation were not identified in information reviewed to date; however, it is assumed that these activities would have resembled what has been reported for other *Hul'qumi'num' Mustmiuhw* while resident on the Fraser River. Large game harvested by Lake Cowichan likely included deer and black bear; small game, fur-bearing mammals, and waterfowl from aquatic settings along sloughs and wetlands, such as beaver, muskrat, otters, mink, ducks, geese, and swans, would have also been targeted. Lake Cowichan First Nation has reported that they are harvesting seals and ducks, specifically mallards and coots, at Roberts Bank. They have previously expressed concern regarding the diminishing numbers of marine birds in the area.

Lake Cowichan First Nation identified the following concerns and comments related to potential effects to wildlife and wildlife habitat, including:

- Protection of Lake Cowichan First Nation's ability to harvest within the Project area;
- Potential adverse impacts on marine mammals such as the Stellar Sea Lion; and
- Adverse potential effects on wildlife due to:

- Decreased Fraser River water quality from run off and drainage, as well as from potential pollutants and contaminants on the Tunnel walls are left in place;
- Potential light and noise effects on wildlife; and
- Potential effects of the bridge structure on species such as waterfowl and migratory birds.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operation as well as a marine mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed a condition requiring a noise management plan. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO understands from the Application that Lake Cowichan First Nation expressed concerns related to the protection of its ability to harvest within the Project area, However, EAO notes that no specific sites of importance for Lake Cowichan First Nation are understood to overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application. EAO anticipates that potential disruptions to access to hunting and trapping areas for any Aboriginal Groups currently participating in such activities would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Lake Cowichan First Nation's asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, land use and visual quality (sensory

disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible–to-Minor impacts to Lake Cowichan First Nation's asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

Lake Cowichan First Nation has reported gathering eelgrass at Roberts Bank in the intertidal zone. Other member bands of the Hul'qumi'num Treaty Group have reported that berries and other plants were gathered and cultivated by *Hul'qumi'num' Mustmiuhw* ancestors at *Tl'uqtinus,* and were harvested from other locations in the Project area. These plants included cranberries, blueberries, blackberries, wapato, and bulrushes/reeds*.* Available information indicates that berries were traditionally harvested from bogs in the vicinity of the historic Tl'uqtinus site and fire was used to maintain open areas for the berry bushes from encroachment from pine trees.

Lake Cowichan First Nation identified concerns related to potential effects to vegetation, including:

- potential adverse effects of removing the Tunnel on the marshes along the South Arm of the Fraser River;
- Increased invasive species and proposed plans to manage their presence during construction, and a request for culturally significant plants to be included in planting plans. Lake Cowichan First Nation noted interest in opportunities to be involved in identification of plants, and planting work, noting that they had the capacity to undertake this type of work; and
- The Proponent's hydro-seeding spray contains invasive grasses that Lake Cowichan First Nation expressed concern about damaging new plants and adding to the problem of invasive plants.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect vegetation species which EAO understands pertain to Lake Cowichan First Nation's asserted Aboriginal rights to gather.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

While Lake Cowichan First Nation communicated to the Proponent their concerns that potential Project impacts could adversely affect their ability to harvest within the Project area, no information was provided that indicates Lake Cowichan First Nation traditionally gathered plants from within the Project area. EAO also considered that gathering areas in the vicinity of the Tunnel corridor on the north shore of the South Arm, including surrounding bogs and sites of importance for Lake Cowichan First Nation's traditional gathering, are understood to be outside both the LAA and RAA for vegetation. Furthermore, there is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO has also proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at gathering areas would affect quality of experience for Lake Cowichan First Nation. It is understood that residual quality effects are anticipated within 1  km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible–to-Minor impacts to Lake Cowichan First Nation's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

No information on Lake Cowichan First Nation's interests with respect to archaeology and cultural heritage were identified in the study prepared for this Project, *Ts'uubaasatx Interest: George Massey Tunnel,* or in publicly available sources.

Lake Cowichan First Nation identified concerns and comments including:

- Protection of Lake Cowichan First Nation's rights to use the Project area, including to camp;
- Importance of maintaining and protecting traditional historical access to the Project area, and future aspirations of Ts'uubaasatx to learn about and exercise their rights in the Project area as the community grows;
- Not only maintaining and asserting Aboriginal right to camp, hunt, fish and otherwise move about in the area of the Tunnel, but to restore the area in the future as a healthy habitat that can be utilized for food gathering purposes;
- Protection of archaeological and heritage resources, including intangible heritage sites, and protection of cultural and archaeological sites that are known to exist or may be discovered within the Project area;
- No more tolerance for further disturbance of archaeological sites in the overdeveloped Lower Mainland, including disturbed and intact sites; and
- Interest in participation in archaeological fieldwork and review of archaeological draft reports, as well as the importance of having a cultural person known to Lake Cowichan First Nation and Lyackson First Nation participate in archaeological work.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and

experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

There is not anticipated to be an overlap between Lake Cowichan First Nation's archaeological and cultural heritage interests with the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

There is potential for changes to quality of experience at unspecified important locations for Lake Cowichan First Nation to occur, in particular in relation to changes in atmospheric noise during construction and operations, and visual conditions during operation. These effects are not fully mitigable or reversible. EAO does not anticipate sites of importance to Lake Cowichan First Nation to be affected based on currently known information.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at sites of importance to Lake Cowichan First Nation.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Lake Cowichan First Nation, such as spiritual or storied sites, or named places, potentially affected by the Project, although EAO is unaware of any such sites in the vicinity of the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of

residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance including visual quality and noise), human health (atmospheric noise and air quality), and land use, and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible–to-Minor impacts to Lake Cowichan First Nation's other traditional and cultural interests.

Impacts on Asserted Aboriginal Title

Members of the Lake Cowichan community are actively working to find members that have dispersed from the community, and they have expressed their desire to, at some time in the future, visit the Project area with these new members in order to renew their relationship with and learn about their "traditional rights" in the area.

Lake Cowichan First Nation expressed interest in Aboriginal participation and Project-related opportunities, including: potential employment, training, contracting and economic development opportunities; community preparedness; cultural recognition and naming; importance of *Tl'uqtinus* near the Project area for trade in terms of its historic, current and future significance; and revenue from tolling. Equity and revenue sharing for Aboriginal Groups and the importance of initiating related discussions with Aboriginal Groups during the pre-Application stage of the environmental assessment were also discussed, as well as ensuring there was adequate training time to take full advantage of potential future Project work activities, as well as opportunities for training related to traditional opportunities.

EAO has considered how the Project may impact each of the following three components of Lake Cowichan First Nation's Aboriginal title claims overlapping the Project area: use and occupation, decision-making, and economic benefits.

In regards to potential effects to Lake Cowichan First Nation's use and occupation of the area, EAO considered that the majority of construction works would be confined to relatively small areas during construction, be temporary in nature, and for the road improvements would be within a pre-existing corridor. The nature of the new bridge will result in permanent changes to the landscape, which could impacts the practice/ expression of Aboriginal Interests in the vicinity of the Project. Impacts related to visual quality are not mitigable, although again they will be limited in geographic extent.

Regarding Lake Cowichan First Nation's control of the area and decision-making over the land, EAO considered that the Proponent has provided and would continue to provide capacity funding to support the meaningful participation in future consultation activities with the Proponent and in the regulatory process.

Regarding potential effects to the ability to benefit economically from the land, EAO considered that the Proponent is actively engaged with Aboriginal Groups to ensure that local First Nation communities benefit directly from the Project, including opportunities related to employment, training and contracting. The Proponent would also encourage and support the use of Aboriginal and local businesses by encouraging suppliers and subcontractors to adopt local procurement. EAO's proposed Aboriginal engagement report condition would also require the Proponent to include description of actions taken or planned to provide training, construction monitoring, employment, business, and contracting opportunities to Aboriginal Groups.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects, and as discussed in section 13.5 of this Report, the Project is expected to result in Minor impacts to Lake Cowichan First Nation's asserted Aboriginal title.

## 14.6 Lyackson First Nation

### 14.6.1 Context

Lyackson First Nation is a Hul'qumi'num-speaking Central Coast Salish group. Lyackson First Nation has three reserves, all on Valdes Island (*Le'eyqsun*), which lies approximately 45 km west of the Project area on the west side of the Strait of Georgia, directly opposite the mouth of the Fraser River. Over 90% of Lyackson First Nation's 198[33] registered members live off reserve, principally in or near the eastern shore of Vancouver Island and the adjacent Gulf Islands of the Salish Sea. Chemainus serves as the administrative center for the Lyackson, but the eastern Gulf Island of *Le'eyqsun* (also known by its English name, Valdes) is described by Lyackson First Nation as their cultural homeland. Lyackson are part of the Hul'qumi'num Mustmiuhw, a group of six Vancouver Island First Nations that together form the Hul'qumi'num Treaty Group.[34]

Based on their affiliation with the Hul'qumi'num Treaty Group, Lyackson First Nation has also asserted a larger, collective traditional territory with the other member First Nations of that group. The asserted traditional territory of the Hul'qumi'num Treaty Group members generally includes parts of South-eastern Vancouver Island, the southern Gulf Islands, a portion of the Lower Mainland, and the waters of the Salish Sea to the

[33] As of August 2015.
[34] The other members of the Hul'qumi'num Treaty Group include Cowichan Tribes, Halalt First Nation, Penelakut Tribe, Stz'uminus First Nation and Lake Cowichan First Nation.

Sunshine Coast, including the lower portion of Howe Sound, Haro Strait, the Strait of Juan de Fuca and the Fraser River up to Yale.

The members of the Hul'qumi'num Treaty Group collectively assert a traditional territory of core Aboriginal title lands and a broader traditional fishing territory, as described in its Statement of Intent to the BC Treaty Commission. Of particular relevance to this Project, is the assertion of Aboriginal rights and title that includes "the south arm of the Fraser River, including Canoe Pass, up to and including Douglas Island, with lands on the north shore of the south arm up to Sapperton Channel (New Westminster), the islands in the south arm of the Fraser River and the south bank of the Fraser River along Canoe Pass up to Deas Island" [35].

Lyackson First Nation, along with other Island Halkomelem speaking groups, traditionally utilized the lands and waters on both sides of the Strait of Georgia as part of a seasonal round. The Aboriginal title lands claimed by the Hul'qumi'num Treaty Group includes *Tl'uqtinus*, spanning the north shore from approximately opposite Deas Island to opposite Tilbury Island. Lyackson First Nation reportedly had a house at *Tl'uqtinus* along with each of the other Hul`qumi`num Treaty Group member bands. Lyackson Elders and knowledge holders have described *Tl'uqtinus* as having been a powerful and permanent *Hul'qumi'num Mustimuhw* trading centre for a number of commodities. Lyackson First Nation reported that they traveled between *Le'eyqsun* and the mouth and south arm of the Fraser River year-round for visiting and resource-harvesting purposes, as well as up and down the Northwest Coast.

### 14.6.2 Preliminary Strength of Claim Assessment

The entirety of the Project corridor (approximately 25 km) runs through the asserted traditional territory of the Lyackson First Nation, as collectively asserted with the members of the Hul'qumi'num Treaty Group.

It is understood from the information reviewed that Lyackson First Nation's primary traditional village sites were on Valdes Island.

In the ethnographic and historic sources, members of the Hul'qumi'num Treaty Group were often all referred to as "Cowichan". Occasionally "Cowichan" was also used to refer to a broader group that included all of the Central Coast Salish or Halkomelem speaking people. This lack of clarity in the information means it is sometimes difficult to

[35] Hul'qumi'num Treaty Group Statement of Intent. BC Treaty Commission website. http://bctreaty.net/soi/soihulquminum.php (accessed August 26, 2016).

attribute historical references of “Cowichan” use to individual Aboriginal groups or collectives of particular Aboriginal groups. However, where historical information indicates the presence and use of the Project area by Cowichan people in a manner that makes it unclear which Aboriginal group was being described, EAO has not used this information to undermine the exclusivity component of Aboriginal title for the Lyackson First Nation preliminary strength of claim assessment or other members of the Hul’qumi’num Treaty Group.

It is understood that Cowichan people have historically been residents of Vancouver Island and other Gulf Islands, and travelled annually to the South Arm of the Fraser River to fish for salmon and sturgeon, including prior to and around the time of contact below and upstream of the Project. Based on current case law and a review of the currently available information, and descendancy from the historic Cowichan people, EAO’s preliminary assessment is that Lyackson First Nation has a **strong *prima facie* claim of Aboriginal rights** to fish, gather and hunt in the areas in proximity to the Project area, including the South Arm of the Fraser River.

EAO is of the view that the available information suggests Cowichan people did not traditionally occupy the Project footprint with the intention of controlling this land, although given the relative proximity of the Project to the claimed village site, an inference can be made that Cowichan people may have utilized this area for resource harvesting activities. The Project footprint appears to be at the western edge of an area identified by ethno-historians as a boundary between the traditional territories of several different Aboriginal groups: Musqueam Indian Band to the west and north, Tsawwassen First Nation to the southwest, and Kwantlen First Nation to the south and east. Some early ethnographers identified an area of land at the intersection of these traditional territories as not attributed to any Aboriginal Group. The information also indicates that the Fraser River and surrounding area was a particularly rich resource area and the sheer abundance of resources may have reduced the need or practicality of defending use by others. In fact, information indicates that multiple Aboriginal groups may have fished, hunted, and gathered within the vicinity of the Project footprint, which raises questions regarding whether exclusivity of use of the area can be established by the Cowichan people.

Based on the above, and descendancy from the historic Cowichan people, EAO’s preliminary assessment is that Lyackson First Nation has a **moderate *prima facie* claim of Aboriginal title** to the Project footprint. EAO notes that Lyackson First Nation has communicated its disagreement about this preliminary *prima facie* strength of claim assessment of Aboriginal title.

### 14.6.3 Involvement of the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Lyackson First Nation's Aboriginal Interests, EAO is of the view that the duty to consult Lyackson First Nation lies at the mid-to-high end of the *Haida* consultation spectrum. Lyackson First Nation is listed in Schedule B of the Section 11 Order.

Lyackson First Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Lyackson First Nation also attended Working Group meetings on January 21, March 10, and September 20-21, 2016, a site visit on September 19, 2016, and was invited to meet with EAO staff directly.

The Proponent began consulting with Lyackson First Nation in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events has included 15 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Lyackson First Nation with two rounds of funding, one in pre-Application phase and the other in Application Review phase, to support their involvement.

A summary of the Proponent's engagement activities with Lyackson First Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| November 10, 2014 | Meeting (teleconference) | Initial meeting between Lake Cowichan First Nation, Lyackson First Nation, EAO and the Proponent. The Proponent introduced the Project Description and Proposed Studies document; EAO outlined the EA process and consultation. |
| January 21, 2016 | Working Group meeting | Lyackson First Nation attended. |
| March 10, 2016 | Working Group meeting | Lyackson First Nation attended. |
| September 6, 2016 | Teleconference | Teleconference to update new Lyackson First Nation Land and Resource Use Coordinator on the status of the EA and Application Review phase. |
| September 19, 2016 | Working Group Site Tour | Lyackson First Nation attended. |
| September 20-21, 2016 | Working Group meeting | Lyackson First Nation attended. |

| | | |
|---|---|---|
| October 3, 2016 | Email (attachment | EAO invitation to Lyackson First Nation to comment on early section of Part C. |
| October 17, 2016 | Email (attachment) | Lyackson First Nation submitted comments on early section of Part C and on the Application |
| November 22, 2016 | Email (attachment) | EAO invitation Lyackson First Nation to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC.. |
| November 23, 2016 | Email (attachment) | EAO invitation to Lyackson First Nation to comment on EAO's draft Part C. |
| December 13, 2016 | Email (attachment) | Lyackson First Nation response regarding EAO's draft referral package. |
| December 14, 2016 | Email (attachment) | Lyackson First Nation response regarding EAO's draft Part C. |
| January 5, 2017 | Email (attachment) | EAO response to Lyackson First Nation response regarding EAO's draft referral package and Part C. |

### 14.6.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Lyackson First Nation during the EA (EAO notes that these key issues and concerns are in addition to those relating to potential impacts of the Project to Lyackson First Nation's Aboriginal Interests, which are discussed in section 14.6.5):

*Methodology, Process and Consultation*

- View that they required funding for participation in EAO's process in addition to funding provided by the Proponent and were concerned about a lack of resources and funding for Aboriginal communities;
- Concern about differences between different EAs, the number of EAs currently underway, associated timelines, the effectiveness and nature of the EA process, and the assessment of cumulative effects on Aboriginal Interests;
- Communicated to the Proponent their disagreement with EAO`s strength of claim assessment, as well as the related depth of consultation;
- View that the proper context of the Village site was not considered nor was the Village site as a trade area accurately characterized (the Proponent clarified that it had provided the draft language to Lyackson First Nation prior to submitting the Application to EAO);
- Interest in being consulted on any management plans (Aboriginal groups

including Lyackson First Nation will be consulted on most proposed management plans as per the TOC); and

- Concerns about how early they had been engaged, noting they only had one opportunity to meet with the Proponent and their Traditional Knowledge holders regarding their TUS which the Proponent funded.

*Environmental Impacts*

- Concern regarding congestion and air quality issues, and their support for improved transit and anything that reduces idling, and was interested in the traffic assessment methodology in the Application and the effects of increased traffic on urbanization;
- Increased air contamination from idling vehicles, perceivable from the Fraser River banks, resulting in disturbance of Lyackson First Nation use and potential adverse effects on human and animal health was also a concern;
- Concerns about cumulative effects on Aboriginal rights;
- The Project rationale for widening the highway, which Lyackson First Nation is of the view will result in increased traffic, highway run-off, GHG emissions, and pollutants associated with the construction phase; and
- Generally, adverse impacts of decommissioning the existing Tunnel.

*Health and Human Safety*

- Concerns that the Project may lead to higher traffic volume and resulting increase in GHG emissions, including from the construction phase;
- Concerns that potential effects related to air quality, including from traffic, has not been adequately addressed, and concern about adverse impacts of construction on air quality;
- Concerns about potential adverse effects from noise due to pile driving and blasting, as well as from increase in traffic, and consequent increase in associated noise and vibration due to the increased capacity of the new bridge;
- Concerns about socio-economic impacts of the project and health, including that the presence of a new bridge could result in increased suicide attempts and criminal activity, homeless populations, and attract shadow populations/marginalized groups; and

- Concern that potential spread of social problems would occur, including drug and sex trafficking, to more areas in the Lower Mainland due to economic changes.

### 14.6.5 Potential Impacts of the Project to Lyackson First Nation's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Lyackson First Nation's Aboriginal Interests. These potential impacts are characterized by considering how the Project could affect several factors important to Lyackson First Nation's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in sections 4 - 8 of this Report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Lyackson First Nation for the preparation and submission of the following TUS: *Preliminary Lyackson Use and Occupancy Mapping Study for BC MOTI`s George Massey Tunnel Replacement Project.*

EAO considered all information available, including from public sources as well as relevant technical issues raised by Lyackson First Nation, in the following assessments of the potential impacts of the Project on Lyackson First Nation's Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Lyackson First Nation from available sources is described below.

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

Lyackson has informed EAO that its elders have reported that “marine species harvested at the mouth and south arm of the Fraser include sockeye and pink salmon, sturgeon, halibut, dogfish, octopus, oysters and other shellfish”.

Areas within the wider Fraser River estuary were also utilized by *Hul’qumi’num'*-speaking peoples for fishing salmon, sturgeon, groundfish, halibut, and other marine resources on the foreshore (e.g., Tsawwassen, Point Roberts, and 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 within their trans-Georgia Strait settlement round. The same has also been reported by Lyackson First Nation in regard to marine mammals (i.e., seals, porpoise, sea otters, sea lions, and whales).

Lyackson First Nation currently participates in the Hul’qumi’num Fisheries Limited Partnership (HFLP), a commercial fishing business, along with Cowichan Nation Alliance member groups and Lake Cowichan First Nation. Species harvested under commercial licences through this enterprise are crab, prawn, halibut, herring, rockfish, sablefish, and salmon. Commercial fisheries for halibut and sablefish are generally undertaken off the west coast of Vancouver Island. Lyackson First Nation also holds, independently of the HFLP, a commercial licence for red sea urchin and a 1/16$^{th}$ block of geoduck, purchased in the last quarter of 2015.

Lyackson First Nation identified several concerns related to potential effects to fish and fish habitat, and water quality, including:

- Potential effects to fish and fish habitat, including to migrating salmon and other marine life;
- Concern about use and disposal of dredged and other material in the Fraser River as well as about dredging of the Fraser River;
- Accidents and malfunctions including spills of hydrocarbons from refueling or leaks in construction equipment/vessels and during operations were also raised
- Potential effects related to species of cultural and economic importance such as eulachon, sturgeon and salmon;
- Potential effects including mortality from pile driving, blasting and underwater noise generated by Tunnel decommissioning and other construction activities, including dredging and disposal of dredged and other material in the Fraser

River, disturbance of green space on Deas Island, increased vessels due to construction, particularly to salmon migration;

- Adverse impacts on fishing, fishing habitat and marine mammals, particularly where negative impacts have already deteriorated fish populations and access to key fishing sites including but not limited to Deas Island;
- Adverse effects to salmon spawning associated with decreased shade or cooling on the banks of the Fraser River from increased development;
- Fraser River flow rates after Tunnel removal, and potential effects of run-off and drainage to water quality;
- Potential adverse effects on the marshes along the South Arm of the Fraser River, which provide critical habitat for fish and maintenance of water quality;
- Potential increased run off related to the Project allowing for increased traffic volumes during the operational phase;
- Impacts of the River from potential pollutants and contaminants on the Tunnel walls if the Tunnel is left in place; and
- Potential vibration, light and noise effects, on fish in addition to other marine life.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Lyackson First Nation's concerns regarding underwater noise effects on fish, EAO notes that this pathway was considered in EAO's Report. In regards to Lyackson First Nation's concerns about potential effects to white sturgeon from the Project, sturgeon was one of five sub-component species assessed. EAO considered that fish species of conservation concern including white sturgeon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity will not be adversely affected. In regards to concerns about river hydraulics and redistribution from sedimentation, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO discusses its assessment of potential effects of the Project on river hydraulics and river morphology in the lower Fraser River in section 4.2, and is of the view that residual effects to hydrology would not be significant. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal

Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel"[36]. Any such future plans would be subject to review under the VFPA's Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

[36] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

Lyackson First Nation reported that “Lyackson members used and continue to use the Project area, particularly around the south arm of the Fraser at Steveston and Canoe Pass, for visiting with members of other First Nations, for fishing, hunting, and gathering of subsistence resources, and as a residence area. The mouth and south arm of the Fraser are reported to be the source of over fifty percent of Lyackson’s current subsistence salmon catch. Lyackson members also historically used and occupied the area while fishing commercially and working at canneries. The area remains of critical cultural and subsistence importance to Lyackson members today.”

*Hul’qumi’num Mustimuhw,* which includes Lyackson First Nation, reportedly followed a seasonal round of resource use and regional settlement that took them from their winter residences on Vancouver Island and the Gulf Islands across the Strait of Georgia to the Fraser River estuary, where they resided for all or part of the annual salmon runs (April to through October), or, in some instances, year-round. Seasonal movements reportedly involved the relocation of entire households, including house planks and supplies, from location to location within the collective traditional territory, between three and five times annually. Lyackson members have reported that having a base at the mouth and South Arm of the Fraser River, where they could prepare and preserve food before crossing the Strait of Georgia, was an important part of their subsistence system.

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 First Nation, with Canoe Passage (*Hwlhits’um*) identified as particularly important for salmon fishing. Lyackson Elders recall crossing the Strait of Georgia to the mouth of the Fraser River to participate in commercial fishing, primarily for sockeye. Salmon and other fish were said to be abundant and easily fished in large numbers from small vessels. Dried clams and other foodstuffs (e.g., camas) were also traded to other Aboriginal Groups while *Hul’qumi’num’*-speaking groups were resident in and around the area.

Access to sockeye for Hul’qumi’num Treaty Group member nations for FSC purposes is said to be provided annually by 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 Aboriginal Groups 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 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).

DFO management areas to which Lyackson FSC licences apply are not specified in their latest available fisheries agreement with DFO; however, Lyackson First Nation's agreement suggests that their current fishing focus is on traditional areas in and around *Le'eyqsun,* surrounding Gulf Islands, and locations on Vancouver Island. The Application notes that DFO records for communal FSC licences in the Fraser River downstream of the Port Mann Bridge do not suggest that Lyackson First Nation has had recent access to fisheries in this area. Lyackson First Nation that as their TUS states, the mouth and south arm of the Fraser River are the source of over 50% of Lyackson First Nation's current subsistence salmon catch and that their members further expect to continue using the mouth and south arm of the Fraser River for fishing. Lyackson First Nation also noted that the TUS noted low present-day fish populations require larger boats and more expansive technology to obtain fish in sufficient number to meet their subsistence and commercial needs and for this and other reasons, fishing in the Fraser River has been largely unavailable, and that this is indication that their asserted Aboriginal rights to fish are already hindered. Lyackson Elders confirm that, at one time, family ties and arrangements between communities provided consistent access to salmon at the mouth of the Fraser River, but that, today, other Aboriginal Groups attempt to require Lyackson First Nation to seek permission prior to harvesting in the area.

Lyackson has informed EAO that today its "members are largely prevented from accessing the mouth and south arm of the Fraser due to cumulative impacts in the Lower Mainland. Existing levels of urbanization and industrialization have reduced the ability of Lyackson members to harvest in the area, and reduced the frequency of interactions between Lyackson and Lower Mainland First Nations for cultural, ceremonial, and economic reasons. In addition to this, large ship traffic in the Salish Sea impairs Lyackson members' ability to travel to the Fraser in small crafts. Because of fewer returning fish, increasing costs, and restrictive administrative requirements, Lyackson elders indicated that Lyackson members have largely been excluded from current commercial fisheries. Despite changes in commercial fishing, and increasing pressure on fish stocks, Lyackson members reported continuing fishing of the lower Fraser area based on long-standing practices."

"Elders contrasted the past abundance of salmon and other fish in the area, where large quantities could be harvested by jigging from canoes and other small craft, to the current low populations of fish which require expensive boats and technologies to harvest reliably, or in sufficient quantities for subsistence or commercial use. Due to a variety of existing impacts, Lyackson elders indicate that the ability of Lyackson members to harvest and maintain relationships with marine and foreshore resources is already seriously impacted, and many marine species are already in serious decline in

the region, including species critical to Lyackson cultural practice such as salmon, killer whales, eulachon and others."

Lyackson First Nation identified specific issues and concerns with potential Project impacts relating to specific locations and access to fishing and marine resource harvesting activities:

- Lyackson First Nation's ability to harvest within the Project area and values, including related to subsistence fishing, anticipated to be directly impacted by Project construction and operation;
- Access to the Fraser River and potential of the Project construction to displace fishing vessels and Lyackson First Nation fishing activities, as well as the importance of working closely with communities to ensure negative effects are avoided;
- Potential adverse impacts on access to the mouth and south arm of the Fraser River due to cumulative impacts of urbanization and industrialization of the Project area, which Lyackson First Nation noted could be exacerbated by the Project;
- Potential adverse effects of removing the Tunnel on the marshes along the South Arm of the Fraser River, which provide critical habitat for fish for protection from predators, rest, and for maintaining water quality; and
- Post construction monitoring and sharing information with Aboriginal Groups.

Disruption of access to fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. EAO has not received information from Lyackson First Nation indicating fishing activities occur within this 7.5 km stretch of the river, and as such does not anticipate potential for construction activities to impact access to Lyackson First Nation's fishing activities. EAO is aware however that Lyackson First Nation is interested in expanding their fishing activities in the vicinity of the Project. EAO anticipates that any potential disruption to access for Aboriginal Groups to fishing areas within the 7.5 km stretch of the river described above would be would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused

by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure, and this is not expected to affect Lyackson First Nation, as EAO understands Lyackson First Nation is not currently fishing in this area.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests. In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise), and as discussed in section 13.1 of this Report, the Project is expected to result in Minor impacts to Lyackson First Nation's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Lyackson First Nation report that in the past they hunted for ducks and geese in the Project area, while whitetail deer were hunted farther up the Fraser River. Lyackson First Nation also reports currently harvesting ducks, deer, and grouse and Porlier Pass

(outside of the Project area, in between Galiano and Valdes Islands), which they say remains a particularly important marine and terrestrial resource harvesting area for Lyackson First Nation given the range of resources that occur there.

Lyackson First Nation identified the following concerns and comments related to potential effects to wildlife and wildlife habitat, including:

- Protection of Lyackson First Nation's ability to harvest within the Project area;
- Potential adverse impacts on marine mammals such as the Stellar Sea Lion;
- Adverse potential effects on wildlife, including ducks, geese, and deer, in the Project area, due to:
    - Decreased Fraser River water quality from run off and drainage, as well as from potential pollutants and contaminants on the Tunnel walls are left in place;
    - Potential light and noise effects on wildlife; and
    - Potential effects of the bridge structure on species such as waterfowl and migratory birds; and
- Decreased quantity of birds, air quality impacts to wildlife, and destruction of wildlife and nesting habitat, especially for bald eagles, waterfowl and blue herons, due to disturbance of green space on Deas Island and other riparian areas in the Project footprint during construction and operation, and from the BC Hydro infrastructure.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report.

EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operation as well as a marine mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed conditions requiring a noise management plan. and a drainage and stormwater management plan to be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and

experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Lyackson First Nation's asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, land use and visual quality (sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible–to–Minor impacts to Lyackson First Nation's asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

Lyackson First Nation has said that members recall harvesting berries (including salmonberries and huckleberries), cattails, and fiddleheads in the Project area. Available information indicates that berries were traditionally harvested from bogs in the vicinity of the historic Tl'uqtinus site and fire was used to maintain open areas for the berry bushes from encroachment from pine trees.

Berry-picking sites are said to be currently available to Lyackson First Nation members at Porlier Pass (outside of the Project area, in between Galiano and Valdes Islands).

Lyackson First Nation identified the following concerns and comments related to potential effects to gathering activities:

- Protection of Lyackson First Nation's ability to harvest within the Project area, including as resulting from: increased development and pollution on current and future harvest of berries and medicinal plants; pollution from dredging activities; increased traffic volumes; negative impacts to quality of air, water, and terrestrial habitats;
- Increased invasive species and proposed plans to manage their presence during construction, and a request for culturally significant plants to be included in planting plans. Lyackson First Nation noted interest in opportunities to be involved in identification of plants, and planting work, noting that they had the

capacity to undertake this type of work;

- Concern proposed management plans and habitat enhancements/offsets will not fully address their ecological, cultural and spiritual concerns; and
- The Proponent's hydro-seeding spray contains invasive grasses that Lyackson First Nation expressed concern about damaging new plants and adding to the problem of invasive plants.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect vegetation species which EAO understands pertain to Lyackson First Nation's asserted Aboriginal rights to gather.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

EAO also considered that gathering areas in the vicinity of the Tunnel corridor on the north shore of the South Arm including surrounding bogs and sites of importance for Lyackson First Nation's traditional gathering are understood to be outside both the LAA and RAA for vegetation. Furthermore, there is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO has proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Lyackson First Nation's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

Lyackson First Nation informed EAO that "Lyackson's use of lands, waters, and resources in the area of the mouth and south arm of the Fraser River within 5 km of the Project, including the ancestral village site of Tl'uqtinus and camps, cabins, and other residences in the area of Steveston and Canoe Pass, are fundamental to past, present, and future Lyackson use and occupancy, and to the ongoing practice of Lyackson culture, identity, and rights."

Lyackson First Nation identified a number of culturally important places, including *Sùtl`qulus*, meaning "facing outside", for the east side of Le'eqsun, and *Kwùkwìyukwun,* a fishing area off the southeastern end of *Le'eqsun,* in the Strait of Georgia (which EAO understands do not overlap with the Project corridor). A newly constructed youth camp, where the canoes of their ancestors once lined up in preparation for trips to the Fraser River, is also located on the eastern side of *Le'eqsun.*

Lyackson Elders and knowledge holders also identified the importance of Tl'uqtinus, in the vicinity of the north end of the Tunnel, opposite Tilbury Island and have described *Tl'uqtinus* as having been a powerful and permanent *Hul`qumi`num Mustimuhw* trading centre for a number of commodities.

Lyackson First Nation identified concerns and comments including:

- Lyackson First Nation's use of lands, waters, and resources in the area of the mouth and south arm of the Fraser River within 5 km of the Project, including the ancestral village site of Tl'uqtinus and camps, cabins, and other residences in the area of Steveston and Canoe Pass, are fundamental to past, present,

and future Lyackson First Nation use and occupancy, and to the ongoing practice of Lyackson First Nation culture, identity, and rights;

- Concerns about the visual quality effects of running BC Hydro power lines above ground, as opposed to their current location within the Tunnel;
- Downstream effects on archaeological sites from Tunnel decommissioning;
- Protection of archaeological and heritage resources, including intangible heritage sites, and protection of cultural and archaeological sites that are known to exist or may be discovered within the Project area, and concern that adverse impacts of historical or archaeological heritage sites may not be mitigated by future management plans;
- Adverse impacts to Lyackson First Nation's past, current and future cultural heritage which Lyackson First Nation notes are based on continued traditional practices and cannot be mitigated by proposed mitigation plans or installing artwork at the bridge site; and
- Assessment of cultural significance of the site, if a run-off pool is being created for the Project on Deas Island.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

There is not anticipated to be an overlap between Lyackson First Nation's archaeological and cultural heritage interests with the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

There is potential for changes to quality of experience at unspecified important locations for Lyackson First Nation, including Tl'uqtinus (ancestral village site) and Hwlhits'um/Canoe Pass and Steveston (traditional areas where camps, cabins and other residences were located), to occur, in particular in relation to changes in atmospheric noise during construction and operations, and visual conditions during operation. These effects are not fully mitigable or reversible. EAO does not anticipate

sites of importance to Lyackson First Nation to be affected based on currently known information.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. EAO recognizes Lyackson First Nation's concern in regards to the potential impact to visual quality due to running the BC Hydro power line above ground, but notes given the design of the transmission line replacement and its alignment with the bridge piers and deck, this is not anticipated to result in cumulative effects. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at Tl'uqtinus, Hwlhits'um and Steveston sites.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Lyackson First Nation, such as spiritual or storied sites, or named places, potentially affected by the Project, although EAO is unaware of any such sites in the vicinity of the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance including visual quality and noise), human health (atmospheric noise and air quality), and land use, and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Lyackson First Nation's other traditional and cultural interests.

Impacts on Asserted Aboriginal Title

Lyackson First Nation identified concerns and comments, including:

- Inappropriate toll burden to access Lyackson village site, especially considering the current BC Ferries toll burden;
- Adverse impacts to Lyackson First Nation's asserted Aboriginal title interests from the continued decline of the quantity and quality of resources that support Lyackson's cultural, social and economic title interests, which Lyackson First Nation is of the view cannot be mitigated by subjective assessments on the quality of atmospheric noise and visual conditions;
- Interest in Aboriginal participation and Project-related opportunities, including:
    - Potential employment, training (and training related to traditional opportunities), contracting and economic development opportunities, including revenue sharing opportunities from tolling, and the importance of initiating related discussions with Aboriginal Groups during the pre-Application stage of the EA;
    - Importance of the Project area for trade in terms of historic and current/future significance, particularly in relation to *Tl'uqtinus;* and
    - Opportunities for cultural recognition and naming, with suggestion that a Canoe be commissioned which would have paddles for each Nation showing the relationship between the Proponent and the Nations.

EAO has considered how the Project may impact each of the following three components of Lyackson First Nation's Aboriginal title claims overlapping the Project area: use and occupation, decision-making, and economic benefits.

In regards to potential effects to Lyackson First Nation's use and occupation of the area, EAO considered that the majority of construction works would be confined to relatively small areas during the construction, be temporary in nature, and for the road improvements would be within a pre-existing corridor. The nature of the new bridge will result in permanent changes to the landscape which could impact the practice/expression of Aboriginal Interests in the vicinity of the Project. Impacts related to visual quality are not mitigable, although again they will be limited in geographic scope.

Regarding Lyackson First Nation's control of the area and decision-making over the land, EAO considered that the Proponent has provided and would continue to provide

capacity funding to support the meaningful participation in future consultation activities with the Proponent and in the regulatory process.

Regarding potential effects to the ability to benefit economically from the land, EAO considered that the Proponent is actively engaged with Aboriginal Groups to ensure that local First Nation communities benefit directly from the Project, including opportunities related to employment, training and contracting. The Proponent would also encourage and support the use of Aboriginal and local businesses by encouraging suppliers and subcontractors to adopt local procurement. EAO's proposed Aboriginal engagement report condition would also require the Proponent to include description of actions taken or planned to provide training, construction monitoring, employment, business, and contracting opportunities to Aboriginal Groups.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects, and as discussed in section 13.5 of this Report, the Project is expected to result in Minor impacts to Lyackson First Nation's asserted Aboriginal title.

## 14.7 Musqueam Indian Band

EAO and Musqueam Indian Band (Musqueam) have attempted to collaboratively draft this chapter, through work undertaken from October 2016-January 2017. Where consensus was not reached between EAO and Musqueam, the differing views of EAO and Musqueam are indicated through chapter headings or language written by one of the parties. More discussion on the collaboration process is provided throughout this document from the perspective of both EAO and Musqueam.

### 14.7.1 Community Profile

Musqueam has communicated to EAO that Musqueam's identity and livelihood are intrinsically linked to their unceded territory, their core teaching being the necessity of knowing who you are and where you come from. Musqueam assert Aboriginal Title over this territory over which they note their perspective that they exercised exclusive control prior to the assertion of Crown sovereignty. This core territory of approximately 144,888 ha,[37] as described in the 1976 Musqueam Declaration, encompasses the lands, lakes and streams defined and included by a line commencing at Harvey Creek

[37] Musqueam Indian Band. 2007. Musqueam Community Profile: Knowing our Past, Exploring our Future.

in Howe Sound and proceeding Eastward to the height of land and continuing on the height of land around the entire watershed draining into English Bay, Burrard Inlet and Indian Arm; South along the height of land between Coquitlam River and Brunette River to the Fraser River, across to the South or left bank of the Fraser River and proceeding downstream taking in the left Bank of the main stream and the South Arm to the sea, including all those intervening lands, islands and waters back along the sea shore to Harvey Creek, and the sea, its reefs, flats, tidal lands and islands adjacent to the above described land and out to the centre of the Salish Sea (Georgia Strait).[38] Musqueam has communicated to EAO that the Project is located in the heart of Musqueam's territory.

Musqueam has communicated to EAO that Musqueam's oral tradition establishes ancestral connections to these lands and waters, including the Project area, since time immemorial.[39]Their core territory is described and known to them in a matrix of over 80 place names. To Musqueam these places are not limited to settlements (seasonal and winter), landscape features, and transformer sites[40], but also act as store houses of knowledge for oral traditions and histories of both individuals and Musqueam society as a whole. These traditions describe a time when the Fraser River delta was only water, before its current sedimentation.[41] Musqueam's name xʷməθkʷəy̓əm (anglicized "Musqueam"), translates to "Place of məθkʷəy̓", and is a site on what is now Musqueam IR 2. xʷməθkʷəy̓əm signifies the məθkʷəy̓ plant which grew throughout the Fraser River delta and tidal flats.[42] Musqueam communicated that Musqueam IR2, under 6  km from the Project footprint, is a site of important historical villages documented by Simon Fraser during his descent of the Fraser River in 1808, with archaeological evidence indicating habitation at the site for more than 4,000 years, and continuous occupation through the present. Current oral histories carry these traditions forward, and layer a continuity of Musqueam history, culture, and use of their lands and resources.

Musqueam are part of the regional Central Coast Salish cultural group and traditionally speak hən̓q̓əmin̓əm̓, also known as the Downriver Dialect of Halkomelem; the central

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[38] Musqueam Indian Band. 1976. *Musqueam Declaration*. Musqueam Indian Band. http://www.musqueam.bc.ca/sites/default/files/musqueam_declaration.pdf.
[39] Musqueam Indian Band. 1976. *Musqueam Declaration*. Musqueam Indian Band. http://www.musqueam.bc.ca/sites/default/files/musqueam_declaration.pdf. Roy, Susan. 2007. *Who were these mysterious people?: the Marpole Midden, Coast Salish identity, and the dispossession of Aboriginal lands in British Columbia*. University of British Columbia, Vancouver.
[40] Transformer sites are sites of historical interactions with χe:y̓ls, the transformer.
[41] "c̓, Susan. 2007. m.bc.ca/sites/default/files/musqueam_declaration.pdflaration.pdf" nd Gallery. 4000 Musqueam Avenue. Vancouver, BC V6N 4B9. 23 January 2015.
[42] Musqueam Indian Band. 2007. Musqueam Community Profile: Knowing our Past, Exploring our Future.

dialect of three ranging from the eastern shores of Vancouver Island through the Lower Fraser canyon. Halkomelem is a member of the Salishan language family,[43] and is heavily tied to the landscape and lifestyles of its speakers (e.g. riverine directionality system). The Coast Salish cultural group is historically made up of interconnected families, alliances, and linguistic identities that extended past village boundaries to encompass larger geographical, cultural, and spiritual spaces.[44]

Musqueam has three registered reserves accounting for approximately 0.2% (338 hectares) of their traditional territory: Musqueam IR2 (the largest reserve, also known as the 'Musqueam Indian Reserve,' located south of Marine Drive at the mouth of the Fraser River); Musqueam IR4 (located in Ladner); and Sea Island IR3 (located on the northwest corner of Sea Island at the outlet of the north arm of the Fraser River).[45] Musqueam's administrative centre and principal community are located on Musqueam IR2. Musqueam currently has approximately 1,383 registered members, with approximately 672 members living on Musqueam IR2.[46]

### 14.7.2 EAO's Preliminary Strength of Claim Assessment

The Project corridor overlaps with Musqueam Indian Band's asserted traditional territory at the north 15 km of the corridor, including the South Arm of the Fraser River.

EAO recognizes that the Supreme Court of Canada confirmed Musqueam has an Aboriginal right to fish, as established in the *Sparrow* decision. While EAO acknowledges the Province and the Musqueam have differing views on the geographic scope of the *Sparrow* decision, EAO indicated to Musqueam that it would be willing to consider the factors relevant to the *Sparrow* justification analysis if there was

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[43] First Peoples' Heritage, Language and Culture Council (FPHLCC). 2005. First Peoples' Language Map of BC. http://maps.fphlcc.ca/henqeminem; Ham, Leonard C, with linguistic assistance from Woolman, J. 2014. Traditional Musqueam Use of the Southern Fraser Delta. Overview prepared for Musqueam Indian Band; Wilson, Jordan P.H. 2015. Sq'eq'ip – Gathered Together. (Master's Thesis) Retrieved from the University of British Columbia.

[44] Roy, Susan. 2007. Who Were These Mysterious People?: The Marpole Midden, Coast Salish Identity, and the Dispossession of Aboriginal Lands in British Columbia. PhD. Dissertation: University of British Columbia.

[45] Musqueam Indian Band. 2011. *Musqueam First Nation: A Comprehensive Sustainable Community Development Plan*. Musqueam Indian Band. And AANDC. 2015. First Nation Profiles. http://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNReserves.aspx?BAND_NUMBER=550&lang=eng.

[46] AANDC. 2015. First Nation Profiles. http://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNReserves.aspx?BAND_NUMBER=550&lang=eng.

information indicating a potential impact to Musqueam fishing from the Project. This analysis is included in section 14.7.7.4 of this Report.

Based on the information reviewed, EAO is of the view that ethnographers understood the core traditional territory of the Musqueam people to be north of the Project area, in the vicinity of the North Arm of the Fraser River. Closer to the Project area, the information indicates Musqueam may have utilized fishing camps on the western shore of Lulu Island and on the South Arm of the Fraser River possibly on Westham Island. Canoe Passage was an important site for fishing and was the location of a fishing camp/village (also possibly used by other Aboriginal groups) at which cattails and rushes were gathered. EAO understands that the South Arm of the Fraser River, in the vicinity of the Project, was an important area for harvesting salmon and sturgeon for Musqueam and other Coast Salish groups pre-contact. There is some indication that bogs in the Delta area were used for harvesting plant resources, though the information does not attribute this activity to any one Aboriginal Group.

In addition to Musqueam's established Aboriginal rights to fish under *Sparrow,* EAO is of the view that the information reviewed supports a **strong *prima facie* claim of Aboriginal rights to harvest marine and terrestrial resources** (e.g. gathering, fishing, hunting and trapping) in the South Arm of the Fraser in the vicinity of the Project.

EAO notes that the Project footprint is near the southeastern end of what was considered by ethnographers to be Musqueam territory. The area of land directly west of the Project footprint is identified by ethno-historians as a boundary between the territories of Musqueam, Tsawwassen to the southwest and Kwantlen to the south and east. Ethnographers describe a centralizing of Musqueam occupation towards the north arm of the Fraser River in around the 1830's, which raises questions of the sufficiency of Musqueam occupation, particularly of the southern end of the Project footprint, at 1846. The information also indicates that multiple Aboriginal Groups fished, hunted and gathered in this area, which raises questions for EAO regarding whether exclusivity of use can be established by Musqueam to the Project footprint. As such, EAO assessed Musqueam as having a **moderate *prima facie* Aboriginal title claim** in the vicinity of the Project, with the claim being stronger at the north end of the Project footprint than further south.

EAO notes that it received additional ethnographic materials provided by Musqueam in December 2016. A review of this additional information was provided to Musqueam on January 9, 2017, and further information was provided to Musqueam, including a supplemental memo, on January 13, 2017. Through consideration of this additional

review, EAO turned its mind to the views expressed by Musqueam in its response to EAO's preliminary strength of claim as articulated below. Given the different views held by various ethnographers regarding traditional territories and the application of Coast Salish access protocols in this area, and that an EA is not a rights determinative process but includes a strength of claim assessment to inform the appropriate depth of consultation, and that EAO has provided consultation opportunities at a deep level, EAO is of the view that changes to EAO's preliminary strength of claim assessment are not required.

### 14.7.3 Musqueam's Response to EAO's Preliminary Strength of Claim Assessment

Musqueam disagrees with EAO's characterization of Musqueam's Aboriginal rights and title and EAO's strength of claim assessments for both Aboriginal rights and title. However, Musqueam is in agreement with EAO's views of Musqueam having strong prima facie Aboriginal rights, in addition to Musqueam's established rights under *Sparrow*.

Musqueam understands it has Aboriginal title to its territory as set out in the 1976 Musqueam Declaration, and is of the view EAO should assess Musqueam as having a strong prima facie Aboriginal title claim in the vicinity of the Project footprint. Musqueam view this as being supported by Musqueam's oral history and the ethnographic record.

The characterization of Musqueam's claim to Aboriginal title in EAO's strength of claim assessment is limited, narrow, and does not consider historical evidence, including information from other ethnographers, or broader understandings of Musqueam territory. Wayne Suttles, a highly respected expert on the Coast Salish, identified Musqueam' territory similarly to Musqueam's 1976 Declaration as inclusive of the lands and waters extending from Burrard Inlet to the south shore of the main channel of the Fraser River.[47]

Musqueam view the ethnographic records cited throughout EAO's assessment as not properly considering Musqueam and Coast Salish bilateral kinship systems and associated protocols regarding access to resources, such as through inter-village marriage with Musqueam. The presence of other Aboriginal Groups utilizing Musqueam territory is not evidence of a lack of exclusivity with respect to the legal test for Aboriginal title. Musqueam does not contest the presence of other communities seasonally within Musqueam territory but their presence was pursuant to inter-

[47] Suttles 1984, pp. 3

community protocols and with Musqueam's permission to access Musqueam resources. Their presence must be understood through the Central Coast Salish cultural and legal lens, and not just a Western lens. Another groups' presence does not indicate ownership, nor preclude Musqueam's exclusivity, but demonstrates the Coast Salish familial and communal inter-village network in practice.

Through this broad network of affinal ties, in-laws invited one another to partake in resources from their respective territories. Musqueam's territory was, and is, theirs to be exploited and shared with their relations.[48] When relatives came into Musqueam's territory they did so as guests, just as Musqueam went as guests to their relations' territories for resources.[49] Island Halkomelem use of ƛ̓əqtinəs, for example, adjacent to the George Massey Tunnel, was with Musqueam permission and based on protocol.[50] The breadth of this network and Musqueam's position within it is the patrimony Musqueam's ancestors passed on to current generations of Musqueam's.[51]

Further, Musqueam is of the view that EAO has not assessed their sources' reliability to support their assessment. Many of the authors of EAO's sources are known to have had little or no contact with Musqueam and so lacked the proper information to draw conclusions about Musqueam use and occupancy. Franz Boas, for example, who is relied upon in EAO's analysis of Musqueam occupation and use of territory, did not visit Musqueam and largely relied upon acquiring his information from non-Musqueam peoples. It would be more appropriate for EAO to consider the work of Suttles who has spent over five decades interacting with Coast Salish communities and has been cited in several Supreme Court of Canada decisions, including Sparrow, in its analysis of Musqueam strength of claim to title and rights.

Again, EAO does not consider sources highlighting the Project area as within Musqueam's jurisdiction, based on a misunderstanding of Musqueam's traditional territory as ill defined, a free-for-all, or had fluid boundaries. This consideration does not account for an individual's extraterritorial rights based on kinship ties and premised on systems of governance and relationships that do not conform to a western colonial perspective.

Musqueam understands it has Aboriginal rights in its territory as set out in the 1976 Musqueam Declaration, including the Aboriginal right to harvest marine and

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[48] Suttles, 1984, pp. 14
[49] Suttles, 1984, pp. 4
[50] Rozen, 1985, pp. 247
[51] Suttles, 1984, pp. 10

terrestrial resources. This is supported by Musqueam oral history as well as the ethnographic record.

Indeed, Musqueam's right to fish in the Fraser River was recognized by the Supreme Court of Canada's Sparrow decision. As a result, Musqueam's Aboriginal fishing rights need to be considered in this EA as not asserted but proven rights.

Musqueam is of the view that EAO has correctly assessed that Musqueam has a strong prima facie claim of Aboriginal rights to harvest terrestrial resources in the vicinity of the Project footprint.

Given the strength of Musqueam's Aboriginal title and rights claims and the nature and degree of potential Project impacts, Musqueam is of the view the duty to consult with Musqueam Indian Band lies at the high end of the Haida consultation spectrum. However, with respect to Musqueam's Aboriginal right to fish in the Fraser River, the Haida consultation spectrum does not apply. Rather, the established rights framework established in Sparrow, and summarized in Tsilhqot'in, applies, and the Crown must justify any infringements of Musqueam's established right. The Crown cannot avoid its duty to justify an infringement of Musqueam's proven Aboriginal right by using a regulatory regime that puts Musqueam into the same category as First Nations with asserted but unproven rights and then applying to Musqueam the approach of consultation rather than justification. Musqueam stresses consultation is only part of justification and does not constitute justification in and of itself. Where rights have been established, the Crown must not only comply with its procedural duties, but must also ensure the proposed government action is substantively consistent with the requirements of s. 35 of the Constitution. This requires both a compelling and substantial governmental objective and that the government action is consistent with the fiduciary duty owed by the Crown to the Aboriginal group.

### 14.7.4 EAO Perspective of Consultation

As will be discussed in further detail below, EAO and Musqueam Indian Band began discussing means by which they could work together more collaboratively on EAs generally in spring 2016, and began discussing collaboration specifically on this Project in fall 2016. As a result of these discussions, EAO and Musqueam Indian Band decided to pursue work to collaboratively draft this section of Part C in October 2016. EAO has communicated its view that a collaborative approach to Musqueam's engagement in the EA should be in a non-adversarial, interest-based manner. Furthermore, EAO is of the view that such a collaboration process satisfied the requirements of the deep end of consultation for the EA of the Project.

Consultation at the deep end of the consultation spectrum was considered appropriate by EAO given the nature of Musqueam's Aboriginal Interests in the Project area, the nature of potential adverse effects to such Aboriginal Interests, and the level of concern Musqueam have regarding this and other proposed projects in proximity to the Project area.

The Project corridor overlaps with Musqueam Indian Band's asserted traditional territory at the north 15 km of the corridor, including the South Arm of the Fraser River, based on the Statement of Intent map that has been provided to the Province by Musqueam. EAO's views regarding the nature of Musqueam's Aboriginal Interests, including assessment of strength of claims, in the Project area, were first communicated to Musqueam in January and February, 2016, and January 9, 2017.

EAO recognizes that the Supreme Court of Canada confirmed Musqueam has an Aboriginal right to fish, as established in the *Sparrow* decision. While EAO acknowledges the Province and the Musqueam have differing views on the geographic scope of the *Sparrow* decision, EAO indicated to Musqueam that it would be willing to consider the factors relevant to the *Sparrow* justification analysis if there was information indicating a potential impact to Musqueam fishing from the Project.

Given the nature and location of the Project, and the potential impacts of the Project on Musqueam's Aboriginal Interests, Musqueam is listed in Schedule B of the Section 11 Order.

Musqueam was invited by EAO to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Musqueam attended Working Group meetings on January 21, March 10, and September 20-21, 2016, a site tour on September 19, 2016, and met with EAO staff directly.

The Proponent began discussions with Musqueam in early 2014, before entering the EA process.[52] The Proponent reports that discussions and information sharing events has included face-to-face meetings, email exchanges, and phone calls, as well as a Musqueam-led site tour, and meetings between the Proponent, Musqueam and EAO to discuss Musqueam's comments on the draft AIR and the Application. Musqueam was

[52] Musqueam Indian Band notes its view that discussions with the Proponent which occurred in advance of the issuance of the Section 11 Order does not constitute consultation.

also provided with revised sections of the Application to review during Application Evaluation.

The Proponent entered into a Participant Funding Agreement with Musqueam including pre-EA and pre-Application phase funding and committed to provide funding during the Application Review phase. The Proponent provided Application Review phase funding to Musqueam to support their involvement. The Proponent also provided funding to Musqueam for the preparation and submission of the following TUS: *Knowledge and use study: BC Ministry of Transportation and Infrastructure's proposed George Massey Tunnel Replacement Project (October 2016)* ("the TUS").

A summary of the Proponent's engagement activities with Musqueam is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

EAO first met with Musqueam and the Proponent regarding the Project in November 2014, during which the Proponent introduced the Project and EAO outlined the EA process and consultation as anticipated at that point in time. As the Project did not enter the EA process until December 2015, the next correspondence with Musqueam was not until that time. Between February and March 2016, EAO and Musqueam exchanged several correspondences, which included Musqueam's concerns about the draft AIR being reviewed in advance of the Section 11 Order being finalized and view the EA was being fast-tracked, and challenges with resourcing. A miscommunication was identified by Musqueam in February 2016 in which they had not received previous letter and key correspondence from EAO in January 2016, where EAO had requested comments on EA documents including the draft Section 11 Order, Project Description and Key Areas of Study, and draft AIR. Musqueam provided comments on these documents in February 2016.

While EAO notes that correspondence between EAO and Musqueam in April and May 2016 sought to provide Musqueam with a second opportunity to comment on the draft AIR, EAO understands that Musqueam continue to disagree on whether this was adequately provided. In May 2016, this and related communication from Musqueam resulted in a meeting between EAO and Musqueam seeking to review outstanding concerns on the draft AIR. EAO understands that Musqueam remains dissatisfied of the outcome and is of the view that they were not provided adequate opportunity and their requests for changes to the draft AIR were insufficiently considered. EAO does not agree with this view and is of the perspective that Musqueam was consulted and its comments incorporated and/or responded to sufficiently.

During Application Screening, EAO provided additional opportunity to Musqueam to provide comments on a revised version of Part C of the Application; additionally, Musqueam provided comments on the Application in September and October 2016 during Application Review. Musqueam requested in its second submission that EAO pause the EA process in light of Musqueam's views regarding deficiencies in the Application. EAO determined that it did not agree with Musqueam regarding the need to pause the EA at that time.

In September 2016, EAO attended a Musqueam community meeting to provide information on the EA process in addition to a Musqueam-led site tour of important fishing, gathering and cultural sites on the Fraser River for EAO and Proponent staff. While Musqueam has communicated to EAO that it has not seen the information shared and collected incorporated adequately for the purposes of this EA, EAO notes that it has done this through information gathered, including from the TUS, September 16, 2016 Musqueam-led site tour, and ongoing consultation with Musqueam. EAO has included and considered this information in relevant sections of this Report, including this section, and this was also communicated to Musqueam by letter on January 13, 2017. EAO, Musqueam and the Proponent also met in October 2016 to discuss Musqueam's outstanding concerns, including Musqueam concerns related to impacts to their fishing rights on the Fraser River and a high-level discussion of potential conditions.

EAO and Musqueam began discussing means by which they could work together more collaboratively on EAs generally in spring 2016, and began discussing collaboration specifically on this Project in September 2016. As a result of these discussions, EAO and Musqueam decided to pursue work to attempt to collaboratively draft this section of Part C in October 2016. This process included regular meetings and discussions, and sharing of iterative drafts of this document in between October 2016 and January 2017, including three full days of face-to-face collaborative drafting meetings and several teleconferences. In November 2016, Musqueam shared its TUS with EAO. EAO has sought to meaningfully consider and incorporate the information provided in the TUS in this Report. In this final version of the report, where consensus was not reached on the content, the differing views of EAO and Musqueam are set out separately.

In addition to collaboratively drafting this section of Part C, EAO has sought Musqueam's input on multiple drafts of proposed conditions. EAO made several revisions to the proposed TOC as a result of feedback from Musqueam, including a number of new proposed conditions, to address outstanding concerns by Musqueam.

### 14.7.5 Musqueam Perspective on Consultation

Musqueam agrees with EAO and the Proponent that consultation with Musqueam should take place at the deep end of the consultation spectrum due to the nature of Musqueam's established and asserted Aboriginal Rights and Title in Musqueam's territory, the potential adverse impacts to Musqueam's proven *Sparrow* rights and asserted Aboriginal Title and Rights; and the level of concern Musqueam has regarding this Project as articulated in meetings, phone-calls, emails, and letters to the Proponent and EAO since 2014, when the Proponent first began to iterate its intentions to undertake this Project. However, from Musqueam's perspective, the consultation that has been undertaken has not been meaningful or aimed at understanding and addressing Project impacts to Musqueam's established and asserted Aboriginal Rights and Title, and therefore does not meet the Crown duty to consult.

To constitute meaningful consultation and accommodation, there needs to be a meaningful intention on the part of the Crown to understand the rights at issue, identify potential impacts to those rights, and be open to meaningfully addressing or accommodating those impacts. Musqueam is of the view that those steps have not been adequately undertaken in relation to this Project. At this late stage of the EA, there is no consensus between Musqueam and EAO on any substantive issues in relation to Musqueam's established and asserted Aboriginal Rights and Title, the potential Project impacts to those Rights and Title, and the efficacy of proposed mitigation measures and conditions to address those impacts.

Musqueam note that the EA for the Project has been undertaken in an expedited manner, as has been articulated in correspondence with EAO. Musqueam has made numerous requests that additional time be allocated to the process in order for the EA and consultation to be meaningful. For example, due to truncated timelines for review of both the draft AIR and Section 11 Order, the EAO did not provide Musqueam with the requested second opportunity to review and comment on a full version of the draft AIR.

The Participation Funding Agreements entered into by Musqueam Indian Band and the Proponent to support Musqueam participation in pre-Application and Application Review periods of the EA was limited, from Musqueam's perspective. For example, on July 20, Musqueam articulated in an email to EAO that Musqueam initially received only a small amount of funding from the Proponent to participate in all Pre-EA and pre-Application activities, and that the demands of the pre-Application period went beyond the funding that was allocated. As such, Musqueam did not have capacity to fully participate in Project Application Screening.

Adequate funding for a TUS was not provided to Musqueam until late August 2016, a month following the commencement of the Application Review period. As a result, the Proponent's Application does not incorporate or consider any project-specific baseline and effects data related to Musqueam rights-based activities within the Project-affected area.

Further, Musqueam views that much of the information provided by Musqueam has not been incorporated into the assessments contained with the Application or the EA Report. For example, Musqueam provided a site tour to EAO and the Proponent on September 16, 2016 to provide contextual and supplemental information and better illustrate Musqueam's interests in the Project area. However, Musqueam views the information provided has not been utilized by EAO to meaningfully assess how Project impacts will affect Musqueam's Aboriginal Rights and Title.

Musqueam provided the TUS in early November and supplemental ethnographic literature on December 2, 2016 to EAO and the Proponent to be incorporated into the analysis and assessment of Project impacts on Musqueam Aboriginal Rights and Title, and to address how meaningful mitigation of these impacts may occur. Musqueam notes that it has yet to be demonstrated to Musqueam that these sources are being utilized and considered meaningfully to inform the assessment or consultation and accommodation. The information provided has not been meaningfully considered in meetings, reports, or analysis involving the Proponent or EAO. The information that has been provided to the Proponent to date, particularly in relation to the assessment of Project impacts to Musqueam's rights and title, has not been responded to, other than being addressed in a December 23, 2016 letter and table from the Proponent wherein it dismissed the information as irrelevant to the analysis of impacts because the Proponent said it had already purportedly taken into account those types of impacts prior to Musqueam's input.

With respect to the effort to collaboratively draft this section of the EA Report, Musqueam entered into this process with EAO in good faith. Unfortunately, the process has been fraught with unreasonable timelines, has been frustrating, and has not been a meaningful process. In order for a meaningful drafting process to occur, Musqueam is of the view that significantly more time was needed for the parties to set the framework and methodology for working together and to work through issues with a view to trying to reach consensus.

As mentioned previously, information provided to EAO from the site tour, TUS, literature, and drafting meetings has not been included in EAO's assessment of Project

impacts in such a way that demonstrates to Musqueam that our concerns are being considered or incorporated into the assessment of Project effects.

### 14.7.6 Summary of Key Issues and Concerns Raised

The following key issues and concerns were raised by Musqueam Indian Band during the EA:

*Methodology, Process and Engagement*

- Inadequacy of methodology to address familial, communal, and cultural effects;
- Lack of methodological inclusion of Musqueam traditional knowledge in assessment of VCs and ability to address concerns;
- Inadequacy of methodology to address impacts of legislative and policy constraints coupled with project impacts (e.g. regulatory restrictions limiting firearms discharge areas due to by-law and other agencies limit hunting areas to reserves and primarily within 6 km of the Project area; and regulatory restrictions on harvestable species);
- Inadequate process and unrealistic timelines;
- Ineffectiveness and nature of EA process, and current volume of EAs underway;
- Development of EAO guidelines including the AIR template without Aboriginal Group consultation;
- Concern about resource and funding for participation including to participate in the Project review process and to undertake a TUS, as well as interest to ensure information shared by Musqueam is used appropriately as it relates to confidentiality/dissemination;
- Interest in a Musqueam-only site visit;
- Concern with inclusion of certain Aboriginal Groups in Project consultation per Schedule B of the Section 11 Order;
- Interest in a Musqueam specific Project-related study to be undertaken in advance of the start of Application Review phase;
- Concern about inadequacy of Proponent's processes of consultation with Musqueam;
- Lack of assessments regarding Project impacts to Musqueam's *Sparrow* rights; and
- Lack of details on Project design and management render it difficult for Musqueam to fully consider the potential interactions and impacts of the Project.

*Cultural, familial and communal Impacts*

- Effects of increased marine and vehicular traffic, urbanization and industrialization;
- Project may facilitate increased development around the new Bridge and expansion of marina at Deas Slough;
- Concerns relating to cumulative impacts preventing the transmission and continuity of Musqueam language and culture;
- Negation of applicability of Musqueam knowledge from alterations to the landscape;
- Negative impacts on socialization and familial and communal cohesion from access and use restrictions;
- Disruption to Musqueam familial and communal connections (both within the community and as part of Musqueam's historic and ongoing regional familial and communal network), personal and communal identities, and cultural resilience as a result of lost teaching and familial and communal interactions; and
- Musqueam views current conditions within the territory as the result of two centuries of cumulative impacts and not as a starting baseline. The baseline should be pre-contact/ at time of contact.

*Environmental Effects*

- Potential marine and vehicular accidents and malfunctions;
- Absence of a comprehensive study on the cumulative effects on the Fraser River;
- Potential effects of run off and drainage along the highway corridor, including heavy metal transport from traffic to water and land, and management of runoff from the bridge;
- Use and disposal of dredged and other material in the river;
- Impacts of staging/laydown areas, and requests that Ministry provide construction parameters to avoid impacting areas around the Project footprint;
- Spills of hydrocarbons from refueling or leaks in construction equipment/vessels, including human waste, and spills from accidents during construction and operations;
- Concerns related to dredging, potential for increased vessel traffic and larger vessels resulting from proposed Tunnel removal;
- Concerns related to fish habitat being impacted from tunnel removal;
- Loss of natural resources integral to Musqueam economic, ceremonial, and practical wellbeing; and

- Concerns related to pollution from tunnel entering the river during tunnel decommissioning.

*Health and Human Safety*

- Effect of shipping on $CO_2$ levels in the water, concern with effluent acidity levels and carbon outputs from ships affecting water and air quality;
- Consideration of the airport in air quality assessment;
- View that the RAA is too large to properly measure cumulative effects of "intensified" industrial development on the South Arm of the Fraser River;
- Consideration of municipal and regional health plans related to human health;
- Effect of Project on Musqueam to learn, teach, and practice cultural and ceremonial safety
- Health and safety impacts from access and use restriction to landscape and resources (e.g. subsistence impacts);
- Effects of tunnel removal on fishermen's safety (e.g. flowrate increase); and
- Effects of increased marine and vehicular traffic on fishermen's' safety.

*Musqueam Perspectives on Cumulative Impacts*

Musqueam provided the following language regarding their ongoing concerns with regard to cumulative impacts:

Musqueam has indicated throughout the pre-EA and EA process that it is concerned about the cumulative effects that are likely to impact its territory. This concern is premised on Musqueam's experiences of past and on-going cumulative effects on Musqueam's rights within the highly impacted landscape of the Fraser River region, and the foresight of likely future impacts both from already existing and future industrialization projects in the region. Reasonable foreseeable further industrialization likely to occur as a result of the construction of the Project includes, dredging and deepening of the River particularly if the tunnel is removed, increased marine traffic, industrial development upriver of the Project, and increased urban development facilitated by access created by the proposed bridge. Musqueam has also raised concerns regarding further land disposition, including surplus lands potentially sold.

It is Musqueam's position that the Proponent has not considered cumulative effects and has not proposed any mitigation measures to address the cumulative effects that will impact the Fraser River region as well as Musqueam's rights to cultural continuity, sense of place and spirituality, fishing and marine harvesting, hunting and trapping,

harvesting of plant and other food resources in the region, and other rights-based practices. Musqueam's ways of life and values, particularly those identified in its assessment of project impacts to Aboriginal Rights and Title, have degraded over time, which creates a pre-existing state of significant adverse effects in Musqueam's territory, including the Project area.

A primary concern of Musqueam regarding the cumulative effects induced by the Project connects to the removal of the existing George Massey Tunnel, and the potential future dredging of the Fraser River. Musqueam is concerned that the removal of the existing tunnel that will allow for future dredging to increase the number and the size of marine vessels that will transit through the Fraser River. Removal of the existing tunnel, even without future dredging the River, is likely to induce significant changes including: faster water flow in the Fraser River, the removal of fish staging areas, the removal of underwater features that fish use to rest, altered fish behaviour (in reaction to more and greater ship traffic, faster water flow and deeper waters), and increased fish mortality. This would result in a decline in the abundance of fish and the redistribution of fish within the channel, impacting Musqueam fishing rights.

Furthermore, Musqueam notes that increased marine vessel traffic throughout the Fraser River would impact Musqueam's ability to access culturally important practices as the quality of fish would be impacted through pollution, and case direct fish mortality due to the destruction caused by large ship propellers and thrust. Musqueam would also be impacted by competition for space in an already crowded Fraser River, and increased safety issues would arise as small Musqueam boats interact with large barges and tankers.

Musqueam's view is that an increase in industrialization, anticipated to be facilitated by the Project, is foreseen to lead to urban development south of the Fraser River. The loss of habitat areas to urban development will negatively impact Musqueam's hunting of waterfowl that transit through the region, and as such, will be a detriment to Musqueam cultural continuity.

Musqueam notes that this is not an extensive list of the reasonably foreseeable cumulative effects caused as a result of the construction and operation of the Project, and Musqueam has been vocal in its articulation of its concerns regarding cumulative effects. Musqueam sees this Project as part of a wider plan to further develop the river system. Musqueam strongly urges that the Project should not be considered in isolation from the multitude of reasonably foreseeable future cumulative impacts that the Project will induce and facilitate, particularly if the tunnel is removed.

EAO response to Musqueam perspective on cumulative impacts

EAO is of the view that concerns related to cumulative effects and related impacts on Musqueam's Aboriginal Interests have been adequately addressed through the EA for the Project as outlined throughout this Report. In addition to the consideration of cumulative effects as assessed in Part B of this Report, EAO has also proposed a cumulative effects condition which would require the Proponent to participate in initiatives related to the monitoring, assessment, or management of cumulative environmental effects, if requested by federal, provincial, or regional government agencies.

### 14.7.7 Potential Impacts of the Project to Musqueam Indian Band's Proven and Asserted Aboriginal Rights and Title

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally is provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Musqueam's Aboriginal Interests. These potential impacts are characterized by considering how the Project could affect several factors important to Musqueam's ability to practice its Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal Rights (e.g., fish) that were assessed in Part B of this Report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

This assessment is based on a combination of primary and secondary sources. The TUS was a key document provided to EAO in its consideration or impacts to Aboriginal Interests as presented below. In addition, EAO considered all information available, including from public sources as well as relevant technical issues raised by Musqueam in the following assessments of the potential impacts of the Project on Musqueam

Indian Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

Musqueam has utilized the TUS, and has drawn on additional historical and contemporary ethnographic sources, and has collaborated with community knowledge holders to inform its impacts assessment and analysis of Project-related information.

#### 14.7.7.1 Impacts on Aboriginal Title

EAO's Analysis on Project Impacts on Asserted Aboriginal Title

In considering potential impacts of Project-related activities on Aboriginal title claims, EAO has considered the following three components of Aboriginal title:

- Use and occupation: Consideration of potential alienation of an area, the degree of potential disturbance or functional effect of the potential disturbance associated with the Project, how the proposed decision might restrict community members' access to the area, and how the proposed decision might affect community members' enjoyment, experience, and use of the area, now and in the future;
- Decision-making: Consideration of whether the proposed decision would result in a new tenure or transfer of ownership to the area, the extent to which an Aboriginal community might be involved in the decision-making process, and whether the activity might be consistent/inconsistent with any cultural/other objectives of the Aboriginal Group for management in this area, now and in the future; and
- Economic benefits: Consideration of whether the Project-related decision might affect a community's ability to derive direct and/or indirect economic benefits from the area, and how the proposed decision might affect a community's economic development aspirations for the area, now and in the future.

*Use and Occupation*

EAO's view is that the majority of construction works would be confined to relatively small areas during construction, be temporary in nature, and for the road improvements would be within a pre-existing transportation corridor. However, the nature of the new bridge would result in permanent changes to the landscape which Musqueam has communicated would impact the practice/expression of Aboriginal Interests in the vicinity of the Project. Impacts related to visual quality are not mitigable, although again they would be limited in geographic application. EAO's analysis of potential residual effects on VCs relevant to other related Aboriginal Interests indicate low to moderate

magnitude of effects that are not expected to be significant. However, EAO acknowledges the perspective of Musqueam regarding this significance of the Project area to Musqueam and its territory, as well as Musqueam's significant concerns, as described below, regarding the Project's alteration of the landscape and its effect on Musqueam's exercise of Aboriginal Interests.

*Decision Making*

EAO has considered the concerns Musqueam describes below regarding the effect of the Project on Musqueam's future ability to make decisions in the Project area. EAO has attempted to address this impact by consulting Musqueam deeply, which included adopting a collaborative approach to various aspects of this EA to attempt to seek to develop consensus conclusions for this report. In support of such engagement, EAO and the Proponent have provided capacity funding to support Musqueam's participation in the EA. In regards to Musqueam's concerns about consultation on land dispositions, EAO understands from the Proponent that, following the EA, in the case that there are surplus crown lands, dispositions would follow the appropriate processes which include consultation.

EAO is of the view that it has engaged in a principled, meaningful and responsive consultation process characterized by genuine efforts to acknowledge and document Musqueam's concerns as well as to identify ways to demonstrably address these concerns prior to, or as part of, the decision-making process. Throughout the EA, Musqueam was provided with opportunities to describe their views of the nature and scope of potential impacts of the Project on their Aboriginal Interests and on mitigation or accommodation measures that could be applied to address those potential impacts. EAO's consultation process also provided Musqueam with an opportunity to provide their perspective on the extent to which the Project affects their ability to manage and make decisions over areas impacted by the Project.

Further, EAO has proposed a condition that wherever a condition requires the Proponent to develop a plan, program or similar document, the Proponent must include schedules and methods for the submission of reporting to Aboriginal Groups, and the required form and content of those reports, following feedback from Musqueam. Therefore, Musqueam are assured an opportunity to review and provide input on the development of such plans

*Economic Benefits*

EAO has considered the concerns Musqueam describes below regarding the effect of the Project on economic benefits to Musqueam. Although EAO is aware that the

Proponent is actively engaged with Aboriginal Groups to ensure that local Aboriginal communities benefit directly from the Project, including training, environmental works, employment and contract opportunities, an agreement has not yet been reached between Musqueam and the Proponent. In a letter sent on January 12, 2017, the Proponent indicated its willingness to engage with Musqueam in this respect. EAO is aware that Musqueam has noted that discussions related to Project benefit agreements have not yet commenced with the Proponent. EAO's Aboriginal engagement report condition would require the Proponent include a description of actions taken or planned to provide training, construction monitoring, employment, business, and contracting opportunities to Aboriginal Groups.

*EAO's Conclusions*

In consideration of the available information, including Musqueam's analysis of the nature of potential impacts, the additional considerations described above, including the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to social, economic, environment, heritage, and health VCs, and as discussed in section 13.5 of this Report, EAO is of the view that potential impacts on Musqueam's Aboriginal Title are minor and have been adequately considered and addressed at this stage of review.

EAO also notes that it has proposed a condition requiring the Proponent to participate in any initiatives related to the monitoring, assessment or management of cumulative environmental effects if requested by federal, provincial or regional government agencies, developed in part due to Musqueam's concerns about impacts of cumulative effects on their asserted Aboriginal title.

<u>Musqueam's Analysis on Project Impacts on Asserted Aboriginal Title</u>

Musqueam has identified project-specific impacts on Musqueam's Aboriginal title, including:

| Aboriginal Right | Impact Pathway |
|---|---|
| The right to decide how the land will be used | • Musqueam deprived of ability to make decisions about how Musqueam title lands will be used. |
| The right to the economic benefits of the land | • Musqueam deprived of economic benefits of major infrastructure development in a key area of Musqueam territory. |
| The right to pro-actively use and manage the land | • Musqueam deprived of ability to proactively govern and control Musqueam lands. |

Other issues identified by Musqueam include but are not limited to:

- Consultation and accommodation with Musqueam is required for any land disposition, including surplus lands potentially sold to third parties; and
- Potential impacts to Musqueam title, rights and culture.

Musqueam's perspective is that Musqueam's Aboriginal Title is a fundamental aspect of Musqueam identity and culture, and Musqueam has not signed a treaty or otherwise surrendered or ceded its Aboriginal Title, and retains possession and ownership across all lands and waters (including the riverbed and foreshore) within Musqueam's territory, as described in the 1976 Musqueam Declaration:

> We, the Musqueam people openly and publicly declare and affirm that we hold Aboriginal title to our land, and Aboriginal rights to exercise use of our land, the sea and fresh waters, and all their resources within that territory occupied and used by our ancestors …

At the core of Musqueam's Aboriginal Title is the right to proactive governance and control over Musqueam lands and resources - in short, the right to choose how Musqueam title lands will be used, the right to manage Musqueam title lands, and the right to the economic benefits of Musqueam title lands. This position is also captured in the 1976 Musqueam Declaration.

As with any major infrastructure project in Musqueam territory, Musqueam has therefore expressed its expectation that the Crown seek Musqueam's consent to the Project and accommodate the impacts to Musqueam's proven and asserted Aboriginal Rights and Title. The Supreme Court of Canada's decision in *Tsilhqot'in Nation v British Columbia*, 2014 SCC 44 reaffirmed the Crown's duty to consult and accommodate Aboriginal Groups like Musqueam. The Crown can avoid a charge of infringement or failure to adequately consult by seeking and obtaining the consent of Musqueam to the Project. The Court in *Tsilhqot'in* also noted that "the right to control the land conferred by Aboriginal Title means that governments and others seeking to use the land must obtain the consent of the Aboriginal Title holders." If consent is not provided, the "government's only recourse is to establish that the proposed incursion on the land is justified under s. 35 of the *Constitution Act, 1982*." Similarly, the Court states that "if the Crown begins a project without consent prior to Aboriginal Title being established, it may be required to cancel the project upon establishment of the title if continuation of the project would be unjustifiably infringing."

Musqueam does not agree with EAO's use of "three components" of Aboriginal title for its analysis. Musqueam has identified Project-specific impacts on Musqueam's Aboriginal title, which are included in the table above.

Musqueam view the Project area as a unique and critical area of Aboriginal title lands within Musqueam territory, which has already been severely impacted through historical and contemporary developments, as set out in this report and the Musqueam TUS and the Project will continue to impact Musqueam's title, rights, and culture.

Musqueam notes that, as set out in the other sections of the Part C report, regarding Project impacts on Musqueam cultural continuity, sense of place and spirituality, freshwater fishing and marine fishing and harvesting, as well as hunting, trapping and gathering, the Project stands to have significant impacts on Musqueam's ability to choose how precious Musqueam lands and resources will be used. For example, Project effects include long-term, multi-source, and large scale adverse impacts on Musqueam territory, rights, and interests, including increased urban and industrial development of Musqueam title lands resulting in loss of resources, habitats, and access for rights-based practices, etc. Musqueam assert that the construction of a major infrastructure development like the Project will forever alter the landscape of Musqueam territory, and limit Musqueam's ability to exercise rights associated with its Aboriginal Title, such as the right to use and manage its lands, and the right to decide how the lands and resources will be used. Musqueam's position is that many of these impacts are infringements on Musqueam's title which cannot be fully mitigated. The Crown has not sought Musqueam's consent for this Project. From Musqueam's view, there have been no substantive discussions between Musqueam and the Crown around accommodation of the impacts to Musqueam's Aboriginal Title and rights, and it is unclear who within the Province of British Columbia is responsible for identifying and implementing accommodation measures. Musqueam notes that EAO has informed Musqueam that it does not have the mandate to discuss economic accommodation with Musqueam, and there have been no commitments from the Proponent on these matters.

*Musqueam Conclusions*

Musqueam disagrees with EAO's conclusions. Overall, the Proponent's proposed mitigations, to be incorporated into their CEMP and operations environmental management plans (OEMP) to mitigate effects on Musqueam's Aboriginal Rights and Title, are ill-defined. The precise mechanisms, through which the CEMP, OEMP, and subcomponent plans will accomplish the intended mitigations, the likely efficacy of those mechanisms, and what role would be taken by Musqueam, remain unclear. Many critical design components of the Project and the precise timing and management of

construction, for example, remain vague. Musqueam maintains the lack of details on Project design and management make it impossible for Musqueam or EAO to fully consider the potential interactions and impacts of the Project. Central to the integrity of Musqueam's culture, identity and the underpinning of Musqueam's right to exercise governance over and fully benefit from its lands, is Musqueam's Aboriginal title and the ability to choose to what use its lands will be put. The Project will deprive Musqueam of the ability to make decisions about how Musqueam title lands will be used, now and into the future. Musqueam's voice on the future use of Musqueam title lands is taken away. The Crown has not sought or obtained the consent of Musqueam to the Project. Further, there have been no substantive discussions around accommodation, and it is unclear who within the Province of BC is responsible for identifying and implementing accommodation measures.

In consideration of the above, Musqueam is of the view that the Project is expected to result in moderate to severe impacts to Musqueam's Aboriginal title.

#### 14.7.7.2 Impacts on Cultural Continuity

Musqueam's cultural persistence is underpinned by the transmission of knowledge within and across generations. This knowledge transmission is dependent on multisensory landscape and activity-based Musqueam teaching and learning models, e.g. the need to be in the landscape and practicing an activity. Current oral histories and practices on the landscape carry these traditions forward and layer on a continuity of Musqueam history, culture, and use of their lands and resources.

Musqueam's language, hən̓q̓əmin̓əm̓, encodes this knowledge and these practices across the landscape. Together, the transmission of Musqueam's cultural knowledge and language is called Cultural Continuity. All other Musqueam values areas are dependent on the reliable and successful transmission of knowledge among Musqueam members, and thus central to the integrity of Musqueam's culture.

The Fraser River delta is host to over 50 Musqueam named sites within 25 km of the Project footprint and several as close as under 1 km. These include (but are not limited to) villages, seasonal sites, transformer sites, and burial sites. These sites are part of a network of over 125 Musqueam named sites sharing linkages and inter-dependencies through (including but not limited to) genealogy, history, story, cultural practice, teachings, and region familial and communal network. Musqueam reported use of the Project area from the 1900s to the present related to cultural continuity includes:

- Within 250 m of the Project footprint:

    - Habitation sites, including camps used on fishing trips, places used for family gatherings, and a village site;
    - Teaching areas relied on for the transmission of cultural knowledge, including learning how to fish, pick berries, family history, and oral traditions; and
    - Spiritual sites.
- Within 5 km of the Project footprint:
    - Teaching areas important for the transmission of knowledge and Musqueam values, including how to hunt, how to fish, how to operate a boat, how to drift and set net, and learning about important plants and medicines; and
    - Habitation sites used on fishing trips, village sites, sites relied on for family gatherings, places used for fishing facilities, and seasonal camps used by Musqueam;
- Within 25 km of the Project footprint:
    - Teaching areas where Musqueam members learned about catching and preparing fish and shellfish, medicinal and food plants, how to hunt, how to carve and weave blankets, and Musqueam history;
    - Habitation sites including those used on fishing trips, campsites used on seasonal rounds and Musqueam fish harvesting camps and warrior training camps; and
    - Ceremonial sites.

Musqueam notes that intergenerational knowledge transfer is critical and foundational for Musqueam culture and identity; and it is a requirement for Musqueam's practice of its asserted and proven Aboriginal Rights (e.g. fishing, hunting, plant harvesting, cultural practices). Musqueam notes a documented prevalence of teaching within the area of the Project. Lessons often extend beyond use to include associated language, principles, beliefs, and modes of conduct. Morals and values may also be communicated through hən̓q̓əmin̓əm̓ stories, and transmission of lessons, stories, and practices strengthens Musqueam identities by connecting to their heritage and history. Strengthening pride and connection of Musqueam youth to their ancestors and past through teachings is perceived as especially vital, and helps to build the community's cultural resilience.

Knowing who you are and where you come from is a core tenet for Musqueam. hən̓q̓əmin̓əm̓ and its persistence is viewed as fundamental to Musqueam identity. It carries specialised information about Musqueam's history, spirituality, familial and communal relationships, worldview, culture, and the environment. Places names, for example, may encapsulate actions, histories, genealogies, rights and responsibilities,

and stories, which remind and link contemporary Musqueam to their heritage and the environment. They are not only settlements or topographical features but symbols and points of identity and tradition. Time between teachers and students and building of traditional knowledge creates and reinforces familial and communal connections and the familial and communal fabric of the community and regional network.

The importance of the Fraser River in the vicinity of the Project area to Musqueam for teaching and learning is especially notable and unique. This area of the River is favoured for fishing, not only for the abundance of fish but also calmer and safer navigational conditions, and because Musqueam fishers have extensive knowledge and experience of the area, both current and knowledge passed through oral tradition over millennia. Fish are not solely a meal, but are a vessel for knowledge transfer of Musqueam culture. Moreover, the Project area is more than an area in which to fish, it's a classroom, but through industrialization, it has become a highway due to an abundance of vessel traffic. With the increased traffic, Musqueam fishers cannot simply move up or down to find fish, fishers need to be able to catch fish in an area that was taught. Musqueam has communicated its view that the Project area has always been a critical fishing area for Musqueam and contains unique and critical features which are the last within Musqueam's traditional fishing area. If the Project area is significantly altered in such a way that is being proposed in the Application, Musqueam view the river as at significant risk of being altered in such a way that the Project area will become an unproductive fishing area for Musqueam. This has been communicated numerous times, including on the site visit that Musqueam provided to EAO and the Proponent.

Cultural continuity relies upon availability of healthy resources and access to those resources and the landscape, as well as time and experience for teaching. Musqueam notes that the ability of its members to transmit knowledge and language, and opportunities to do so, has been eroded by various sources over time. Furthermore, stressors that affect fishing, hunting, and plant and medicine resources impact Musqueam's cultural continuity, whether by reducing resources or access to erode knowledge and teaching capacities and opportunities. Given the rate and scale of loss experienced by Musqueam in terms of the capacity to transmit knowledge and language (e.g., availability of teachers, knowledge, language loss), and quantity of accessible and healthy resources, what capacities and resources remain are considered invaluable to Musqueam's cultural continuity, documentation, and revitalisation efforts.

During the EA, Musqueam Indian Band identified concerns and comments regarding cultural continuity including:

| Impact Pathway | Impact to Cultural Continuity |
|---|---|
| Safety concerns | • Construction of the Project will hinder Musqueam general access to the Project area and will lead to decreased skill, proficiency, confidence, and safety of younger land and water users as a result of lost teaching opportunities and experiences; and<br>• Construction of the Project will hinder Musqueam general access to the Project area and will lead to decreased skill, proficiency, in cultural and spiritual conduct affecting physical and spiritual safety;<br>• Reduced safety of Musqueam on Fraser River in vicinity of Deas Island during construction and operation, due to construction and the likely increase in marine traffic on the Fraser River, post construction; and<br>• Tunnel removal and construction are likely to lead to changes to River hydrology, potentially affecting flow rates which negates Musqueam's knowledge of the safe navigation and overall use of the River. |
| Physical, environmental, and multisensory changes | • Potential increased disruption to the applicability and reliability of traditional knowledge due to alteration of the landscape (e.g., sightlines, river hydrology etc.) from construction and operation of the Project;<br>• Impediments (e.g., lack of access to the Project area) to the ability of to transfer their knowledge due to alteration of the landscape from the construction and operation of the Project;<br>• Loss of teachable and/or desirable ecological species (e.g., salmon holding areas, cherry trees etc.) due to project construction and operation; and<br>• Protection of archaeological and heritage resources, including intangible heritage sites and protection of cultural and archaeological sites/spaces that are known to exist or may be discovered within the Project area. |
| Potential changes in access and use to key teaching cultural use areas | • Increased gaps in knowledge (e.g., language loss) from lost opportunities (e.g., decreased abundance of resources, decreased time spent together) to transmit knowledge due to likely increased traffic on the river, Project construction and operation;<br>• Disruption to Musqueam familial and communal connections (both within the community and as part of Musqueam's historic and ongoing regional familial and communal network), identities, and cultural resilience as a result of lost teaching and familial and communal interactions due to decrease in quality and durational access to Project area, and potential loss of culturally required resources; and<br>• Construction and operation of the Project will Inhibit Musqueam's ability to hold certain ceremonies and cultural practices both within and external to the project area. |

Other issues related to cultural continuity identified by Musqueam include but are not limited to:

- Aboriginal participation and Project-related opportunities, including:
    - community preparedness; and

    - cultural recognition and naming, art and interpretive signage;
- Participation in archaeological fieldwork and review of archaeological draft reports;
- Proponent's archaeological consultant will not work effectively with Aboriginal Groups based on experience on past projects; and
- Concern with involvement of certain Aboriginal Groups in archaeological fieldwork for the Project.

EAO's analysis

With respect to the importance of the availability of healthy resources and access to those resources and landscape for cultural continuity, please refer to the below sections discussing potential Project impacts on freshwater and marine fishing and harvesting, hunting and trapping, and food and medicinal plant harvesting. See also discussion of related matters in section 6 (heritage), section 5.3 (marine use), section 5.2 (visual quality and land use), and section 7 (human health, including both atmospheric noise and air quality) of this Report.

In regards to concerns about sites of key importance for cultural continuity, EAO understands there will be overlap with the South Arm of the Fraser River generally, although overlap between other sites of importance including IR 4 near Canoe Pass is not anticipated. EAO is not aware of direct overlap at archaeological interest sites and the Project footprint during operation, as the Project corridor does not overlap with any known archaeological interests. However, Musqueam has reiterated to EAO that much of the Project footprint is in an area of great cultural importance to Musqueam and that as such there is direct overlap with cultural heritage sites. EAO also understands that Musqueam is of the view that EA methodology cannot sufficiently capture the interconnectedness of Musqueam's territory and Musqueam cultural continuity. EAO also understands that Musqueam has noted concern about potential archaeological and cultural disturbance related to the Project.

The Proponent noted in the Application that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Musqueam, including specific and general sites mentioned above which have been noted by Musqueam, potentially affected by the Project. EAO understands that physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. Furthermore, Musqueam has communicated to EAO the importance of opportunities for teaching and cultural transmission and their direct relationship to sites and resources in the vicinity of the Project area, and Musqueam's concern that these opportunities will be

adversely impacted by both construction and operation phases of the Project. EAO has also proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

As discussed in the below sections, there is potential for changes to quality of experience while exercising traditional harvesting activities, which could affect cultural continuity at important locations for Musqueam, including the South Arm of the Fraser River generally, in particular in relation to changes in atmospheric noise during construction and operations, and visual conditions during operation. The effects to the South Arm of the Fraser River are not fully mitigable or reversible. EAO has proposed a condition requiring a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however, the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality, generally speaking, would extend beyond 1 km of the bridge. However, Musqueam has communicated to EAO that Musqueam anticipates the Project would interfere with viewscapes and adversely affect how Musqueam individuals interact with the landscape.

While changes to marine use during construction, including increased vessel traffic and related noise, could be experienced 2.5 km downstream and 5 km upstream on the South Arm of the Fraser during construction, with potential implications for cultural continuity during construction, EAO’s discussion of impacts to Musqueam’s Aboriginal Interests related to fishing below outlines proposed conditions to address this.
In response to a request from Musqueam, and to address the Project effects described above, EAO proposes a condition requiring an Aboriginal cultural awareness and recognition plan, in consultation with Aboriginal Groups, that would include continued engagement with Aboriginal Groups to further identify, explore and plan for opportunities for cultural awareness and recognition, as well as a description of how opportunities for cultural awareness and recognition requested by Aboriginal Groups have been considered and supported.

In consideration of the available information, including Musqueam's analysis of the nature of potential impacts, the additional considerations described above, including the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to social, economic, environment, heritage, and health VCs, and as discussed in section 13.4 of this Report, EAO is of the view that concerns Musqueam have raised regarding potential impacts on Musqueam's cultural continuity have been adequately considered and addressed at this stage of review.

Musqueam analysis

Due to the seriousness of effects and lack of detail regarding the relevance of mitigations proposed in the application, Musqueam is of the view that the effectiveness of proposed mitigations in preventing residual adverse effects on cultural continuity cannot be determined until finalized. Taking this into consideration, Musqueam anticipates that there will be significant Project-specific residual impacts to Musqueam's cultural continuity in the Project area during construction and operation, with a particularly high adverse effect on the transmission of knowledge (e.g. fishing-related knowledge specific to a critical fishing area).

Musqueam's traditional resource harvesting on the Fraser River delta continues, in a manner that has been heavily impacted by legacy and cumulative effects of non-Aboriginal development, including: installation of training structures and ongoing dredging activities for shipping channels, the construction of jetties disrupting water flow patterns, the loss of shoreline habitat and the sealing off of other previously free-flowing areas. Musqueam's safe access to many areas of the lower Fraser River has been compromised or eliminated by competing non-Aboriginal use of the river, including industrial marine shipping, marinas and float plans. Many key fish species have declined in the region: salmon, steelhead, sturgeon, eulachon, and numerous other fish species are now facing severe declines or are currently inaccessible for Musqueam, partially due to habitat degradation and the industrialisation of fisheries. The combination of reduction in quantity and quality of resources, and greatly restricted access to resources that remain, places pressures on Musqueam's cultural continuity.

According to Musqueam, EAO's reliance on discussion in section 6 (heritage), sections 5.3 (marine use), 5.2 (visual quality), and 7 (human health) does not address a number of Musqueam's concerns that have been expressed multiple times. First, section 6 (heritage) is inadequate and does not incorporate necessary discussions regarding the impacts of decreased or loss of knowledge transmission and loss of sense of place, among many other factors. Knowledge and cultural practices transferred within the Project area are intrinsic to how Musqueam conducts itself regionally, and the

Project area is highly valued for its combination of teachable features. Any impacts to Musqueam's ability to transfer and transmit knowledge (e.g., fishing knowledge, language, cultural conduct), will hinder long-term continuation of Musqueam's way of life. Moreover, Musqueam notes that any negative change in efficacy of Musqueam fishing gear will negatively impact Musqueam's ability to exercise its *Sparrow* rights.

Additionally, sections 6 and 7 do not take into consideration the impact of loss of spirituality on human and cultural health.

The determination that EAO is unaware of "direct overlap at archaeological or cultural heritage interest sites and the Project footprint during operation," is considered by Musqueam to be inaccurate. Musqueam asserts that EAO has been made aware of negative impacts to site lines and interrelationships of places of importance to Musqueam locations in the Project area. Additionally, it is too narrow a perspective to solely consider impacts at areas of direct overlap with culturally important sites in the immediate vicinity of the Project footprint. The reach of Project impacts to spaces integral to Musqueam are likely to be far beyond the footprint of the Project.

Finally, Musqueam's view is that EAO's proposed conditions intended to mitigate noise during construction and impacts to fish habitat and access to fishing are inadequate. Monitoring, notification, and selective moments of consultation do not meaningfully recognize the impacts that the loss of opportunities to transmit knowledge and culture over time will have in the Musqueam community and its ability to ensure that the Project will not be detrimental to the longevity of Musqueam culture.

In conclusion, Musqueam disagrees with EAO's above assertions. Musqueam expects the effects of Project interactions to be long-term (over 10 years) and to be irreversible. Reduced access caused by construction at a critical area will affect at least two (or more) fishing seasons, as well as many years of access to gathering other resources. Moreover, Musqueam considers that the diminishment of resource harvesting practices at a critical area due to adverse psycho-social, cultural landscape, sensory and harvesting efficacy project-specific and cumulative impacts is expected to be long-term or permanent. The conditions developed by EAO, such as "Aboriginal Cultural Awareness and Recognition," only monitor impacts rather than provide a prescriptive process to mitigate impacts. Musqueam has requested that EAO consider in-situ-decommissioning of the existing George Massey Tunnel as a measure to avoid several significant aforementioned long-term impacts. Given the highly sensitive context, Musqueam is of the view that the Project constitutes a moderate to severe impact on Musqueam cultural continuity. Furthermore, Musqueam does not understand EAO to meaningfully have considered Musqueam's "cultural continuity" as an Aboriginal right,

and as such, EAO has not provided Musqueam with a conclusion regarding the seriousness of adverse effects on this right. Musqueam finds the unwillingness of EAO to meaningfully consider Musqueam's right to cultural continuity is significantly problematic.

#### 14.7.7.3 Impacts on Senses of Place and Spirituality

Musqueam report that the environment, place, and spirituality precipitate and reinforce familial and communal relationships (both kin and non-kin). These relationships create an identity linked to history, community, worldviews, ethics, and beliefs radiating throughout the region. Many Musqueam members also perceive the environment as an interrelated whole rather than separate entities. These tenets form the essence of Musqueam identity and the current generation of Musqueam have a responsibility to preserve these essential elements of who they are. This worldview places them as stewards of the environment and their culture for their ancestors and for successive generations.

The Fraser River delta is host to over 50 traditionally named sites within 25 km of the Project Footprint and several as close as under 1 km. These include (but are not limited to) villages, seasonal sites, transformer sites, and burial sites. These sites are part of a network of over 125 named sites sharing linkages and inter-dependencies through (including but not limited to) genealogy, history, story, cultural practice, teachings, and Musqueam's region familial and communal network. Musqueam have a collective responsibility to maintain these sites as their stewards and they play a critical and active role in knowledge transmission and generation.

Musqueam members reported use from the 1900s to the present related to sense of place and spirituality includes:

- Within 250 m of the Project footprint:
    - A settlement site and place names for an important boat route and historical use site;
- Within 5 km of the Project footprint:
    - Several burial site locations;
    - Important heritage resource locations including village, burial, and seasonal sites, shell middens and archaeological sites;
    - Place names; and
    - A spiritual site;
- Within 25 km of the Project footprint:
    - A birthplace site;
    - Multiple burial locations;

- Important places used for ceremonial purposes and gathering areas; and
- Important heritage resource locations, including village, burial, and seasonal sites, midden sites and archaeological resources, place names, spiritual locations and sources of water considered safe for drinking up until the 1970s.

Musqueam communicated that identities and senses of place are not only tied to the state of the environment, but also to the practice and ability to practice traditional activities; the practice of traditional activities in places used by ancestors help to tie contemporary members to their history and heritage.

Ceremonies, feasts, and gatherings are essential to the identity of Musqueam and the community (e.g., by reinforcing identities, creating new ties to people and the environment, and engaging with other communities). Ceremonies and gatherings involve and depend on an abundance of, or use of, natural resources found in Musqueam's territory, help to build familial and communal resilience, and while many events occur in private or on the Musqueam reserve, many ceremonial and spiritual sites are found throughout Musqueam's territory. All ceremonies are also spiritual events; spirituality permeates art, crafting, and day-to-day activities.

Spiritual sites may be non-ceremonial, or areas not principally used in the contemporary era for ceremonial purposes, including where historic events have occurred, such as wars and transformer sites, and places with spiritual qualities and strength, as well as areas in which Musqueam stories and histories are based. Burials are also considered spiritual and sacred areas, off limits to development and disturbance, and many sites are associated with village sites and camps, which are dispersed throughout the lower Fraser River region, including known sites near the Project area (including a settlement around Canoe Pass and a campsite upriver from Steveston), although much remains underground, only revealed (and often damaged) through development and industrialisation.

Musqueam reports that ceremonial and spiritual practices, material cultural expressions, and Musqueam's sense of place rely heavily on transmission of knowledge and the presence of, and access to, healthy natural resources, access to which has steeply declined along with opportunities and capacities to transmit traditional knowledge, impacting ceremonial and spiritual activities and sense of place. The environment has also experienced disturbance and loss of tranquillity, privacy, and even safety, resulting in places valued or necessary for ceremonial and spiritual practices being lost (e.g., aesthetic qualities, access).

Musqueam notes that its communal collective is dependent on the individuals within it and there is a communal responsibility towards one another. Changes to land, waters, and resources from urbanisation, industrialisation, and other manmade impacts can create disconnects between individuals, their communal collective and connection to place, including the Fraser River, decreasing, for example, their sense of place. Such changes challenge the maintenance of worldviews and beliefs, and manifest as psychological and emotional stress by obstructing traditional uses of the land and water, and familial and communal components of use. Residential and industrial development have resulted in desecration and destroyed heritage resources, including belongings, burials, and settlements.

Musqueam reports that its people have endured sustained losses in resources and access, creating large gaps in knowledge, language, and transmission of moral values, even within a single lifetime. Musqueam noted implications of these losses for their identity, and stressed the importance of building from what remains.

Musqueam Indian Band has identified the following Project-specific impacts on Musqueam's sense of place and spirituality, including:

| Impact Pathway | Impacts to Sense of Place and Spirituality |
|---|---|
| Impacts to territorial integrity | • Need for Musqueam heritage protocols to be followed in all stages of project work, including but not limited to, surveying and overview work; and<br>• Project construction and operation, leading to a lack of quality access to the Project area will disrupt hən̓q̓əmin̓əm̓ heritage protocols, ceremonial practices, heritage sites, and archaeological resources. |
| Potential changes in access and use | • Project construction and operation, leading to a lack of quality access to the Project area will disrupt hən̓q̓əmin̓əm̓ heritage protocols, ceremonial practices, heritage sites, and archaeological resources; and<br>• Increased disruption to Musqueam's sense of place in heavily used and familiar areas as a result of changes to the cultural landscape, including the introduction of significant visual disturbances (i.e., the bridge, as well as other non-visual sensory disturbances such as ecological, auditory, olfactory, etc.), and way of life, including ceremonial and spiritual activities, tool crafting and art, and the persistence of Musqueam worldview, beliefs, and ethics in connection to their past and to their heritage and archaeological resources. |
| Health and Safety Impacts | • Safety concerns including decreased skill, proficiency, in cultural conduct and language affecting physical and spiritual safety due to decreased access to the Project area and a loss in essential resources;<br>• Impacts to spiritual and physical health and safety due to breaches in cultural protocols (e.g. |

| | |
|---|---|
| | disturbance of ancestral remains and belongings) that may occur during all phases of Project construction and operation; and<br>• Increased psychological and emotional stress from changes to the physical and cultural landscape, loss of important resources and associated cultural values, and contemplation of the Project. |

EAO's analysis

With respect to the importance of the abundance of and access to natural resources found in Musqueam's territory to ceremonial/spiritual practices and members' sense of place, please refer to the below sections discussing potential Project impacts on freshwater and marine fishing and harvesting, hunting and trapping, and food and medicinal plant harvesting. See also discussion of related matters in sections 5.2 (visual quality and land use) and 7 (human health, including both atmospheric noise and air quality) of this Report, as well as section 13 of Part C, which discusses potential impacts of the Project on proven and asserted Aboriginal rights and title.

EAO understands there will not be a direct overlap with sites related to sense of place and spirituality of particular importance as identified by Musqueam, and the Project area, but understands the Project is within 250 m of a settlement site and place names for an important boat route and historical use site, which EAO infers is within the vicinity of the South Arm of the Fraser River. EAO acknowledges that an overly narrow, site-specific approach in regards to sense of place and spirituality is inappropriate and that the Project area is part of a broader geographic area that is important for Musqueam sense of place and spirituality.

As noted in the previous section, EAO understands there is potential for changes to quality of experience which could affect sense of place and spirituality at important locations for Musqueam, potentially at the settlement site referred to above, in particular in relation to changes in atmospheric noise during construction and operations. Visual conditions during operation could also affect the site in the case that the site is near the new bridge. These effects are not fully mitigable or reversible. EAO proposes a condition requiring a noise management plan be developed, in consultation with Aboriginal Groups, which seeks to partially address such potential effects. Furthermore, Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations.

As mentioned above, EAO has proposed a condition requiring an archaeological - heritage resources plan be developed, in consultation with Aboriginal Groups, which would also include requirements to engage Aboriginal Groups on an ongoing basis, as

well as a proposed condition requiring an Aboriginal cultural awareness and recognition plan. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, including Musqueam's analysis of the nature of potential impacts, the additional considerations described above, including the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to social, economic, environment, heritage, and health VCs, and as discussed in section 13.4 of this Report, EAO is of the view that the concerns raised regarding the potential impacts on Musqueam's sense of place and spirituality have been adequately considered and addressed at this stage of review.

Musqueam's analysis

Due to the substantial dispossession of the land base within Musqueam territory, a substantial degree of Musqueam's rights-based activities today take place within the estuarine and marine environments of the territory. Musqueam's sense of connection with the Fraser River delta continues, albeit in a manner that has been heavily impacted by legacy and cumulative effects of non-Aboriginal development. Legacy effects on the delta include the installation of training structures and ongoing dredging activities for shipping channels, the construction of jetties disrupting water flow patterns, the loss of shoreline habitat and the sealing off of other previously free-flowing areas. Musqueam's safe access to many areas of the lower Fraser River have been compromised or eliminated by competing non-Aboriginal use of the river, including port development, industrial marine shipping, marinas, and floatplanes. The cultural landscape of the Fraser estuary has been altered due to diking and other forms of shoreline hardening, bridges (e.g., multiple rail and road transportation bridges), as well as industrial and residential structures built adjacent to the river. Musqueam considered the few remaining areas along the lower Fraser River that continue to be free of large industrial structure and related pollution (i.e., light, noise, and air pollution), such as Deas Island, are integral for Musqueam members in the practice of spiritual and cultural activities.

The instream location adjacent to Deas Island is a highly used and important Musqueam teaching, fishing, hunting, gathering, and cultural area. It is one of the rare locations remaining within Musqueam territory where members can enjoy the experience of tranquillity, privacy, and even safety, free of pollution (light, noise, air) and large orthomorphic structures. Therefore, the context for Musqueam sense of place and

spirituality, is high (very sensitive). Intangible cultural values are not easily defined by geographic space but may be expected to have wide-spread effects (e.g. disruption of inter-First Nation regional familial and communal network). Musqueam report that reduced access caused by construction at a critical use area will be affected for multiple years, while the diminishment of sense of place due to adverse project-specific and cumulative impacts on cultural landscape, sensory and psychological and social wellbeing, is expected to be long-term or permanent. Musqueam expects many of the effects of Project interactions (i.e., impact to cultural landscape, sensory disturbance from bridge operations) to be irreversible. Given the highly sensitive context, Musqueam's view is that the Project constitutes a severe impact on Musqueam sense of place and spirituality.

Musqueam notes that EAO has been made aware of impacts regarding access to clear sightlines and that cultural spaces are not equitable to archaeological sites. It has been communicated that the Project area is a cultural space, within which are culturally important places (e.g., teaching areas), and there are two adjacent culturally critical sites flanking the proposed location of the bridge. As such, there will be a direct overlap with sites related to sense of place and spirituality of particular importance to Musqueam. Moreover, impacts to visual conditions will impact sightlines in the vicinity of the bridge that are relied upon for expressing connections within and across the territory.

Musqueam is of the view that EAO's proposed conditions including incorporating Aboriginal engagement in the creation of an archaeological resources and cultural heritage management plan, is not an adequate form of mitigation. Musqueam feel it is imperative that Musqueam meaningfully collaborates and participates in a decision-making role in the creation and implementation of any conditions specific to cultural continuity and sense of place and spirituality, and that Musqueam has the opportunity to play a decision-making role in gauging the effectiveness of any proposed conditions and mitigation measures.

In conclusion, Musqueam disagrees with EAO's conclusion and does not consider impacts on Musqueam's sense of place and spirituality as being meaningfully considered nor addressed. EAO has also provided an inadequate impact analysis and has not provided a meaningful conclusion regarding the seriousness of adverse effects to sense of place and spirituality as an Aboriginal right. The proposed mitigation measures, such as (but not limited to) the "Aboriginal Cultural Awareness and Recognition," submitted by EAO have a high degree of uncertainty due to the lack of detail and specificity regarding how the proposed management plans intend to address Project impacts to cultural continuity and sense of place and spirituality. Musqueam has

requested that EAO consider in-situ decommissioning of the existing tunnel as a measure to avoid several significant aforementioned long-term impacts. Without in-situ decommissioning of the existing George Massey Tunnel, Musqueam anticipates that there will be high Project-specific residual impacts to Musqueam's sense of place and spirituality in the Project area during construction and operation, with a particularly high adverse effect on the cultural landscape associated with a critical resource harvesting and teaching area. Given the highly sensitive context, Musqueam's view is that the Project constitutes a moderate to severe impact on Musqueam cultural continuity.

#### 14.7.7.4 Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

For Musqueam, fishing and the Fraser River are a way of life, marine resources are critical to inter-national trading, and the maintenance of Musqueam's millennia old regional familial and communal network. Fishing and activities associated with fishing (e.g., preparation for fishing and fish processing) are key cultural and livelihood activities for Musqueam; waterways provide transportation corridors, and spiritual and cultural benefits as well as food. Additionally, fishing provides tangible and intangible benefits for Musqueam members. Fishing is an important source of food and nutrition as well as income for Musqueam members. Fishing and the stewardship associated with fishing (knowledge, landscape, and resources) also form a core part of Musqueam's identity and sense of place, providing many intangible benefits to Musqueam's spiritual, psychological, and cultural wellbeing. There are a combination of factors that Musqueam have noted make the Project area one of the last dynamic areas where Musqueam can productively fish. These factors include:

- Its habitat value for sturgeon, migrating salmon, and eulachon;
- Features of the river itself, including the river bottom (e.g., river depth, the lack of snags/debris on which nets may become tangled), the narrowness of the river, and the congregation of fish in the area (e.g. funnelling of fish from the south arm around and from šxʷɬiċəm (Canoe Pass) into the Project area);
- Because of the existence of the George Massey Tunnel the area hosts calmer, slower, and shallower waters, as the area has not been exposed to dredging to the same extent as other sections of the Fraser River;
- Fewer seals preying on catch as compared to the mouth of the Fraser River;
- Sheltered from wind and less prone to fog that can inhibit fishing and create safety hazards, especially in combination with competing marine traffic;
- As it has been traditionally, the area is critical for teaching activities (e.g. language, culture, history) and younger fishers, and has been fished by many current Musqueam for many decades; and

- A key fishing point along an established fishing route for Musqueam fishers including the Sand Heads Lighthouse at the mouth of the main arm of the Fraser River to the Pattullo Bridge in New Westminster.

Musqueam notes the Project area is in the heart of Musqueam's territory and is regularly fished by Musqueam fishers, as it has been for millennia. Musqueam has communicated that impacts to any of Musqueam's key fishing area, especially at critical times coinciding with prime fishing opportunities, can have large consequences.

Musqueam members reported use from the 1900s to the present related to fishing includes:

- Within 250 m of the Project footprint:
    - Numerous fishing locations for various fish species including salmon (spring, sockeye, chum, coho, spring, steelhead), sturgeon, and eulachon;
    - Important fish spawning habitats and holding areas;
    - A fish processing site;
    - Important waterways and boating routes relied on for reaching field grounds on the Fraser River or Salish Sea; and
    - Required for intergenerational knowledge transfer;
- Within 5 km of the Project footprint:
    - A variety of fish species relied on for subsistence purposes, including salmon (spring, sockeye, chum, coho, pink), eulachon and sturgeon;
    - A variety of shellfish species, including prawns and crab;
    - A fish processing site;
    - Required for intergenerational knowledge transfer; and
    - Multiple traditionally named sites;
- Within 25 km of the Project footprint:
    - Processing locations for cleaning, drying, smoking and packing fish;
    - High value shellfish habitat;
    - High value fish habitat such as holding, rearing, and spawning locations;
    - High value bird habitat;
    - Fishing sites for salmon (coho, sockeye, chinook, chum, pink), eulachon, halibut, cod, flounder, smelt, perch, sole, dogfish, roe, and sturgeon, and a variety of shellfish species, including crabs and prawns;
    - Required for intergenerational knowledge transfer; and
    - Multiple traditionally named sites required for intergenerational knowledge transfer.

Musqueam notes that waterways provided transportation corridors, and spiritual and cultural benefits as well as food. The complex environment requires specialized knowledge. Fishing and subsisting from the Fraser River, the Salish Sea, and other freshwater and saltwater bodies are defining aspects of Musqueam's history and culture, and has been for millennia as evinced by their hən̓q̓əmin̓əm̓ language and archaeological, historical, and oral records. A diverse set of freshwater and saltwater species are valued and fished by Musqueam, including (but not limited to) sturgeon, eulachon, and all species of salmon, as well as smelt, flounder, and octopus. Musqueam fishing occurs over a wide geographical area, but it is in the lower Fraser River where the majority of Musqueam's food, social (familial and communal) and ceremonial (FSC) fishing is conducted. Fishing activities are highly dictated by the timing, arrival, and abundance of various fish stocks. Inseparable from these species and the territory utilized in fishing are associated knowledge, language, and cultural practices.

Fish, and especially salmon, are major components of Musqueam health and diets. Fishing and the sharing of catch is also a major component of Musqueam's food security. The distribution of fish from fishers to elders and other Musqueam members ensures, as a cultural imperative, that individuals who are unable to fish are supported and have access to traditional foods still constituting a major portion of diets. Issues in species abundance and status, however, limit distribution to a small portion of the community based on availability. Fishing also has economic importance to Musqueam, as a primary livelihood for many members and contributes to food security by allowing members to purchase other dietary staples. Activities associated with pre- and post-fishing, including preparation and fish processing, which has deep cultural roots for Musqueam, are also crucial for food security and knowledge transmission, and are increasingly important as abundance of traditional foods has dwindled and fluctuated.

Marine resources are integral parts of Musqueam health and diets. Fish continue to be an essential component of inter-First Nation relations and at Musqueam's cultural events today, including at feasts, dances, naming ceremonies, memorials and funerals, public gatherings and more. Without marine resources many of the aforementioned activities cannot take place. The importance of fishing and fish for the Musqueam community is clearly illustrated by Musqueam members' conservation concerns and actions over more than a century. This is also evidenced by Musqueam's desire to once again harvest currently non-accessible species when populations and health of stocks rebound.

During the EA, Musqueam Indian Band raised specific issues and concerns with potential Project impacts relating to their Aboriginal right to fish and harvest marine resources:

| Impact Pathway | Impacts to Fishing and Marine Harvesting |
|---|---|
| Reduced access to critical fishing area at delegated times | • Construction of the new bridge and the removal of the existing tunnel will impede the already limited access to fishing. Impediments include: construction-related navigation exclusion zones on fishing access, barges and construction equipment, marine navigational access and mobility to regions upriver and downriver of the Project;<br>• Footprint effects of the Project on instream and riparian fish habitat in Deas Slough and Greens Slough from Project construction;<br>• Increase in stress and behaviour changes in fish as a result of barge traffic, and instream construction noise;<br>• The timing of the removal of the existing tunnel is scheduled to occur during a critically important fishing year for Musqueam. Any changes in the River many seriously impact the high return anticipated and Musqueam's access to the high return population. As such, there will be multigenerational impact on fish population beyond the scheduled construction; and<br>• Impeded road access to fishing grounds. |
| Reduced harvesting opportunities due to changes in fish abundance and distribution in critical fishing areas at delegated times, and to future harvesting of currently unavailable and/or restricted species | • Musqueam's rights to harvest under the *Sparrow* decision;<br>• Cumulative effects, including past, present and future effects, to Musqueam's Aboriginal right to fish;<br>• During construction and operation, there will be decreased fishing resource abundance and health due to pollution and sedimentation;<br>• Generally, there will be cumulative effects on fish abundance, especially for species subject to closures or otherwise listed by COWISEC as threatened, endangered, or species of concern. Musqueam desires a return to harvesting traditionally harvested species when conservation, contamination and pollution concerns are addressed. There is a desire to harvest these resources again; and<br>• Importance of fish and fish habitat including species of cultural and economic importance such as eulachon, sturgeon and salmon. |
| Efficacy of Musqueam fishing equipment, due to changes in river dynamics within critical fishing area | • Removal of the existing tunnel will decrease the efficacy of Musqueam fishing equipment due to changes in the river, such as water flow patterns and shoreline changes, and resulting changes to fish distribution and behaviour. |
| Cultural and sensory experience, transmission of fishing-related knowledge | • Construction of the new bridge and the removal of the existing tunnel will permanently change the cultural landscape of the Fraser River;<br>• Long-term risk for further impacts to cultural landscape and sensory experience caused by induced marine vessel traffic and industrial port activities on the South Arm of the Fraser River, resulting from tunnel removal and potential subsequent deepening of navigational channel; and<br>• Efficacy and applicability of Musqueam fishing knowledge and cultural practices through changes to the landscape. |
| Projects effects on Fishing and Marine | • Species have acclimated to current conditions, e.g. tunnel in place;<br>• Loss of fish habitat as a result of changes in water flow patterns, |

| | |
|---|---|
| Habitat | benthic river structures, and altered shorelines caused by Project construction and tunnel removal;<br>• Increased fish stress and mortality as a result of changes in water flow patterns, benthic river structures, and altered shorelines caused by Project construction and tunnel removal;<br>• Increased stress and behaviour changes in fish as a result of noise (e.g. vessel traffic, pile driving, blasting);<br>• Decreased fishing resource abundance and health due to pollution and sedimentation;<br>• Concerns related to dredging, potential for increased vessel traffic and larger vessels resulting from tunnel removal;<br>• Potential effects on the salt wedge due to removal of the tunnel; and<br>• Impediments to ongoing and desired future Musqueam efforts to restore fish populations and habitat. |

Other issues related to fishing and marine harvesting identified by Musqueam include but are not limited to:

- Importance of Musqueam Fisheries Department reviewing Green Slough concept;
- Restriction of Musqueam fishers' ability to access and exercise fishing rights to harvest in the area of the Project area during bridge construction and during removal of the tunnel impacts to Musqueam fisheries indefinitely after the removal of the existing tunnel, and importance of working closely with Musqueam to ensure negative effects are avoided; and
- Inappropriateness/inadequacy of a proposed Marine Users Group for consultation with Musqueam and to address Musqueam concerns.

*Musqueam perspectives on cumulative impacts to fish abundance:*

- Overfishing by the commercial fishing fleets and fisheries mismanagement, both within and beyond 25 km from the Project area;
- Sport fishing effects on salmon numbers (as well as effects of catch and release stress on sturgeon), and DFO's perceived mismanagement of the sport fishery;
- Commercial and sport fisheries effects on stocks caught as bycatch when targeting other species;
- Extensive urbanization and industrial and residential development, including in spawning grounds and habitats for salmon (including salmon-bearing streams), smelt, eulachon, and sturgeon (to name a few);
- Point and non-point pollution associated with industrialisation, urbanisation, and agriculture;

- Anthropogenic stressors within the river have further damaged fish habitats and increased fish mortality, including from the proliferation of log booms;
- Dredging and maintenance dredging of the river has further reduced fish habitats, including holding areas used by migrating fish to rest and spawning areas;
- Climate change (Musqueam fishers have observed that the Fraser River continues to warm, affecting fish mortality and behaviour);
- Increased non-Aboriginal and commercial boats and shipping on the Fraser; and
- Increase in natural predators such as seals and sea lions, which affect fish populations as well as fishing efficiency.

Musqueam notes that, alongside decreases in fish abundance and health, fishing activities are also impacted within 25 km of the Project area by non-biological factors including regulatory mechanisms and build-up of infrastructure/presence of competing river uses, including:

- Changing legal and licensing policies that have restricted Musqueam fishing in terms of time, space, and method (i.e. regulations and restrictions in terms of quotas, allotted hours, and space);
- Regulatory constraints and land alienation restrict Musqueam stewardship abilities (e.g. protection of spawning areas);
- Constrained fishing times negatively impact transmission of knowledge and other intangible values;
- Log booms, and log boom traffic (decrease amount of fishable space, displace fishers due to traffic, and create fishing hazards in the river when logs sink);
- Other construction and infrastructure (e.g., bridges and docks) in the Fraser River, often in areas that were highly productive fishing grounds;
- Infrastructure and developments have altered physical features of the river to affect fishing by changing water flows (e.g. back eddies), leading to loss of valuable fishing areas and changing fish movement;
- Dredging of the river altered water flows according to Musqueam, making the water run faster (also creating safety hazards), and dredging is intensifying;
- Dredging negatively impacts the efficacy of Musqueam fishing gear (gear specifics, e.g. net length, is regulated);
- Restrictions on nets have made certain areas inaccessible or nonsensical to fish;
- Access to fishing areas in the Fraser River have also been blocked or lost due to infilling and sedimentation (interacting with manmade infrastructure);
- Increase in commercial and recreational marine traffic obstructing and disturbing Musqueam fishing and causing severe safety issues. Fishers have noted trips cut

short to avoid being run over by commercial ships or having been run over, including in the Project area;
- Recreational vessels are hindering fishing in already limited spaces and creating safety hazards while on the water and damaging fishing gear; and
- Increasing marine traffic and crowding in a limited area breeds conflict, alienating Musqueam fishers from certain areas.

Musqueam has communicated their view that fishing is increasingly limited by a growing number of factors affecting the availability and accessibility of staple foods that are critical to Musqueam culture, and that as space, time, and abundance become constrained, even chance events and small changes may produce significant negative effects on Musqueam fishing, bringing the sustainability of continuing practices to a tipping point.

EAO analysis

Potential adverse effects to fish and fish habitat, river hydraulics and to water quality are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Musqueam's concerns about species of cultural and economic importance, EAO notes that eulachon, sturgeon and Pacific salmon were included in the five sub-component species assessed. Sediment removal and construction works during least-risk timing windows are a primary mitigation measure to reduce potential adverse effects, including on juvenile salmon and adult and larval eulachon. EAO considered that fish species of conservation concern have higher sensitivity and lower resilience, and is of the view that while adverse effects to individual fish may occur, overall population integrity would not be adversely affected.

In regards to Musqueam's concerns about pollution, sedimentation and changes in hydrology of the Fraser River, EAO anticipates that most of the relocated sediments would remain within the LAA for the Project; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO discusses its assessment of potential effects of the Project on river hydraulics and river morphology in the lower Fraser River in section 4.2, and is of the view that residual effects to hydrology would not be significant. EAO also proposes a condition requiring development of a river bed and hydrology management plan in consultation with Aboriginal Groups, which as a result of feedback from Musqueam includes foreshore monitoring as well as a description of current baseline conditions and trends in river hydrology within the Project area, in the year prior to Tunnel decommissioning, to provide a means of identifying changes in river bed profile

following Tunnel decommissioning. EAO also proposes a condition requiring the Proponent to update hydraulic modelling based on final construction plans to support mitigation planning.

In response to Musqueam's concerns noted regarding inadequate characterization of effects on white sturgeon in this Report, EAO provided a response in regards to its definition of "reversibility" used in EAs and that, although EAO considers mortality of individual juvenile fish to be irreversible, it has characterized the effect as reversible given the ability of a fish population to return naturally to baseline levels. Given mitigations and EAO's proposed conditions, Tunnel decommissioning activities are not anticipated to have a significant residual adverse effect on white sturgeon, with no adverse effect on the viability of the lower Fraser River sturgeon population.

Consideration of potential changes to the salt wedge in the South Arm of the Fraser River as a result of the Project is considered in section 5.1 (agriculture). Salt wedge modeling undertaken by the Proponent indicates salinity levels with and without the Tunnel would be nearly identical. The Proponent's salt wedge study found that any temporary change in the riverbed profile caused by the removal of the Tunnel is not expected to influence the movement of the salt wedge to any substantive degree. However, EAO has proposed a condition requiring development of a plan for mitigating potential adverse effects to agricultural that would include timing, duration and frequency of in-river salinity monitoring to be undertaken, and which Aboriginal Groups would be consulted on.

In response to concerns from Aboriginal Groups about removal of the Tunnel, dredging and a related potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA confirmed that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel"[53]. EAO also notes that any such future plans would be subject to review under the VFPA's Project and Environmental Review (PER) process and additional consultation with potentially affected Aboriginal Groups, including Musqueam. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

[53] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

EAO proposes conditions requiring a fish and fish habitat management plan and fish habitat offsetting plan be developed by a Qualified Professional in consultation with Aboriginal Groups. The offsetting plan would require restoration of Green slough as well as shallow subtidal habitat in Deas Slough, in consultation with Musqueam. EAO also proposes a condition requiring on-site water quality be managed and monitored during construction, including during Tunnel removal, to ensure compliance with specific water quality guidelines, as well as conditions requiring the development of a drainage and stormwater management plan and a noise management plan, in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations. These proposed conditions, in addition to the conditions related to access to the Fraser River discussed below, are anticipated to also serve towards preventing loss of knowledge and barriers to knowledge transmission for Musqueam due to alteration of fish behaviour/river dynamics from the removal of the Tunnel.

EAO's proposed condition requiring that a CEMP be developed by a Qualified Professional, in consultation with Aboriginal Groups, addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies, and specifically speaks to potential spills of hazardous substances. Potential accidents and malfunctions, including potential spills of hazardous substances, are discussed in section 8 of this Report and EAO's view is that following mitigation measures that risk of such an accident is considered to be low.

EAO has also proposed a condition that would require a Qualified Professional to act as an Independent Environmental Monitor to be hired during construction, to observe, record, report and provide information to EAO including regarding compliance.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough, which EAO understands overlap spatially with important fishing areas for Musqueam. EAO understands that there is potential for construction activities to impact fishing activities where active fishing may overlap temporally with construction. Musqueam has also communicated to EAO its concern that decommissioning of the Tunnel is anticipated to occur in 2022, which alongside 2018 is an important year for pink salmon runs, and a concern that this also coincides with construction windows of other projects on the Fraser River, potentially including the

Pattullo Bridge replacement project. As noted in section 5.3 (Marine use) of this Report, EAO anticipates that any potential disruption to marine use from the Project would be local, short-term, and infrequent, recognizing that Musqueam has communicated their concern that impacts could be long-term and high impact to the salmon population. More specifically, and considering the conditions proposed and discussed in the following paragraphs, EAO anticipates that potential disruption to access to fishing areas for Aboriginal Groups from the Project can be avoided.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO proposes a condition requiring the establishment of a marine users group, which would include Aboriginal Groups, and development of a marine access management plan during construction, that would describe how any disruption caused by the Project, including to access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction, would be avoided or mitigated. EAO understands the Proponent is working with Musqueam to seek Musqueam's input on how they would like to be consulted on marine access matters during construction

Construction activities, such as the construction of the bridge, bridge approaches and interchange upgrades, may adversely affect nearby residential, commercial and industrial land uses, by leading to temporary transportation delays, access restrictions to marinas, wharves and boat launches, and increased noise. This may also affect users' experience of, or temporarily restrict access to, recreational areas, especially in the Deas Island Regional Park, the Millennium Trail, and marine recreation facilities. Regarding Musqueam's concerns about road access to fishing areas being impeded, EAO anticipates a potential change in access during construction to be low in magnitude and would be limited to the construction phase or area where temporary access limitations would occur.

EAO proposes a fisheries access condition that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel, during construction. As noted above, EAO is of the view that this, along with the above conditions, are anticipated to be effective in preventing potential adverse effects related to access as well as preventing harm to Musqueam fishing equipment. EAO notes that this is also intended to address Musqueam's concern regarding impacts to knowledge transmission related to access. EAO also notes that in response to Musqueam's concerns, EAO revised the proposed marine access condition to include a complaint resolution process for loss or damage to commercial traps, nets and other fishing

equipment, and anchors and other vessel-related gear due to interactions with Project-related marine vessels.

EAO notes that Musqueam has shared two primary concerns regarding the proposed fisheries access condition: first, that the condition does not specify a compensation element to Musqueam in the case the condition is not complied with; and second, that the condition may be interpreted such that it is ineffective in preventing the impeding the activities of fishers on the river (i.e. by impeding nets and other equipment). However, EAO is confident the proposed wording has been drafted to require the Proponent to not impede Musqueam and other Aboriginal Groups' ability to fish on the Fraser River during fishing windows.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail which connects Ladner to Deas Island Regional Park) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. However, Musqueam has noted the importance of sightlines and the impact of the Project, particularly the new bridge, on those sightlines, in regards to quality of the multisensory experience of fishing on the river.

A minor effect on quality of experience related to a potential change in noise and during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure. While the fisheries access condition requires that construction activities not impede Aboriginal fishing activities including that of Musqueam's, Musqueam has highlighted to EAO its view that construction noise related to other components of the Project could also be disruptive to Musqueam fishers.

EAO also considered sections 5.2 (land use and visual quality, particularly sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, including Musqueam's analysis of the nature of potential impacts, the additional considerations described above, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC

issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, visual quality, human health (atmospheric noise), and as discussed in section 13.1 of this Report, EAO is of the view that the Project is expected to result in minor-to-moderate impacts to Musqueam's asserted and proven Aboriginal Rights to fish.

Musqueam analysis

Musqueam is of the view that these mitigation measures have a high degree of uncertainty for a number of reasons. First, there is a lack of detail regarding how the proposed management plans intend to address Project impacts to Musqueam's fishing rights. For example, it has been stressed to EAO that Musqueam is extremely concerned about how the Project will negatively impact critical years for Sockeye salmon runs, which occur every four years, and the next of which is in 2018. The Proponent's proposed mitigations to be incorporated into their CEMP and OEMP to mitigate effects on Musqueam's Aboriginal rights are yet to be defined.

Musqueam notes that many critical design components of the Project and precise timing and management of construction, for example, remain vague. Specific methods of mitigation have not been prescribed or defined by the Proponent, which intends to leave mitigation development until after the EA has been completed, and to be undertaken by the Project Concessionaire that has yet to be selected. The Proponent's assessment does not identify any potential adverse effects on Musqueam fishing efficacy due to changes in the river (e.g., water flow patterns and shoreline changes) and resulting changes to fish distribution and behaviour. While EAO indicates that the Proponent will consult Musqueam on marine access matters, Musqueam believes this does not guarantee that Musqueam will be granted quality of access to integral harvesting and fishing locations in the Project area and particularly close to the Project footprint. Musqueam also notes that EAO has not articulated proposed conditions that will ensure high quality of access and use for the Musqueam community to harvest fish and the processes associated with fishing. Furthermore, Musqueam has highlighted the need for a Musqueam specific fisheries access condition to address Musqueam's established *Sparrow* rights; this proposition was dismissed by EAO.

In its conditions regarding fish and fish habitat, EAO has not addressed the impacts, such as behaviour and marine habitat, that the marine species in the Fraser River will experience from the removal of the existing George Massey Tunnel.

Additionally, Musqueam's view is that EAO does not take into consideration the impacts and potential conditions to impacts to the efficacy of Musqueam fishing gear and knowledge in an environment in which river depth and river flow may be significantly

altered due to tunnel removal. Musqueam is of the view that EAO's assessment of Musqueam as solely a 'Marine User' or an 'Aboriginal Group' is inadequate as Musqueam possesses established Aboriginal fishing rights, and the Project area is integral for Musqueam to practice these established rights. As such, conditions issued by EAO should include Musqueam in a decision-making role in any issues that address impacts to fish and fish habitat.

In conclusion, Musqueam disagrees with EAO's conclusion. In Musqueam's perspective, the proposed mitigations in the Application and by EAO are expected to be only partially effective, if at all, due to the seriousness of effects and lack of detail regarding the relevance of mitigations in preventing residual adverse effects on Musqueam's right to fish (at critical locations and times). Musqueam's view is that Project construction is likely to significantly restrict Musqueam access to exercise its established *Sparrow* right to fish. As noted previously, Musqueam report that the Project area is a critical fishing space for Musqueam. EAO's proposed "Fishing Access" condition does not clearly take Musqueam's established *Sparrow* rights into consideration, and does not guarantee quality of access to the Project area to exercise Musqueam's right to fish. Taking this into consideration, Musqueam anticipates that there will be high Project-specific residual impacts to Musqueam's right to fish in the Project area during construction and operation. Musqueam has requested that EAO consider in-situ decommissioning of the tunnel as a measure to avoid many of the negative aforementioned long-term impacts. Given the highly sensitive context, Musqueam's view is that the Project constitutes a moderate to severe impact on Musqueam's right to fish.

<u>EAO Justification Analysis</u>

In consideration of Musqueam and EAO's differing views regarding the scope of Musqueam's proven Aboriginal right to fish as described in *R. v. Sparrow* and whether justification is required as a component of consultation on this Project, EAO has agreed to provide a justification analysis as a component of consultation in relation to the Project.

*Compelling and Substantive Objective*

The Highway 99 corridor (including the existing Tunnel) provides an essential link between the municipalities of Delta and Richmond, and connects areas of key regional importance throughout the Lower Mainland and South Coast region including but not limited to Vancouver International Airport, the Canada-U.S. border crossings, BC Ferries Tsawwassen terminal, Deltaport, and Boundary Bay airport. As outlined in

section 2 of this Report, the proposed new bridge and removal of the existing Tunnel is intended to achieve the Proponent's following six key Project goals: to improve traffic and seismic safety, as well as emergency-response capabilities; to reduce congestion and improve travel times for all users; to support trade and commerce; to support dedicated transit and high occupancy vehicle lanes for long-term transit improvements; to support options for pedestrians and cyclists; and to enhance the environment under the new bridge and in the Project right-of-way on Deas Island.

EAO understands from the Proponent that the Project was developed in consideration that the Highway 99 corridor is the busiest transit route of all the Fraser River road crossings, and that the Project would be built to accommodate potential future population growth as well as potential future rapid transit.

EAO also understands, as described in section 2.5 of this Report, that the estimated $3.5 billion Project is anticipated to provide economic benefits during construction and operations, including an estimated 9,000 direct construction jobs and over 8,000 indirect jobs. During construction the Project is anticipated to generate an estimated $518 million in tax revenue, as well as 60 to 90 permanent, primarily full-time, direct jobs during operation. Annual estimated tax revenues during operation are anticipated to be $4.0 million a year, and the Project is forecast to increase GDP growth in the region by about $13 million starting in 2021. In regards to community and social benefits of the Project, the Project is anticipated to improve travel time and reliability for all users as noted above, to improve local air quality, to reduce vehicle collisions and safety risk, to improve access and mobility for local agricultural operators, and to improve access to transit, carpooling, and active modes of transportation.

*Minimize Infringement to Extent Possible*

Potential adverse impacts on Musqueam's proven and asserted Aboriginal rights to fish are outlined above, as well as mitigations and proposed conditions, in part developed to avoid and/or mitigate cultural and economic effects to those rights. These proposed conditions would also address concerns EAO has heard regarding the Tunnel decommissioning being anticipated to occur during an important fishing year, in 2022. Although Musqueam has communicated its preference for the Tunnel to remain in place, decommissioning of the Tunnel would align with MOTI's best practices regarding management of obsolete infrastructure, and would be undertaken to eliminate the future risk of damage to the new bridge and impact to shipping associated with significant future seismic activity, and to support opportunities for fish habitat restoration and enhancement. Road access to fishing areas may be minimally impeded during construction on a short-term basis. While the river may see changes in water flow

patterns and to the shoreline, these changes would be mitigated by opportunities to restore the river bottom to its natural condition and to enhance riparian habitat on Deas Island. Given EAO's views on the expected efficacy of the proposed conditions, only residual impacts that are unavoidable or are at levels as minimal as possible are anticipated by EAO.

*Adequate Consultation*

From September 2016 to January 2017, EAO and Musqueam engaged in a collaborative process to draft this Musqueam-specific section (14.7) of the Report, which from EAO's perspective reflects engagement at the deep end of the consultation spectrum where consensus was sought on proposed conditions to appropriately avoid, mitigate or accommodate potential impacts to Musqueam's asserted and proven Aboriginal rights and title. Where consensus was not achieved, differing views are captured in this Report and in Musqueam's separate submission to the Ministers. Further details regarding EAO's consultation with Musqueam on this Project are identified throughout section 14.7.3 and 14.7.4.

In light of the above, EAO is of the view that any potential infringements on the proven Aboriginal right to fish under *Sparrow* that could result from an issuance of an EAC for this Project would be justified.

EAO notes that on January 12, 2017, Musqueam responded to EAO's January 4, 2017 draft justification analysis and indicated its view that this analysis was insufficient to discharge the constitutional obligation to justify an infringement on Musqueam's constitutionally established rights, as set out in *Sparrow.* It was also Musqueam's position that the infringements that would result from an issuance of an EAC for this Project would not be justified.

#### 14.7.7.5 Impacts on Hunting and Trapping

Musqueam report that hunting is an important activity for both subsistence purposes and critical for Musqueam cultural continuity, including in the vicinity of the Project. Musqueam's territory was host to a wide range of species, each with associated knowledge, language, and uses. Utilized species within the Project area include, but are not limited to, waterfowl deer, bear, elk, furbearers and marine mammals. Access to many of these species has been impacted and currently, waterfowl and upland game birds are the primary species Musqueam hunt within the Project area. The lower Fraser is host to a rich variety of waterfowl including several varieties of geese and dabbling and diving ducks. Hunting is a familial and communal activity and, as with fishing and plant harvesting, hunting and activities associated with hunting (e.g., preparation for

hunting and processing game) are key cultural activities and facilitate the transmission of the language and knowledge associated with the species and activities. Meat and other culturally useful parts of animals are shared around the community or donated to the community smokehouse (i.e., longhouse or big house; ceremonial site), activities which reinforce familial and communal ties. Beyond their use as a food source these species are also required for familial and communal, spiritual and ceremonial uses and critical to inter-First Nations trading and the maintenance of Musqueam's millennia-old regional familial and communal network.

Musqueam notes that the Project area is in the heart of Musqueam's territory and regularly utilized by Musqueam, as it has been for millennia. Musqueam reported use from the 1900s to the present related to hunting includes:

- Within 250 m of the Project footprint:
    - A hunting site for game (i.e., black bear) and hunting areas for a variety of bird species, including ducks, geese, and pheasants;
- Within 5 km of the Project footprint:
    - Sites reported for hunting large game (i.e., deer);
    - Sites reported for hunting smaller game, including rabbit and muskrat;
    - Hunting sites for a variety of bird species, including ducks, geese, and pheasants; and
    - High value habitat for waterfowl;
- Within 25 km of the Project footprint:
    - High value habitat for deer and ducks;
    - Hunting and trapping sites for game including deer, seal, mink and muskrat;
    - Hunting areas for a variety of bird species including ducks, geese, grouse and pheasants; and
    - Important transportation routes for accessing hunting areas.

Musqueam have noted the importance of key areas in the vicinity of the Project for hunting and habitat, particularly for waterfowl. Of particular note is Deas Island, which overlaps with the Project footprint, and Kirkland Island, just downstream of the Project footprint.

The tidal marshes are particularly important habitat areas for hunting waterfowl. Musqueam have explained the importance of hunting waterfowl and game birds both currently and historically, their importance as a subsistence resource and the continued cultural importance of hunting. Historically, Musqueam also hunted deer, bear, seals, sea lions, and whales. Although fish, birds, deer, and sea mammals satisfied the greater

part of Musqueam subsistence needs historically, many other animal species were also hunted and trapped during the seasonal round. Traplines were often shared by friends and relatives, and provided familial and communal ties and connections across the region.

Musqueam's hunting and trapping activities currently occur in a highly impacted environment, as the Greater Vancouver Regional District has taken up increasing amounts of land. Other factors which have adversely limited Musqueam's hunting and trapping include:

- Remaining land areas are often also taken up by agriculture;
- Silling and infilling of waterways around the city have had large impacts on Musqueam's use of water for travel and hunting; and
- Regulations for hunting, firearm use, and ownership, and confusion among enforcement officers about what Musqueam are allowed.

In conjunction with the loss of hunting areas and restrictions that hinder hunting, Musqueam also reports that quantities of hunted species have declined, due to:

- Habitat areas have been destroyed or greatly downgraded due to urbanisation;
- Industrialisation of shorelines impact on mammals and birds that live or feed in these areas, as habitat is downgraded or destroyed;
- Urbanisation and industrialization may also have impacted flight paths of birds such as ducks and geese, and mortality of deer, impacting abundance and distribution; and
- Contamination caused by urbanisation, industrialisation, shipping, agriculture, and sewage has greatly impacted both the numbers and quality of animals available for Musqueam to hunt, with the result that often they do not feel safe harvesting the few animals that are still available in the area.

While some species are currently restricted, e.g. due to conservation concerns, regulations, or pollution, Musqueam have a desire to harvest in the future when these restrictions are addressed.

During the EA, Musqueam Indian Band identified the following concerns and comments related to their asserted Aboriginal Rights to hunt and trap:

| Impact Pathway | Impact to Hunting and Trapping |
|---|---|
| Access to critical harvesting locations | • Decreased access to key hunting grounds due to Project construction and operations caused by navigational barriers and hazards, loss of species specific habitat, and transformation of the landscape;<br>• Decreased and impeded marine navigational access and mobility to areas upriver and downriver of the Project; and<br>• Decreased terrestrial access to hunting grounds due to Project construction and operations, including from possible bridge tolls. |
| Changes in sufficiency of resources in key harvesting locations due to adverse effects on bird abundance, behaviour, and distribution, and continued barriers to future harvesting of currently unavailable and/or restricted species | • The Project will adversely impact the abundance of birds (e.g. a variety of ducks and geese) in key hunting locations due to the loss of habitat from Project construction (ancillary sites, barges) and operations (physical occupation by Project infrastructure);<br>• The Project will cause changes in bird behaviour, distributions, and flight patterns due to construction and operations. In particular, sensory disturbances, such as lighting, noise, and the presence of infrastructure, will impact bird species that Musqueam depends on for food;<br>• The Project will cause increased mortality of birds through collision from vehicles and infrastructure;<br>• Generally, there will be cumulative effects on wildlife abundance, especially for species subject to closures or otherwise listed as threatened, endangered, or species of concern; and<br>• Cumulative effects on Musqueam's past, present, and future Aboriginal Rights to hunt and trap. |
| Cultural and sensory experience, transmission of hunting-related knowledge | • Reduced hunting opportunities will lead to reduced transmission of hunting-related cultural knowledge;<br>• Bridge construction and operation will permanently change the cultural landscape of areas that currently or in future, may be used by Musqueam for hunting; and<br>• Bridge operations will impact sensory experience through noise, visual structures and lighting. |

EAO analysis

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report.

EAO notes that Deas Island is within the RAA for terrestrial wildlife, that Kirkland Island and Deas Island are within the LAA and RAA for marine mammals, and that other key sites noted of importance to Musqueam above are outside of those LAAs and RAAs.

Regarding Musqueam's concerns about potential adverse effects on birds, including eagles, EAO notes in section 4.4 that disturbance is expected to be minimized through mitigation measures proposed, such as clearing outside of bird breeding season and pre-clearing surveys. The Proponent has noted that bald eagles are also more tolerant than most species to human activities and there is abundant evidence and practical knowledge of measures to minimize effects on this species.

EAO notes in section 4.3 that, while a measurable change to underwater noise is expected outside natural variability, with mitigation and monitoring, residual effects are not expected to result in underwater noise levels that injure marine mammals.

EAO proposes conditions that require wildlife and wildlife habitat management plans for construction and operation as well as a marine mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed a condition requiring a drainage and stormwater management plan and noise management plan to be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations.

EAO notes that disruption of access to hunting areas could occur during construction, where construction overlaps temporally with hunting and trapping activities. Considering considerations outlined in section 5.2.6 (Land Use) of this Report, EAO anticipates that potential disruptions to access to terrestrial hunting and trapping areas would be site-specific, restricted to limited areas, such as shore-based facilities or portions of land-based trails, short-term, with effects limited to construction where temporary access limitations would occur, and frequent during construction.

While EAO notes that sites of importance for Musqueam (including the South Arm of the Fraser River generally, and Deas Island) overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application, EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Musqueam's asserted Aboriginal Rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the Project area.

EAO also notes that other sites in proximity to the Project, including Kirkland Island, IR 2, IR 3, and IR 4, are outside of the RAA, outside of which no effects on terrestrial wildlife are anticipated. However, EAO acknowledges Musqueam has noted a concern about a new bridge potentially diverting migratory birds, and Musqueam's corresponding concern that this could impact the feasibility of hunting in particular areas.

In response to Musqueam's concern above, EAO's view is that the Project is not expected to alter waterfowl flight patterns or interfere with the ability for hunters on Westham and Kirkland Islands to access waterfowl. This is due to the low proportions of waterfowl currently travelling along the river that could interact with the new bridge and the observed abilities of waterfowl at a reference site similar to the new bridge to avoid collisions. EAO also understands there is limited potential for the new bridge to alter availability of waterfowl for downstream hunters. EAO also considered the large distance from the new bridge to hunting locations, including on Westham and Kirkland Islands, and the presence of much suitable habitat for waterfowl along both margins of the Fraser River downstream of the new bridge crossing, such as Finn Slough, Ladner Marshes, Alaksan Wildlife Area and Reifel Sanctuary. These suggest local movements of waterfowl across and around the lower Fraser River are a more-likely source and destination for waterfowl hunted on Westham and Kirkland Islands than waterfowl from locations upstream of the new bridge that are further away. Waterfowl from downstream locations that fly over hunting locations on Westham and Kirkland Island would not be anticipated to pass over or interact with the new Bridge.

EAO also notes that changes in atmospheric noise and visual conditions during construction and operations could affect quality of experience for Musqueam's hunting activities, although EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. However, EAO acknowledges that visual quality effects could be experienced beyond 1 km for those on the river, which could possibly affect those hunting in the vicinity of Deas and Kirkland Islands.

EAO also considered sections 5.2 (land use and visual quality, particularly sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise), as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, including Musqueam's analysis of the nature of potential impacts, the additional considerations described above, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC

issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, land use, visual quality, and human health (atmospheric noise), and as discussed in section 13.2 of this Report, EAO is of the view that the Project is expected to result in negligible-to-minor impacts to Musqueam Indian Band's asserted Aboriginal Rights to hunt and trap.

Musqueam analysis

Musqueam report that hunting is both an aspect of, and critical for, Musqueam cultural continuity. As with other rights, hunting is a familial and communal activity and a wide range of knowledge is shared and generated when Musqueam members are hunting. Hunted and trapped species are also required for familial, communal, spiritual and ceremonial uses and remain critical to inter-First Nations trading and the maintenance of Musqueam's millennia old regional familial and communal network.

Musqueam's hunting activities are numerous, and hunting locations are generally restricted to distinct areas, including hunting areas bordering or within 5 km of the Project footprint. Parts of the Project area provide valuable habitat for waterfowl, and concern over Project-related disruptions to hunting and hunting resources is high. Musqueam considers hunting-related Project impacts to be of moderate magnitude, long-term, and wide-spread (e.g. disruption of inter-First Nation regional familial and communal network).

EAO's acknowledgment of disruption of access to hunting areas during construction, must also be coupled with the acknowledgment this will have an impact on the transmission of knowledge. Seemingly small impacts have broad cultural and communal impacts. For example, an elder carrying key knowledge doesn't have the ability to pass on knowledge or a species is otherwise in accessible due to shifts in flight patterns so that knowledge is lost.

According to Musqueam, these mitigation measures have a high degree of uncertainty due to reliance on biophysical proxy for assessing effectiveness of mitigations, a lack of Musqueam-based information in effects assessment, the precise mechanisms (or pathways) through which the Marine Access Management Plan (and other components of the Construction and Operation Environmental Management Plans) will accomplish the intended mitigations, and the final design of the Project and precise timing and management of construction has not been defined.

Due to high level of uncertainty regarding mitigations proposed in the Application, it is interpreted by Musqueam that these mitigations cannot significantly address or mitigate

preventing residual adverse effects associated with this Project. Taking this fact into consideration, Musqueam anticipates that there will be highly severe project-specific residual impacts to Musqueam's cultural/sensory experience and/or transmission of hunting-related cultural knowledge.

Musqueam disagrees with EAO's conclusion. Overall, the Proponent's proposed mitigations, to be incorporated into their CEMP and OEMP to mitigate effects on Musqueam's Aboriginal rights are ill defined. The precise mechanisms (or pathways) through which the CEMP, OEMP, and subcomponent plans will accomplish the intended mitigations, and what role would be taken by Musqueam, remains unclear. Musqueam notes that many critical design components of the Project and the precise timing and management of construction, for example, remain vague. The lack of details on Project design and management challenged Musqueam's ability to fully consider the potential interactions and impacts of the Project. The conditions proposed by EAO or the Proponent do not adequately consider the interactions of the Project with migratory bird species. These interactions include, but are not limited to, bridge structure and sensory impacts from light and noise pollution. The conditions proposed by EAO, such as the wildlife management plans (during construction) reference only nesting birds in the Project Area and not harvestable species, e.g. migratory waterfowl. The wildlife operational condition is focused primarily on monitoring, rather than mitigating impacts; referencing collision of birds with vehicles for a select species, not species that Musqueam harvests. The proposed conditions also ignore potential impacts to terrestrial access to hunting grounds and bird abundance from the aforementioned potential impacts to migratory bird patterns. As such, Musqueam's view is that the analysis and proposed EAO conditions do not address impacts as identified by Musqueam, and Musqueam considers hunting related Project impacts to be significant, moderate in magnitude, irreversible, long-term, and wide-spread.

#### 14.7.7.6 Impacts on Plant Harvesting

The Project area is host to a wide variety of terrestrial and aquatic plants utilized by Musqueam and plant harvesting is critical for Musqueam cultural continuity. Plants are key for subsistence, familial and communal, medicinal (treating both physical and spiritual ailments), spiritual, ceremonial, economic, and material culture purposes (e.g. tools, carvings, weaving, dyes). As with hunting and fishing, plant gathering is also a familial and communal and teaching activity; activities associated with plant gathering (e.g., preparation for plant gathering, preparing and processing plants) and their use are highly specialized skills and are key cultural activities (e.g. the language and knowledge associated with the species and activities). Plant resources are also critical to inter-

First Nations trading and the maintenance of Musqueam's millennia old regional familial and communal network.

Musqueam notes that the Project area is in the heart of Musqueam's territory and regularly utilized by Musqueam, as it has been for millennia. Musqueam reported use from the 1900s to the present related to food and medicine plant gathering include:

- Within 250 m of the Project footprint:
    - A variety of plants used for medicinal, familial and communal, spiritual, ceremonial, crafting and subsistence purposes including, but not limited to, cattails, nettle, cherry tree (sap, bark, wood), fiddleheads, devil's club, ferns, roots, and Labrador tea, Saskatoon berries, blackberries, blueberries, and cranberries;
- Within 5 km of the Project footprint:
    - A variety of plants used for medicinal, familial and communal, spiritual, ceremonial, crafting and subsistence purposes, including but not limited to, cattails, nettle, cherry tree (sap, bark, wood), fiddleheads, devil's club, ferns, roots, Labrador tea, Saskatoon berries, blackberries, blueberries, and cranberries; and
    - Important plant habitation areas;
- Within 25 km of the Project footprint:
    - Material culture (e.g. weaving and carving) and familial and communal plant use collecting areas including but not limited to bark, dye plants (e.g. dandelion, spirea, cattail roots), various woods, grasses, rushes, and roots;
    - Gathering areas for a variety of plants relied on for medicinal purposes including, but not limited to, cattails, cherry, cascara, blackberry, elderberry, stinging nettle, devil's club, horsetail, scouring rush, Labrador tea, liquorice fern, frog leaves, red clover, wild cherries, pears, poplar bud, cottonwood, bulrush, burdock, q̓əχmin (aka Indian consumption plant, barestem desert parsley, barestem biscuitroot), and rose;
    - Collection sites for a variety of plant species used for subsistence purposes, including but not limited to blackberries, huckleberries, salmonberries, thimble berries, salal berries, cranberries, snow berries, crab apples, hawthorn berries, various shoots, berry shoots, dandelions, crab apples and kelp and seaweed harvesting areas;
    - Spiritual, ceremonial plant harvesting areas; and
    - Critical plant habitation sites, including one of the last habitats in the delta for q̓əχmin (aka Indian consumption plant, barestem desert parsley, barestem biscuitroot).

Musqueam have noted the diversity of plants remaining available, their uses, and where they are accessed, and importance of food plants, particularly berries, and the places where they picked berries in the past and present. Musqueam reported berry picking is a highly familial and communal activity, which brings people and families together. A wide range of other plants provide food for Musqueam people, including young shoots and bulbs. Seaweed was historically collected for food along the shorelines and was sometimes sold.

Medicine plants remain important to Musqueam culture and health, and are still harvested, including in the Project area. Musqueam members emphasized the importance of the continued availability of medicine, and that medicine habitats in their territory are preserved. Activity around medicine plants affects their efficacy. Plants are also collected for familial and communal and crafting use, e.g. tools and art, including household items, textiles, shelters, and more, as well as crafts and other cultural activities.

Musqueam reports that plant gathering activities are currently highly constrained by the extensive and intense land conversion in their territory, due to:

- Regional municipalities, farmland, and industrial areas have replaced areas in which plants could traditionally have been harvested (e.g. loss of cranberry and blueberry bogs, and Indian Consumption Plant habitat);
- Conversion of remaining forested areas into parklands;
- Invasive species are also taking a toll on native species that Musqueam traditionally collected; and
- Competition from other Vancouver residents has limited the amount of berries available to Musqueam for harvesting.

Musqueam reports a decline in traditionally used species even in the small areas of habitat still remaining, although they continue plant gathering activities on the few remaining tracts of habitat still available. Musqueam describe the Project area is critical plant habitat for certain species such as q̓əχmin (aka Indian consumption plant, barestem desert parsley, barestem biscuitroot). However, the few plants that remain are often contaminated due to pollution coming from the city, industry, and agriculture, which can deter Musqueam members from harvesting the plant resources. Cleanliness of the environment is particularly important for medicinal plants, which makes finding areas where medicinal plants can be picked difficult in the urban and highly industrialised environment. Access to the few remaining areas where Musqueam members could previously pick plants is even further restricted by private property.

Musqueam notes that their health has declined due to the decline in the harvest of traditionally eaten resources.

During the EA, Musqueam identified the following potential impacts related to their asserted Aboriginal Rights to gather food plants and medicine:

| Impact Pathway | Impacts to Plant Harvesting |
|---|---|
| Decreased sufficiency (abundance and quality) of food, medicine, and other plants within critical harvesting areas due to land clearing and habitat destruction during Project construction and operation and to future harvesting of currently unavailable/restricted species | • The Project will adversely impact the abundance of plants due to the loss of habitat from Project construction (ancillary sites, barges) and operations (physical displacement by Project infrastructure footprint) within the limited critical areas available to Musqueam to exercise its right;<br>• Decreased quality and efficacy of medicine plants within the limited key areas due to disruption and disturbance caused by Project construction and operation (displacement and pollution [e.g. runoff]);<br>• Revegetation is species-dependent and takes time for plants to reach required developmental stages, or to be sufficient in quantity (could be multiple seasons);<br>• Disruption of ecosystems and available foreshore plants in the vicinity of the Project caused by the disruption of silt and microorganisms; and<br>• Cumulative effects on Musqueam's past, present, and future Aboriginal Rights to harvest plants. |
| Cultural and sensory experience, transmission of plant gathering-related knowledge | • Reduced gathering opportunities may lead to reduced transmission of plant harvesting-related cultural knowledge;<br>• Bridge construction and operation will permanently change the cultural landscape of areas the currently or in future may be used by Musqueam for plant harvesting purposes;<br>• Bridge operations will impact sensory experience through noise, visual structures and lighting; and<br>• Revegetation, coupled with loss of knowledge holders equates to long-term and irreparable impacts to Musqueam traditional knowledge and the ability to practice those rights. |

Other issues related to plant harvesting identified by Musqueam include but are not limited to:

- Invasive plant species and proposed plans to manage presence during construction; and
- Culturally significant plants should be used in planting plans.

EAO analysis

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO proposes a condition requiring the development of a vegetation management plan for construction, in consultation with Aboriginal Groups. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. Another proposed condition requires the Proponent to control invasive species. The proposed CEMP condition would also require addressing and managing invasive plants, revegetation, and erosion and sediment control (among others), in consultation with Aboriginal Groups.

EAO notes that upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails would be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor. Musqueam has raised the point that revegetation takes time, particularly for plants of importance to Musqueam to mature, such as cherry trees, and notes Musqueam's concern that this will impact not only the activity of gathering in some cases but could impact cultural/knowledge transmission.

EAO notes that there is potential for construction activities to impact future potential access or gathering activities where construction may overlap temporally with gathering activities. EAO does not anticipate there to be much direct spatial overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO also considered that while Deas Island is within the LAA and RAA for vegetation, other sites of importance including IR 4 and IR 2 are not. EAO recognizes that Musqueam has communicated its view in this regard that direct spatial overlap does not necessarily directly correlate with

degree of access on a right. EAO also proposes a condition requiring the development of a construction traffic and access management plan to avoid or mitigate disruption of access to harvest medicinal and food source plants, or carry out other land-based traditional use activities.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at gathering areas could affect quality of experience for Musqueam's future anticipated activities, and that this area is expected to include Deas Island which the entrance to the east end of the Tunnel is currently situated but which would be altered through the construction of the new bridge. It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. However, such residual effects related to visual quality could be experienced at a greater distance for those on the river, which could include those gathering near the shoreline on Deas Island. EAO understands from Musqueam that the vicinity of the Project on the South Arm of the Fraser River is relatively undisturbed, including but not limited to Deas Island Park, and they have highlighted that the characterization of "highly disturbed" does not apply to the area of the new bridge.

EAO also considered sections 5.2 (land use and visual quality, particularly sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather.

In consideration of the available information, including Musqueam's analysis of the nature of potential impacts, the additional considerations described above, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, visual quality, land use, and human health (atmospheric noise), and as discussed in section 13.3 of this Report, EAO is of the view that the Project is expected to result in negligible-to-minor impacts to Musqueam's asserted Aboriginal Rights to gather.

Musqueam analysis

Due to Musqueam's land use within Musqueam's territory being displaced by urban, agricultural, and industrial development, harvesting activities continue under highly constrained conditions. Musqueam reports that Musqueam's plant harvesting values within the Project Area have already been highly impacted and, as such, are highly

sensitive to further stress due to existing impacts from numerous sources. Plant harvesting related potential Project interactions in key plant gathering areas such as Deas Island and parts of Lulu Island that overlap the Project footprint are places where the magnitude of change may be high. Musqueam sees these impacts as localized but irreversible, and long-term.

The Proponent has proposed the creation of a cultural heritage management plan and a vegetation management plan. As the details of the plans, and whether or not information provided by Musqueam will be included in the plans, are not yet determined, there is a high degree of uncertainty regarding the proposed mitigations and their efficacy. As Musqueam is already restricted in its ability to practice the right of harvesting plants for food, medicinal, and ceremonial purposes, and due to the uncertainty regarding the effectiveness of the Proponent's proposed mitigations, Musqueam's view is that further limitations to Musqueam's ability to practice this right due to the construction of the Project are likely.

Musqueam's view is that these mitigation measures have a high degree of uncertainty, first, due to the "Design Concept" and precise timing and management of construction that have not been defined. As such, Musqueam finds the extent of potential impacts is for these components is uncertain. Secondly, the precise mechanisms through which the marine access management plan, and other components of the Construction and Operation Environmental Management Plans, will be accomplished, the intended mitigations, and what role would be taken by Musqueam, has yet to be clearly defined.

According to Musqueam, EAO's suggested terrestrial vegetation conditions do not take into account the lost opportunities for knowledge transmission while revegetation of already significantly limited plant species takes place. Musqueam considers this a major impact to Musqueam cultural continuity. Additionally, as the vegetation in the Project area are integral to Musqueam cultural continuity, Musqueam asserts that decision making authority be provided to Musqueam in the planning and undertaking of revegetation processes. Additionally, EAO's condition requiring a construction traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest plants is not a constructive condition if the desired species are removed or destroyed in the construction and/or operation of the Project. Moreover, Musqueam notes that EAO has not clearly demonstrated how it has meaningfully considered potential spiritual, social, and experiential impacts, and as such, Musqueam has concerns regarding how these components were considered in EAO's development of conditions addressing Musqueam's right to plant harvesting.

Musqueam disagrees with EAO's conclusion. Due to high levels of uncertainty and narrow scope of analyses, mitigations and conditions proposed by EAO and the Proponent, it is interpreted that these mitigation measures can be expected to be at best minimally effective, if at all, in preventing residual adverse effects. Musqueam anticipates that there will be significant Project-specific residual impacts on the sufficiency of food, medicine and other plants for traditional harvesting purposes. It has been articulated to EAO numerous times that the revegetation plan will only be partially effective, as revegetation takes years to occur, as plants need time to reach maturity. Musqueam finds this creates mid-to-long term impacts not only in harvesting opportunities, but in cultural continuity and sense of place and spirituality. Musqueam is of the view that this has been acknowledged by EAO in meetings with Musqueam and noted by EAO in its analyses, but has not been meaningfully considered in EAO's analyses, conclusions, and conditions.

## 14.8 Penelakut Tribe

### 14.8.1 Context

Penelakut Tribe is a Central Coast Salish group, is a "band" under the *Indian Act*, and is a member of the Cowichan Nation Alliance and the Hul'qumi'num Treaty Group. Penelakut Tribe has engaged directly with the Proponent and EAO on this Project and also collectively as a member of the Cowichan Nation Alliance.

Penelakut Tribe's primary village is on Penelakut Island, to the east of Chemainus on southeast Vancouver Island. Penelakut members also reside on Penelakut, Tent and Galiano islands. Penelakut Tribe members historically spoke the Hul'qumi'num (pronounced "Hul-ka-MEE-num") language. Of Penelakut's 952 registered members, 525 live on reserve.

The asserted traditional territory of the Penelakut Tribe generally includes parts of South-eastern Vancouver Island, the southern Gulf Islands, a portion of the Lower Mainland, and the waters of the Salish Sea to the Sunshine Coast, including the lower portion of Howe Sound, Haro Strait, the Strait of Juan de Fuca and the South Arm of the Fraser River up to Yale.

Penelakut Tribe, as a member of the Hul'qumi'num Treaty Group, assert a territory of core Aboriginal title lands and a broader traditional fishing territory, as described in its Statement of Intent to the BC Treaty Commission. Of particular relevance to this Project, is the assertion of Aboriginal rights and title described as including "the south

arm of the Fraser River, including Canoe Pass, up to and including Douglas Island, with lands on the north shore of the south arm up to Sapperton Channel (New Westminster), the islands in the south arm of the Fraser River and the south bank of the Fraser River along Canoe Pass up to Deas Island"[54]. Cowichan Nation Alliance clarified to EAO during the EA that this assertion of Aboriginal title includes the entire Project footprint, including the Steveston and Highway 17A interchanges.

Penelakut Tribe, along with other Halkomelem speaking groups, traditionally utilized the lands and waters on both sides of the Strait of Georgia. Locations of importance to Penelakut Tribe, with the other Cowichan Nation Alliance members, along the South Arm of the Fraser River in the vicinity of the Project include but are not limited to Tl'uqtinus, spanning the north shore from approximately opposite Tilbury Island and downstream towards Deas Island , and Hwlhits'um or Xwulit'sum, on Canoe Pass. Both of these areas are considered by Cowichan Nation Alliance members, including Penelakut Tribe, as ancestral village and resource sites. Cowichan Nation Alliance is working to re-establish a permanent land base at Tl'uqtinus for residential and/or commercial purposes.

### 14.8.2 Preliminary Strength of Claim Assessment

The entirety of the Project corridor is within the asserted traditional territory of the Penelakut Tribe.

In the ethnographic and historic sources, members of the Hul'qumi'num Treaty Group were often all referred to as "Cowichan". Occasionally "Cowichan" was also used to refer to a broader group that included all of the Central Coast Salish or Halkomelem speaking people. This lack of clarity in the information means it is sometimes difficult to attribute historical references of "Cowichan" use to individual Aboriginal groups or collectives of particular Aboriginal groups.

However, where historical information indicates the presence and use of the Project area by Cowichan people in a manner that makes it unclear which Aboriginal group was being described, EAO has not used this information to undermine the exclusivity component of Aboriginal title for Penelakut Tribe's preliminary strength of claim assessment or other members of the Hul'qumi'num Treaty Group.

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[54] Hul'qumi'num Treaty Group Statement of Intent. BC Treaty Commission website. http://bctreaty.net/soi/soihulquminum.php (accessed August 26, 2016).

The information reviewed indicates that Penelakut Tribe traditionally occupied village sites on Penelakut Island, and are associated with the north end of Galiano Island and Bonsall Creek on Vancouver Island and a village on the south arm of the Fraser River.

It is understood that Cowichan people have historically been residents of Vancouver Island and other Gulf Islands, and travelled annually to the South Arm of the Fraser River to fish for salmon and sturgeon, including prior to and around the time of contact below and upstream of the Project. Based on current case law and a review of the currently available information and on descendancy from the historic Cowichan people, EAO's preliminary assessment is that Penelakut Tribe has a **strong *prima facie* claim of Aboriginal rights** to fish, gather and hunt in the areas in proximity to the Project area, including the South Arm of the Fraser River.

In November 2014, Cowichan Tribes, Stz'uminus, Penelakut and Halalt First Nations filed an *Amended Notice of Civil Claim* seeking a declaration of Aboriginal title to an area described as the Tl'uqtinus Lands and fishing rights to the South Arm of the Fraser River. It is noted that the claimed Tl'uqtinus lands on Lulu Island on the South Arm of the Fraser River are 2 - 3 km upstream from the Project and do not overlap the Project footprint. The assessment of the strength of claimed Aboriginal title to the Project area was conducted to inform the scope of consultation regarding this Project. It is a preliminary assessment only, considering only information reasonably available at the time of consultation and is not based on an exhaustive review of all information and legal issues related to this potential claim, and does not reflect the Crown's opinion of whether the court will ultimately decide in favour of the First Nation in any litigation.

EAO is of the view that the available information suggests Cowichan people did not traditionally occupy the Project footprint with the intention of controlling this land, although given the relative proximity of the Project to the claimed village sites, an inference can be made that Cowichan people may have utilized this area for resource harvesting activities.

The Project footprint appears to be at the western edge of an area identified by ethno-historians as a boundary between the traditional territories of several different Aboriginal Groups: Musqueam Indian Band to the west and north, Tsawwassen First Nation to the southwest, and Kwantlen First Nation to the south and east. Some early ethnographers identified an area of land at the intersection of these traditional territories as not attributed to any Aboriginal Group. The information also indicates that the Fraser River and surrounding area was a particularly rich resource area and the sheer abundance of resources may have reduced the need or practicality of defending use by others. In fact, information indicates that multiple Aboriginal groups may have fished, hunted and

gathered within the vicinity of the Project footprint, which raises questions regarding whether exclusivity of use of the Project area can be established by the Cowichan people. EAO notes that Cowichan Nation Alliance has communicated to EAO that it does not agree with these conclusions.

Based on the above and on a descendancy from the historic Cowichan people, EAO's preliminary assessment is that Penelakut Tribe has a **moderate *prima facie* claim of Aboriginal title** to the Project footprint inclusive of the Highway 17A and Steveston Highway interchanges, EAO acknowledges that Cowichan Nation Alliance disagrees with this conclusion and is of the view that it has a strong *prima facie* claim of Aboriginal title to the Project area.

### 14.8.3 Involvement of the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Penelakut Tribe's Aboriginal Interests, EAO is of the view that the duty to consult Penelakut Tribe lies at the mid-to-high end of the *Haida* consultation spectrum. Penelakut Tribe is listed in Schedule B of the Section 11 Order.

Cowichan Nation Alliance has raised concerns regarding the Crown's assessment of the strength of its asserted Aboriginal title claims, communicating its view that both the sufficiency and exclusivity requirements are clearly met to support a strong *prima facie* claim of Aboriginal title in the vicinity of the Project area. After corresponding with Cowichan Nation Alliance, EAO determined that while it did not agree that the strength of claim assessment should be changed, it would be appropriate to consult with Penelakut Tribe and the other Cowichan Nation Alliance members at the deep end of the Haida spectrum in an effort to address Cowichan Nation Alliance's concerns.

Penelakut Tribe was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Penelakut Tribe was also invited to attend Working Group meetings, site visits, and to meet with EAO staff directly.

The Proponent began consulting with Penelakut Tribe in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events has included 15 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Penelakut Tribe with two rounds of funding, one in pre-Application phase and the other in Application Review Phase, to support their involvement.

A summary of the Proponent's engagement activities with Penelakut Tribe is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| November 14, 2014 | Meeting | Meeting between Penelakut Tribe, EAO and the Proponent. The Proponent introduced the Project Description and Proposed Studies document; EAO outlined the EA process and consultation. |
| January 21, 2016 | Working Group meeting | Penelakut Tribe unable to attend (Cowichan Nation Alliance represented by Halalt First Nation) |
| February 5, 2016 | Meeting | Meeting between Cowichan Nation Alliance, Proponent and EAO to discuss Project concept, presentation of the draft AIR, Cowichan presentation of their asserted Aboriginal Interests, and EAO presentation of the EA process. |
| February 24, 2016 | Letter | Cowichan Nation Alliance comments on the draft AIR related to employment estimates, economic benefits, VC selection, traditional knowledge, cumulative effects, air and water quality, underwater noise, fish and fish habitat, and existing marine use. Responses were provided by the Proponent to all Working Group member comments on the draft AIR. |
| March 10, 2016 | Working Group meeting | Penelakut Tribe unable to attend (Cowichan Nation Alliance represented by Halalt First Nation and Cowichan Tribes). |
| March 23, 2016 | Letter | Cowichan Nation Alliance provided round 2 comments on draft AIR. EAO responded to Cowichan Nation Alliance via letter on April 29, 2016. |
| March 29, 2016 | Letter | Responded to EAO's January 6, 2016 transmittal letters outlining EAO's initial strength of claim assessment for Cowichan groups and disagreeing with EAO's conclusions EAO followed up with Cowichan Nation Alliance members at March 30/16 meeting, and responded via letter on April 29, 2016. |
| March 30, 2016 | Meeting | Meeting with Cowichan Nation Alliance members (except Stz'uminus First Nation) and the Proponent. Provided overview of what was covered at the March 10, 2016, Working Group meeting in Vancouver, reviewed the revised draft AiR and discussed EAO's strength of claim assessment. Cowichan Nation Alliance expressed interest and concern in economic benefits, including through procurement, for its members, and its views that economic impact on Aboriginal Groups should be a VC. |
| April 29, 2016 | Letter | EAO responded to Cowichan Nation Alliance comments on the 2nd version of the draft AIR. Provided response to Cowichan Nation Alliance on: future planned use of lands and resources for Cowichan Nation Alliance members, cumulative effects assessment and Part C of the draft AIR. |
| May 11, 2016 | Letter | Cowichan Nation Alliance provided further details to accompany Cowichan Nation Alliance's second round of draft AIR comments, specifically, on future planned uses in the vicinity of the Project. Comments were shared with the Proponent to incorporate into the Working Group tracking table, and the AIR was finalized on May 24, 2016. |

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|---|---|---|
| May 27, 2016 | Letter | Cowichan Nation Alliance Responded to EAO's letter of April 25, 2016, including the Fraser River Head Lease report that was provided at that time. Expressed concern about: the consultation process including that the BC report was not provided earlier to Cowichan Nation Alliance; EAO's initial strength of claim assessment, including EAO's interpretation of the Kennedy and Brealey reports); Cowichan Nation Alliance's views of its strong Aboriginal title claim; use of the term "Cowichan"; presence of other Aboriginal Groups in the vicinity of the Project footprint at 1846; Coast Salish land use patterns; Cowichan Nation Alliance views on Cowichan intention and capacity to control the land; Project impacts to Cowichan Nation Alliance Aboriginal title from Cowichan Nation Alliance perspective including adverse effects to Cowichan people's ability to manage and make decisions over land use, economic development aspirations for the land; requirement from Cowichan Nation Alliance perspective for deep consultation and accommodation and concern about draft Part C of the Application. |
| July 22, 2016 | Letter | EAO responded to Cowichan Nation Alliance's July 29, 2016 letter to the Proponent. Provided response to their comments on the revised Application, including noise thresholds at regional parks, regarding the cultural heritage management plan, air quality, and inclusion of discussion around Tl'uqtinus. |
| August 22, 2016 | Letter | EAO Responded to Cowichan Nation Alliance letter to EAO of May 27, 2016, regarding Crown consultation and EAO's initial strength of claim assessment, confirming that EAO retains its views from its initial strength of claim assessment of Aboriginal title. |
| September 6, 2016 | Letter | Penelakut Tribe submitted comments on the Application on behalf of Cowichan Nation Alliance. |
| September 7, 2016 | Letter | Cowichan Tribes submitted comments on the Application on behalf of Cowichan Nation Alliance. |
| September 19, 2016 | Working Group Site Tour | Cowichan Nation Alliance unable to attend. |
| September 20-21, 2016 | Working Group meeting | Cowichan Tribes (day 1) and Halalt First Nation (day 2) attended on behalf of Cowichan Nation Alliance by webinar; however, Cowichan Tribes communicated after the meeting that they had been unable to hear the audio well enough to participate in the meeting. |
| September 26, 2016 | Meeting | EAO meeting with Cowichan Nation Alliance post-Working Group meeting of Sept 20/21 and Cowichan Nation Alliance comments on the Application, particularly on air quality, noise, health, and fish and fish habitat. |
| September 30, 2016 | Email (attachment) | EAO invitation to Penelakut Tribe to comment on early section of Part C. |
| October 19, 2016 | Letter | Cowichan Tribes submitted comments on the Application (round 2) on behalf of Cowichan Nation Alliance. |
| October 21, 2016 | Email (attachment) | Penelakut Tribe submitted comments on the Application on behalf of Cowichan Nation Alliance (round 2). |
| November | Email | EAO invitation to Penelakut Tribe to comment on EAO's draft referral package, |

| | | |
|---|---|---|
| 22, 2016 | (attachment) | including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Penelakut Tribe to comment on EAO's draft Part C. |
| December 2, 2016 | Email (attachment) | Cowichan Tribes provided comments on EAO's draft referral package on behalf of Cowichan Nation Alliance. |
| December 6, 2016 | Email (attachment) | Penelakut Tribe provided comments on EAO's draft Part C. |
| December 13, 2016 | Email (attachment) | Cowichan Tribes provided comments on EAO's draft Part C on behalf of Cowichan Nation Alliance. |
| December 19, 2016 | Email (attachment) | EAO responded to Penelakut Tribe's comments on EAO's draft Part C. |
| January 4, 2017 | Email (attachment) | Penelakut Tribe provided a response to EAO's email of December 19, 2016. |
| January 5, 2017 | Email (attachment) | EAO responded to Penelakut Tribe's comments on EAO's draft Part C (January 4, 2017 email). |
| January 5, 2017 | Email (attachment) | EAO response to Penelakut Tribe (Cowichan Nation Alliance members) response regarding EAO's draft referral package and Part C. |
| January 13, 2017 | Email (attachment) | Cowichan Nation Alliance provided its separate submission to the Ministers to EAO. |

### 14.8.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Penelakut Tribe during the EA:

*Methodology, Process and Consultation*

- Concern regarding the EA process and associated timelines throughout the process, as well as concern that they were able to participate less in the EA due to having to travel to Vancouver to participate in EA processes (EAO sought to address this issue by having webinar/teleconference options for all Working Group meetings, giving as much notice as possible regarding upcoming Working Group meetings for this Vancouver based Project, and offering to meet after or before every Working Group meeting with Cowichan Nation Alliance on Vancouver Island, with or without the Proponent);
- EAO understands from Penelakut Tribe that they do not represent the people who identify as Hwlitsum;
- Concern expressed regarding the lack of resources and funding for Aboriginal communities;
- Concern about the adequacy of the methodology to address social and cultural effects on Penelakut Tribe;

- Raised the issue that ethnographical content in reports did not accurately represent Penelakut Tribe's historical presence within the Project area;
- Noted that identification of requirements including international agreements or other agreements should be included in the Crown's constitutional obligations to Aboriginal Groups; and
- Disagreement with EAO's methodology for consideration of cumulative effects on Aboriginal rights, including measurement against a pre-industrial baseline, and with an absence of comprehensive study on cumulative effects on the Fraser River.

*Cultural and Social Impacts*

- Concern regarding contaminants and the sustainability of vital habitats that are necessary to support their members;
- Concern about Aboriginal participation and Project-related opportunities, including: community preparedness; and cultural recognition and naming;
- Concerns regarding social effects of the Project on Penelakut Tribe's ability to transfer knowledge, language loss, dependency and social interaction, and ability to participate in socio-cultural practices; and
- Concern regarding the potential increase in traffic, and consequent increase in associated noise and vibration due to the increased capacity of the new bridge, as well as the choice of building materials in relation to noise and vibration.

*Environmental Impacts*

- Concern regarding cumulative environmental effects on the Fraser River estuary, and that Tunnel decommissioning could result in dredging and the potential for increased vessel traffic and larger vessels on the Fraser River;
- Concern about Disposal at Sea in the case that any dredgeate from the Tunnel removal was not able to be used for beneficial use, due to the close proximity of the site off Galiano and Valdez Islands to Penelakut reserves.

*Health and Human Safety*

- Concern that Aboriginal health was not considered separately in a

disaggregated manner in the human health assessment, noting their intent to re-establish a village at the Tl'uqtinus site and concern that any potential health effects due to decreases in air quality from the Project may disproportionately impact their community members, particularly infants/children, elders, and immunocompromised individuals;

- View that transit modelling assumptions are not conservative enough, with potential implications for human health effects related to air quality, including the assumption that vehicle emissions will be less in 2031 due to new technologies;
- Concerns about low frequency noise during construction and operation, noting its association with adverse effects to both human health and disturbance to wildlife and that it was a gap in the Application that low frequency noise was not assessed; and
- Current conditions along the foreshore and in the Fraser River have not been properly considered in the Human Health Assessment.

### 14.8.5 Potential Impacts of the Project on Penelakut Tribe's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Penelakut Tribe's Aboriginal Interests. These potential impacts are characterized by considering how the Project could affect several factors important to Penelakut Tribe's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this Report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Penelakut Tribe for the preparation and submission of Traditional Use, Traditional Knowledge or other studies. Penelakut Tribe worked with other Cowichan Nation Alliance members and submitted three traditional use studies[55]. EAO also received additional information from Penelakut Tribe that was provided through the Proponent[56].

EAO considered all information available, including from public sources as well as relevant technical issues raised by Penelakut Tribe, in the following assessments of the potential impacts of the Project on Penelakut Tribe's Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Penelakut Tribe from available sources is described below.

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

Penelakut Tribe historically harvested the following species on the South Arm of the Fraser River: sockeye and pink salmon, sturgeon, shellfish, and marine mammals. Areas within the wider Fraser River estuary were utilized by Hul'qumi'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.

Penelakut Tribe identified concerns related to potential Project effects to fish and other marine resources including:

- Effects to fish and fish habitat, including species of cultural and economic importance such as eulachon, sturgeon and salmon from pile driving, blasting,

[55] *Cowichan Nation Traditional, Current, and Planned Future Use of the George Massey Tunnel Replacement Bridge Project Area,* prepared by Candace Charlie for Cowichan Tribes, on behalf of the Cowichan Nation Alliance (August 9, 2015); *George Massey Tunnel Replacement Project: Cowichan Occupation and Use of the Project Lands*, prepared by Dorothy Kennedy for David Robbins of Woodward and Co., Counsel for the Cowichan Tribes, on behalf of the Cowichan Tribes (August 25, 2015); and *Historical Geography of Cowichan Land Use and Occupancy Lower Fraser River: Map Series and Report*, prepared for Woodward and Company and the Cowichan Tribes by Kenneth G. Brealey (May 31, 2010).

[56] *Affidavit #1 of Randy Bouchard,* No. 14 1027, Victoria Registry, March 18, 2016 (filed April 1, 2016).

and underwater noise generated by Tunnel decommissioning and other construction activities, as well as other construction activities, in the South Arm of the Fraser River as well as Deas and Green Sloughs;

- Operational effects of vibration from the bridge during operation, and road and bridge runoff, including from maintenance activities, on fish and fish habitat;
- Potential changes to the Fraser River South Arm and Deas Slough after removal of the Tunnel due to increased hard shoreline/riprap around Bridge supports which may adversely affect eulachon spawning;
- Least risk timing windows do not take into account critical timing for spawning salmon, trout and char migrating upstream through the Project footprint, including: pink, chum, Coho, Chinook, and sockeye salmon, coastal cutthroat and steelhead trout, Dolly Varden and bull trout;
- Adverse effects to fish from increased noise due to increase in marine vessel traffic in response to the decommissioning and removal of the Tunnel;
- Both light and noise effects were raised as having potential adverse effects on fish;
- Concerns related to river hydraulics, including: change in flow rates after Tunnel removal; whether extreme weather events had been adequately considered in the river hydraulics model; potential for contaminants in the Tunnel and how this may affect tunnel decommissioning;
- With regards to sediment and water quality, concerns included potential effects of run-off and drainage; impacts of potential pollutants and contaminants within the Tunnel walls on the river if left in place; use and disposal of dredged and other material in the river as well as general concerns related to dredging of the Fraser River;
- View that habitat offsetting plans should be discussed or finalized at the EA stage; and
- Contaminated sites were also identified by Cowichan Nation Alliance as a concern, as were risk of potential accidents and malfunctions, including spills of hydrocarbons from refueling or leaks in construction equipment or vessels, including human waste, as well as spills from accidents during construction and operations.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Penelakut Tribe's concerns about potential effects to eulachon from the Project, eulachon were one of five sub-component species assessed. EAO considered that fish species of conservation concern including eulachon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity will not be adversely affected. Furthermore, EAO notes that the bridge supports would not be in-stream. In regards to Penelakut Tribe's concerns about river hydraulics, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO discusses its assessment of potential effects of the Project on river hydraulics and river morphology in the lower Fraser River in section 4.2, and is of the view that residual effects to hydrology would not be significant. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel"[57]. Any such future plans would be subject to review under the VFPA's Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the

[57] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

Cowichan Nation Alliance has previously reported that now filled-in sloughs and streams in or near Highway 99 once supported Coho and eulachon, which they traditionally harvested. Cowichan Nation Alliance reports that Tl'uqtinus was used year-round for harvesting purposes, including by Penelakut Tribe, although the information reviewed by EAO suggests use may have been largely on a seasonal basis. Penelakut Tribe also reportedly used other habitation sites in the area, including one along a slough at the southern extent of No. 4 Road in Richmond (approximately 2-4 km from the Project corridor), and on a little bay just below Brunswick Point, on the south side of the western entrance to Canoe Pass.

Members of the Cowichan Nation Alliance have been attempting to restore former fisheries within the Fraser River through DFO. Access to sockeye for members 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 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 is in ongoing, active litigation over its asserted fishing rights on the South Arm of the Fraser River.

Penelakut Tribe participates in the Hul'qumi'num Fisheries Limited Partnerships, a commercial fishing business, with Stz'uminus First Nation and Halalt First Nation. Species harvested through this enterprise are crab (one Area H licence, outside the vicinity of the Project), prawn (two local/coast wide licences), halibut, herring, rockfish

(two Area Inside licences, which EAO understands may overlap the vicinity of the Project, targeting yelloweye, quillback, copper, china, and tiget), sablefish, and salmon (five Area E gillnet licences, which EAO understands may overlap the vicinity of the Project).

Penelakut Tribe identified several concerns with potential Project impacts relating to specific locations and access to fishing and marine harvesting activities including:

- Size of the RAA being too limited to account for potential adverse effects to migrating fish;
- Baseline conditions for fish and fish habitat as they relate to Aboriginal Interests were not considered from a pre-contact perspective;
- Access to the Fraser River and the potential to displace or interfere with Aboriginal fishing; and
- Effects on future exercise of Penelakut Tribe's ability to fish and harvest including in-water and upland of the South Arm of the Fraser River.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. Although there is potential for construction activities to impact future fishing activities at the claimed *Tl'uqtinus* Lands in the case that they overlapped temporally with construction, EAO understands that while Penelakut Tribe is interested in expanding their future fishing activities in the vicinity of the Project, current fishing activities are intermittent. EAO anticipates that any potential disruption to access to fishing areas for Aboriginal Groups would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km

downstream and 5  km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise), and as discussed in section 13.1 of this Report, the Project is expected to result in Minor impacts to Penelakut Tribe's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Cowichan Nation Alliance has previously reported that Highway 99 was built on what was once a prime harvesting location for deer, ducks, and geese, among other species. Canada goose, northern shoveler, and green-winged teal would have been available year-round. The south shore of Lulu Island, along the South Arm of the Fraser River, has been reported as a prime spot for trapping beaver, mink, and muskrat; bear, grouse, elk, squirrel, and porcupine were also hunted by the Cowichan people on the South Arm. The Cowichan Nation Alliance as a group has stated a desire to resume the harvest of traditional resources in the Project area.

Cowichan Nation Alliance has also stated that its members revere bald eagles, which

were not hunted. Elders of the Cowichan Nation Alliance members have indicated that eagle numbers in the Richmond area have been dwindling each year. Breeding habitat along the Highway 99 corridor on Lulu Island has been previously noted as a concern.

Penelakut Tribe identified concerns and comments related to potential effects to wildlife and wildlife habitat including:

Potential adverse effects to wildlife are considered in sections 4.4 (terrestrial wildlife) and 4.3 (marine mammals) of this Report. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operation as well as a marine mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed a condition requiring a noise management plan.

Penelakut Tribe identified concerns and issues related to specific locations and access to hunt and trap including:

- Penelakut Tribe's ability to harvest in the Project area; and
- Penelakut Tribe's use and navigation of the areas surrounding the Project, potentially effecting future ability to harvest, including in-water and upland of the South Arm of the Fraser River.

EAO understands that while Penelakut Tribe is interested in expanding their hunting and trapping activities within the vicinity of the Project, hunting and trapping are not currently taking place in the Project area by Penelakut Tribe.

Disruption of access to hunting and trapping areas could occur during construction, where construction may overlap temporally with future potential hunting and trapping activities. EAO anticipates that potential disruptions to access to future hunting and trapping areas would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

While EAO notes that sites of importance for Penelakut Tribe (including the Highway 99 corridor, along the Fraser River, and south shore of Lulu Island) overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application, EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Penelakut Tribe's asserted Aboriginal rights to hunt and trap as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations could affect quality of experience for Penelakut Tribe's future potential hunting and trapping activities, although EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and that it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, land use and visual quality (sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Penelakut Tribe's asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

Cowichan Nation Alliance report plants that were traditionally gathered include wild rose, rose hips, crabapples, elderberries, horsetail, Labrador tea, Indian hemp, trembling aspen, mock orange, Oregon grape, maple leaves, cranberries, blueberries, blackberries, wapato, bulrushes/reeds (stth'equn), as well as seaweed. Available information indicates that berries were traditionally harvested from bogs in the vicinity of the historic Tl'uqtinus site and fire was used to maintain open areas for the berry bushes from encroachment from pine trees.

Penelakut Tribe identified the following concerns and comments related to potential effects to traditional plants:

- Culturally important vegetative species should have been considered as VCs including species collected for: food, fibres in textiles and nets, building attributes, and construction of baskets, needles, and harpoons (e.g. mock orange, Oregon grape, crabapple, Labrador tea);
- Adverse effects on vegetation including from new shading due to the Bridge, contaminated water run-off, contaminated debris from infrastructure, accidents

and vehicles, garbage from increased traffic, air quality, and dust/smothering of vegetation;

- Potential effects to SARA-listed native streambank lupine from the Project at Deas Island Regional Park, which is understood to have 20-25 plants, including due to shading from the bridge, contaminated water run-off from the bridge, contaminants from maintenance of the bridge and from accidents and malfunctions, changes to shoreline from construction, decommissioning, or maintenance works;
- Adverse effects on wetlands and watercourses due to stormwater and road runoff, as well as from vibrodensification impact;
- Invasive plant species and proposed plans to manage their presence during construction; and
- Culturally significant plants should be used in revegetation plans.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

Cowichan Nation Alliance requested an impact assessment be conducted for all at-risk plant species and ecosystems within the LAA, not only those overlapping the Project footprint. The Proponent's response was that at-risk plants and communities would be identified in the field prior to construction.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

Cowichan Nation Alliance report that in the marshy areas south of Canoe Passage near Brunswick Point – in the area of Xwulit'sum, or place for cutting (cattails) – as well as in the area of Tl'uqtinus and across the Fraser River on Tilbury Island, several varieties of cattails and rushes (stth'equn) were once harvested, although these locations do not fall within the Project footprint. Berries and other plants were reportedly gathered and cultivated by the ancestors of the Cowichan Nation Alliance members at Tl'uqtinus, and were harvested from other locations in the Project area.

Available information indicates that berries were traditionally harvested from bogs in the vicinity of Tilbury Island and fire was used to maintain open areas for the berry bushes from encroachment from pine trees.

Cowichan Nation Alliance has indicated that they wish to see existing bogs on Lulu Island near the Highway 99 corridor – specifically, one near Williams Road and another near the Richmond Nature Park – protected to support future use of traditional resources, like berries and other bog ecosystem flora. At the Tl'uqtinus Lands, which is currently surrounded by blueberry farms, Cowichan Nation Alliance has raised the potential for former berry grounds to be re-established.

Penelakut Tribe identified the following concerns and comments with potential Project impacts relating to specific locations and access to gathering activities:

- Penelakut Tribe's ability to harvest in the Project area; and
- Penelakut Tribe's use and navigation of the areas surrounding the Project, potentially effecting future ability to harvest, including in-water and upland of the South Arm of the Fraser River.

EAO understands that Penelakut Tribe is interested in expanding their future gathering activities in the vicinity of the Project, however current gathering activities are not taking place. There is potential for construction activities to impact future potential access or gathering activities where construction may overlap temporally with future gathering activities. There is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO understands that upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction. EAO has also proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered that Tilbury Island and Hwlhits'um (Canoe Pass), sites of importance for Penelakut Tribe's traditional gathering, are outside both the LAA and RAA for vegetation.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at gathering areas could affect quality of experience for Penelakut Tribe's future anticipated activities. It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Penelakut Tribe's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

Locations along the South Arm of the Fraser River of importance to the Cowichan Nation Alliance members in the vicinity of the Project include, but are not limited to, the Tl'uqtinus Lands, spanning the north shore from approximately opposite Tilbury Island downstream towards Deas Island, and Hwlhits'um or Xwulit'sum, on Canoe Pass. Both of these areas are considered by Cowichan Nation Alliance members as ancestral village and resource sites. Penelakut Tribe has specifically noted the importance of archaeological site DgRs-17, which EAO understands is associated with the Tl'uqtinus site.

Penelakut Tribe identified concerns and comments including:

- Potential impacts to Penelakut Tribe's asserted title, rights and culture;
- Increase in noise levels on Deas Island, as Cowichan Nation Alliance members

intention to use Deas Island Regional Park in the future; and

- Protection of archaeological and heritage resources, including intangible heritage sites and specific concern for any effects on the Tl'uqtinus site and potential archaeological values at interchanges during construction. Penelakut Tribe expressed interest in participating in archaeological fieldwork and review of archaeological draft reports through the EA and consultation in any potential archaeological and heritage resource monitoring plan.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

In regards to concerns about increased noise levels on Deas Island, EAO understands that should Cowichan Nation Alliance re-establish residential and/or commercial use at their village site and use of Deas Island Regional Park for gathering and knowledge transmission purposes in the future, the Proponent will engage in focused discussions in relation to potential noise effects from the Project on Deas Island. EAO has proposed a condition requiring a noise management plan be development, which would include monitoring and adaptive management measures to ensure that noise effects are not greater than predicted in the Application.

There is not anticipated to be an overlap between Penelakut Tribe's archaeological and cultural heritage interests and the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

There is potential for changes to quality of experience at important locations for Penelakut Tribe's, including Tl'uqtinus and Hwlhits'um (Canoe Pass), ancestral village sites, to occur, in particular in relation to changes in atmospheric noise during construction and operations, although EAO does not anticipate atmospheric noise to travel to the village sites, and visual conditions during operation. These effects are not fully mitigable or reversible. Effects on human health related to air quality and atmospheric noise are understood to have been a concern particularly at Penelakut Tribe's village site at Tl'uqtinus as it is hoped to be resettled at some point in the near future. EAO notes it has proposed a condition requiring development of a noise management plan to address Project-related noise during construction and operations,

which would include a noise monitoring and follow-up program and a communication program to inform communities potentially affected by Project-related noise. In regards to air quality concerns, as described in section 4.1 (air quality), of this Report, EAO is satisfied that the Project is unlikely to result in residual adverse effects to air quality during operations of the Project. EAO's proposed CEMP condition is anticipated to mitigate adverse effects to air quality during construction so that health guidelines thresholds would not be exceeded.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at Tl'uqtinus, although less likely at Hwlhits'um.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Penelakut Tribe, such as spiritual or storied sites, or named places, potentially affected by the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance including visual quality and noise), human health (atmospheric noise and air quality), and land use, and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Penelakut Tribe's other traditional and cultural interests.

Impacts on Asserted Aboriginal Title

Cowichan Nation Alliance has asserted Aboriginal title to not only the Tl'uqtinus Lands, but to the Project footprint including between the Highway 17A and Steveston interchanges. Cowichan Nation Alliance has expressed its view that their asserted Aboriginal title includes the right to manage the land, determine the uses to which it can be put, and obtain any economic benefits from it. Cowichan Nation Alliance has advised that it is also working to re-establish culturally integral practices (e.g., harvesting fish, waterfowl, and plants) on the South Arm and at the mouth of the Fraser River, including at and about Tl'uqtinus, as well as a site on Tl'uqtinus for residential and/or commercial purposes. Penelakut Tribe indicated that future developments should include potential Penelakut Tribe's Aboriginal title and rights resulting from established rights or a declaration of Aboriginal title.

Penelakut Tribe identified concerns and comments including:

- Effects on ability to enjoy and use title lands, minimally through increased noise and light disturbance, obstruction of sunlight, and air pollution which could cause adverse health effects to vulnerable members at the Tl'uqtinus site;
- Project footprint could impact Penelakut Tribe's ability to obtain lease income for benefit of future generations on their asserted Aboriginal title lands;
- Aboriginal participation and Project-related opportunities, including employment, training and contracting, economic development opportunities, and revenue sharing (from tolling);
- Concern about air quality effects up river from the highway corridor near the Fraser River on Lulu Island, in the vicinity of the Tl'uqtinus site, including:
    - How the height of the bridge was considered in the air quality modelling; and
    - Request the LAA be extended 3 km downwind of the bridge;
- Re-establishment of a site on Tl'uqtinus site for residential and/or commercial purposes, and surplus land, including land recovery at Green Slough, including concern that this community plan was not discussed in the Application;
- The importance of the Fraser Richmond Lands/Cowichan Village site to Penelakut Tribe and the importance of considering future land recovery in land use and Project planning; and
- Penelakut Tribe also indicated their interest in surplus ALR lands being provided to Penelakut Tribe for creation of a gas station or other businesses.

They noted they must be consulted for any land disposition – specific concerns regarding surplus lands being sold to adjacent farmers.

In regards to concerns about potential air quality effects in the vicinity of the Tl'uqtinus site, EAO requested the Proponent provide an estimate of predicted construction-related emissions for the Project[58]. EAO also proposed a condition requiring the development of a CEMP that would include measures to mitigate and manage air quality during construction. Regarding concerns about the height of the bridge in air quality modelling, the Proponent provided an analysis which considered traffic emissions from an elevated bridge will disperse over a larger area, resulting in ambient concentrations that are lower in comparison to a source that is closer to the ground. The Proponent concluded there would be no exceedances of ambient air quality objectives at the Tl'uqtinus site.

EAO has considered how the Project may impact each of the following three components of Penelakut Tribe's Aboriginal title claims overlapping the Project area: use and occupation, decision-making, and economic benefits.

In regards to potential effects to Penelakut Tribe's use and occupation of the area, EAO considered that the majority of construction works would be confined to relatively small areas during the construction, be temporary in nature, and for the road improvements would be within a pre-existing corridor. The nature of the new bridge would result in permanent changes to the landscape which could impact the practice/expression of Aboriginal Interests in the vicinity of the Project. Impacts related to visual quality are not mitigable, although again they would be limited in geographic extent. The analysis of potential residual effects on VCs relevant to other related Aboriginal Interests, particularly the wildlife and wildlife habitat, fish and fish habitat, vegetation, and heritage VCs - characterized in this Report – are low to moderate magnitude, and are not expected to be significant.

Regarding the decision-making component of Aboriginal title, EAO has actively consulted Penelakut Tribe in an attempt to better identify, understand, and resolve concerns relating to Aboriginal title. EAO considered that the Proponent has provided and would continue to provide capacity funding to support meaningful participation in future consultation activities with the Proponent and in the regulatory process.

[58] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=55

EAO notes that Penelakut Tribe and Cowichan Nation Alliance have shared their view that the Project will prolong and exacerbate existing barriers to benefit economically from the Project area. EAO considered that the Proponent is actively engaged with Aboriginal Groups to ensure that local Aboriginal communities benefit directly from the Project, including opportunities related to employment, training and contracting. The Proponent would also encourage and support the use of Aboriginal and local businesses by encouraging suppliers and subcontractors to adopt local procurement. EAO's proposed Aboriginal engagement report condition would also require the Proponent to include description of actions taken or planned to provide training, construction monitoring, employment, business, and contracting opportunities to Aboriginal Groups.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to social, economic, environment, heritage, and health VCs, and as discussed in section 13.5 of this Report, the Project is expected to result in Minor impacts to Penelakut Tribe's asserted Aboriginal title.

## 14.9 Hwlitsum

### 14.9.1 Context

The Hwlitsum self-identify as descendants of the historic Lamalchi or Lamalcha Tribe and as close relatives of Penelakut Tribe from Penelakut Island. Hwlitsum reports having over 300 members, some of whom are individually registered Indians under the *Indian Act,* but are not collectively recognized as a "band" under the *Indian Act* and do not have any reserves. In or around 1877, the Lamalcha and two other local groups on Kuper Island (renamed Penelakut Island in 2010) were amalgamated under the *Indian Act* with the Penelakut and became the Penelakut Indian Band. Hwlitsum members claim descendancy from Lamalcha who did not join with or who left the Penelakut Indian Band in the early part of the twentieth century.

In 2008, Hwlitsum's Statement of Intent was accepted into the British Columbia Treaty Commission process. However, Canada and BC advised Hwlitsum that they would not continue negotiations to Stage 2 of that process.

The "Island" dialect of Halkomelem (pronounced "Hul-ka-MEE-num") is Hwlitsum's ancestral language. Some Hwlitsum members reside in the area of Canoe Pass in Delta, and carry the Halkomelem name for this location (e.g., *Hwlits'um, Xwulit'sum*).

Hwlitsum claim that early ethnographic use of the term “Cowichan” that refers to a set of linked Halkomelem speaking communities includes Hwlitsum, but that Hwlitsum are related to, but independent of, the broader Cowichan community.

Prior to the EA, between early 2014 and fall 2014, Hwlitsum were affiliated with the Cowichan Nation Alliance and participated in Project engagement with the Proponent through the Cowichan Nation Alliance. On November 7, 2014, Hwlitsum filed proceedings in the BC Supreme Court in which they claim to be an “identifiable group of indigenous people,” and seek a declaration of Aboriginal title “to all of their traditional village sites and territories” – an area very similar to the asserted traditional territory of the Hul’qumi’num Treaty Group members (Cowichan Tribes, Halalt First Nation, Penelakut Tribe, Stz’uminus First Nation, Lyackson First Nation and Lake Cowichan First Nation).

### 14.9.2 Preliminary Strength of Claim Assessment

EAO considered its preliminary strength of claim assessment for Penelakut Tribe, of whom the Province considers Hwlitsum to be a sub-group, when determining how to engage with Hwlitsum. The Penelakut Tribe preliminary strength of claim assessment is discussed in section 14.8.2.

### 14.9.3 Involvement in the Environmental Assessment Process

The Province is of the view that Hwlitsum is a family group/component of Penelakut Tribe. However, the Province is aware of Hwlitsum’s views that it is an Aboriginal Group independent of the Penelakut Tribe or any other Cowichan community. The Province also understands that Hwlitsum does not believe its interests are represented by Penelakut or any other Cowichan group.

To ensure that information about potentially affected Aboriginal Interests of descendants of the historic Cowichan community is available and considered for the purposes of the EA, EAO included Hwlitsum on Schedule B of the Section 11 Order and has provided the same opportunities to Hwlitsum to review materials and participate as a member of the Working Group as were provided to the broader Cowichan community. EAO notes that the engagement undertaken with Hwlitsum for this EA is not intended to signify any change in the position that the Province takes in other contexts in relation to the duty to consult with Hwlitsum.

Hwlitsum has been included on Schedule B of the Section 11 Order and has been provided the same opportunities as other Schedule B Aboriginal groups to review

materials and participate as a member of the Working Group. Hwlitsum was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Hwlitsum also attended Working Group meetings on January 21, March 10, and September 20-21, 2016, and was invited to attend site visits, and to meet with EAO staff directly.

The Proponent began engaging with Hwlitsum in early 2014, before entering the EA process. The Proponent reports that engagement and information-sharing events have included 10 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Hwlitsum with two rounds of funding, one in pre-Application phase and the other in Application Review phase, to support their involvement.

The Proponent provided additional funding to Hwlitsum for the preparation and submission of the following TUS: *Hwlitsum Traditional Use and Occupancy Study 2015.*

A summary of the Proponent's engagement activities with Hwlitsum is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| **Date** | **Type of Engagement** | **Summary** |
|---|---|---|
| February 23, 2015 | Meeting | Meeting between Hwlitsum, EAO and the Proponent to discuss the Project Description and Proposed Studies document and the EA process. |
| February 2, 2016 | Email | Hwlitsum provided follow-up comments to be included in the Working Group meeting minutes, including related to fish and fish habitat, water quality, concern around sedimentation in the Fraser River, and concern about loss of oolichan and salmon. |
| February 12, 2016 | Letter | Hwlitsum provided comments on the draft Section 11 Order, Project Description and Key Areas of Study document and draft AIR. |
| September 1, 2016 | Letter | Hwlitsum provided comments on the Application, including: residual and cumulative effects; mitigation measures; fish and fish habitat; Aboriginal consultation; and management plans (involving Aboriginal peoples; fish and fish habitat management opportunities; and residual/cumulative effects). |
| October 3, 2016 | Email (attachment) | EAO invitation to Hwlitsum to comment on early draft section of Part C. |
| November 22, 2016 | Email (attachment) | EAO invitation to Hwlitsum to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Hwlitsum to comment on EAO's draft Part C. |

### 14.9.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Hwlitsum during the EA.

*Methodology, Process and Engagement*

- Concern regarding capacity funding to facilitate participation in the Project review process, funding towards a TUS, and that information shared by Hwlitsum be used appropriately and kept confidential when requested;
- Hwlitsum emphasized to the Proponent the importance of having opportunities to learn about the Project;
- Concern regarding the adequacy of EA methodology to address social and cultural effects, regarding social effects of the Project on the ability to transfer knowledge, regarding language loss, and ability to participate in socio-cultural practices;
- View that the Proponent should have assessed "cumulative effects of regional development on meaningful exercise of Aboriginal rights";
- Concerns regarding the methodology for consideration of cumulative effects, including measurement against a pre-industrial baseline;
- Concern regarding the EA process, including Hwlitsum's place on Schedule B as a subgroup of Penelakut Tribe and EAO's depth of consultation with Hwlitsum (While the Section 11 Order shows Hwlitsum as a subgroup of Penelakut Tribe, Hwlitsum was provided opportunities to participate in the Working Group and to engage with EAO directly); and
- Concern about timelines associated with the EA process (EAO sought to address concern about timelines by having webinar/teleconference options for all Working Group meetings, and giving as much notice as possible regarding upcoming meetings).

Cultural and Social Impacts

- Concern about urbanization and cumulative effects of marine development in the area has contributed to diminished use of terrestrial resources; and
- Concern that the Project may contribute towards increased traffic, urbanization, and industrialization, and unleashing of further demand as a result of the Project.

*Environmental Effects*

- Concern about cumulative effects of developments, including the Project;
- Absence of a comprehensive study of cumulative effects on the Fraser River; and
- Suggested the need for a residual effects/cumulative effects management plan to better address this concern.

*Health and Human Safety*

- Concern for potential falling snow and ice from the new bridge.

### 14.9.5 Potential Impacts of the Project on Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the Project. These potential impacts are characterized by considering how the Project could affect several factors important to Hwlitsum's ability to practice traditional harvesting and other cultural activities. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this Report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

EAO considered all information available, including from public sources as well as relevant technical issues raised by Hwlitsum, in the following assessments of the

potential impacts on the Project. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Hwlitsum from available sources is described below.

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

The Lamalcha and other Cowichan people traditionally followed a seasonal round of resource use and regional settlement that involved spending summers on the Lower Mainland (March to November). Hwlitsum assert that the ancestors of individuals who currently identify as Hwlitsum began living year-round at Canoe Pass, reported as the centre of fishing for the Lamalcha, after 1863, when the Lamalcha winter settlement on Penelakut Island was fired upon by the Royal Navy.

While part of the salmon fishing season was also spent at *Tl'uqtinus,* all species of salmon, cutthroat, Dolly Varden, dogfish, flounder, steelhead, smelt oysters, crab, sturgeon, eulachon, and trout are or have reportedly been obtained by Lamalcha and other Cowichan people traditionally 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). 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 Lamalcha and other Cowichan people traditionally for fishing salmon, sturgeon, groundfish, and other marine resources.

Hwlitsum have said that access to and use of Fraser River resources has and remains aided by physical presences, including "a set of houses, two wharves and two net sheds" on or near Canoe Pass, as well as through kinship ties with other Aboriginal Groups; however, other sources indicate that Hwlitsum do not currently have a communal licence to fish in the Fraser River for FSC purposes, and that their access to their FSC allocation must be gained through negotiations with First Nations with a communal licence.

Hwlitsum reportedly 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.

Hwlitsum identified several concerns related to potential effects to fish and other marine resources including:

- Further diminishment of resources related to fish and fish habitat from the Project and related to cumulative effects;
- Adverse effects to fish and fish habitat, particularly related to species of cultural and economic importance (e.g., eulachon, sturgeon and salmon), including from construction activities, sedimentation, Tunnel decommissioning, and accidents and malfunctions;
- The importance of protecting Green Slough prior to, during, and post-construction; and
- Interest in ongoing role in development and implementation of a fish and fish habitat management plan.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

EAO considered that fish species of conservation concern including eulachon and sturgeon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity will not be adversely affected. In regards to Hwlitsum's concerns about sedimentation, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. The fish habitat offset plan would include a requirement of measures to offset effects of the Project on fish and fish

habitat, including the restoration of Green Slough under the new south approach bridge span. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

Hwlitsum identified several concerns related to potential impacts to specific locations and access to fishing:

- Disruption of access to the Fraser River and displacement of fishing vessels, including due to interference due to Tunnel decommissioning and construction;
- The Project's facilitation of increased shipping in the Fraser River, contributing to the number of ships and making it more hazardous to fish;
- Changes in resources and their use have disrupted community life and gatherings and that without fishing (including trout, salmon, eulachon and other species), hunting, and gathering, they will be unable to continue to pass on the teachings of their ancestors to future generations. Hwlitsum reports changes in resources and their distribution/use have already disrupted community life and gatherings; for example, because they cannot access eulachon, families no longer gather annually in the old houses and wharf at Canoe Pass to harvest, process, and distribute eulachon; and
- Adverse effects to availability and accessibility of healthy local species for harvest, which could impact food security, spiritual and ritual practices.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the

Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that “The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel”[59]. Any such future plans would be subject to review under the VFPA’s Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. EAO notes that Canoe Pass is further than 2.5 km downstream of the Project and understands, as noted above, that Hwlitsum do not currently have a communal licence to fish in the Fraser River for FSC purposes, and that their access to their FSC allocation must be gained through negotiations with First Nations with a communal licence. However, EAO anticipates that any potential disruption to access for Aboriginal groups to fishing areas within the 7.5 km stretch of river described above, in the case Hwlitsum was fishing in this area at the time, would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.
EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction

[59] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

Impacts on Hunting and Trapping

Hwlitsum report that the historic Lamalcha group hunted at “Canoe Pass and all along the Fraser River as far up as Hope and Yale”. Species harvested by Lamalcha and other Cowichan people traditionally in the vicinity of the South Arm of the Fraser River have included seal, otter, muskrat (Westham Island), black duck, mallard, widgeon, geese (snow, Canada), brant, pintail, pigeon, pheasant (Ladner Reach), and red fox; at Burns Bog, deer, and black bear have been taken. Many of these species continue to be harvested in these areas and others on the Lower Mainland (e.g. waterfowl at Steveston and Boundary Bay, sandpiper at Roberts Bank), as well as on southeast Vancouver Island and the Gulf Islands (e.g., Valdes, Gabriola, Galiano).
Hwlitsum report that changes in resources and their use have disrupted community life and gatherings and that without fishing, hunting, and gathering, they will be unable to continue to pass on the teachings of their ancestors to future generations.

Hwlitsum identified the following concerns and comments related to potential effects to wildlife and wildlife habitat, including:

- Further diminishment of resources related to wildlife from the Project and related to cumulative effects;
- Adverse effects to availability and accessibility of healthy local species for harvest, which could impact food security as well as spiritual and ritual practices;
- Adverse effects to wildlife, including from light and noise effects and accidents and malfunctions;
- Interest in ongoing role in development and implementation of a wildlife management plan; and
- Adverse effects from the bridge structure to waterfowl and migratory birds,

including on ducks and geese.

Potential adverse effects to wildlife are considered in sections 4.4 (terrestrial wildlife) and 4.3 (marine mammals) of this Report. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operations as well as a marine mammal management plan be developed in consultation with Aboriginal Groups.

EAO has not received any information that indicates Hwlitsum is currently practicing hunting or trapping in the Project area.

Furthermore, EAO is of the view that there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

Impacts on Plant Gathering

Hwlitsum have reported the historic Lamalcha group traditionally gathered up to 20 plant species from areas throughout their traditional round for food, medicinal, and other purposes. Plants said to be currently utilized in the area of Canoe Pass include cattails, rhubarb, crab apple, and plums. Ferns and alder (for firewood and smoking salmon) have been reported as collected at Burns Bog, with cottonwood having been gathered in the area of *Tl'uqtinus.* Hwlitsum have identified a preference for alder over cottonwood for smoking salmon, but have switched to the latter due to a reported unavailability of alder in the last few years. Hwlitsum also report harvesting marine plants, such as kelp, seaweed, and rockweed, from the Gulf Islands.

Hwlitsum report that changes in resources and their use have disrupted community life and gatherings and that without fishing, hunting, and gathering, they will be unable to continue to pass on the teachings of their ancestors to future generations.

Hwlitsum identified the following concerns and comments related to potential effects on the gathering of plants:

- Further diminishment of resources related to gathering from the Project and related to cumulative effects;
- Adverse effects to availability and accessibility of healthy local species for harvest, which could impact food security as well as spiritual and ritual practices;
- Adverse effects to vegetation, including culturally significant plants, from accidents and malfunctions, and invasive plants;
- Interest in ongoing role in development and implementation of a Terrestrial Vegetation Management Plan; and
- Desire for culturally significant plants to be used in revegetation plans and to participate in identification of plants and planting work.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction.

The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

EAO is not aware of any current gathering activities which are taking place in the vicinity of the Project footprint. There is potential for construction activities to impact access for gathering activities in the case that construction overlapped temporally with gathering areas for Hwlitsum. There is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway 99 corridor and currently inaccessible. EAO has also proposed a condition

requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered that Burns Bog, Canoe Pass and the area in the vicinity of the Tl'uqtinus site are outside both the LAA and RAA for vegetation.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at gathering areas could affect quality of experience for gathering activities. It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered section 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and section 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on gathering.

Impacts on Other Traditional and Cultural Interests

No information with respect to archaeology was identified in the study provided to the Proponent for this Project, *Hwlitsum Traditional Use and Occupancy Study 2015,* or in publicly available sources.

Hwlitsum identified concerns and comments including:

- Social effects of the Project on Hwlitsum's ability to transfer knowledge, regarding language loss, and ability to participate in socio-cultural practices including community life and gatherings including at preferred locations with spiritual, economic, and ritual importance, and to which their oral traditions are tied;
- Need to protect archaeological and heritage resources, including intangible heritage sites, specifically including Tl'uqtinus and potential archaeological values at Project interchanges; and
- Interest in contributing to heritage resources management.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual

quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

There is not anticipated to be an overlap between Hwlitsum's archaeological and cultural heritage interests and the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Hwlitsum, such as spiritual or storied sites, or named places, potentially affected by the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

Impacts on Asserted Aboriginal Title

The Project is upstream of Hwlitsum's current residence at Canoe Pass (where some Lamalcha persons allegedly relocated after 1863) and downstream of *Tl'uqtinus,* along the Fraser River in the vicinity of the north end of the Tunnel. Hwlitsum claim that *Tl'uqtinus* was a home base occupied and used extensively by the Cowichan people, of which Hwlitsum consider themselves to be descendants. Hwlitsum have asserted, however, that they are independent of all other Cowichan groups and the Province should consult with Hwlitsum on their own behalf.

Hwlitsum identified concerns and comments including:

- Interest in project-related opportunities, including:
    - Potential employment, training, contracting and economic development opportunities, and revenue sharing opportunities from tolling;
    - Community preparedness; and
    - Cultural recognition and naming.

Potential effects of the Project on Aboriginal title are discussed in section 13.5 and section 14.8.5.

## 14.10 Upper Stó:lō Aboriginal Groups – People of the River Referrals Office

### 14.10.1 Context

The Stó:lō are Coast Salish speakers of the Halkomelem language that traditionally lived along the lower Fraser River below Yale. Based on differences in dialect and culture, the Stó:lō groups may be described as Upper and Lower Stó:lō, or Upriver and Downriver Halkomelem.

The Aboriginal groups referenced in this section are all "bands" as defined by the *Indian Act*, and are members in various tribal, treaty and other legal and political organizations.

In 2003, the Stó:lō Nation filed a Protective Writ on behalf of its members[60] which asserts Aboriginal rights and title to a broad area encompassing all of the lower mainland from the mouth of the Fraser River in the west, along the Canada border in the south to Manning Park in the east, and north around Harrison Lake and Fire Lake and into Garibaldi Park.

Around 2005, the Stó:lō Tribal Council was created to represent eight[61] Aboriginal groups, most of which were former Stó:lō Nation members. The Ts'elxweyeqw Tribe (formerly the Ch-ihl-kway-uhk Tribe) is a society that represents seven Aboriginal groups[62] in a number of economic, business and cultural initiatives, largely in the forestry and natural resource sector.

The People of the River Referrals Office was formed in 2012 as a virtual office of technical staff from Stó:lō Nation (Stó:lō Research and Resource Management Centre), Stó:lō Tribal Council, and the Ts'elxeyeqw Tribe.[63] The People of the River Referrals

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[60] Aitchelitz Indian Band, Chawathil Indian Band, Kwantlen Indian Band, Kwaw Kwaw Apilt Indian Band, Leq'á:mel Indian Band, Matsqui Indian Band, Popkum Indian Band, Scowlitz Indian Band, Seabird Island Indian Band, Shxw'ow'hamel Indian Band, Skawahlook Indian Band, Skowkale Indian Band, Skyway Indian Band, Soowahlie Indian Band, Squiala Indian Band, Sumas Indian Band, Tzeachten Indian Band, and Yakweakwioose Indian Band.

[61] Shxw'ow'hamel First Nation, Seabird Island Band, Cheam First Nation, Chawathil First Nation, Kwaw Kwaw Apilt Indian Band, Scowlitz First Nation, Soowahlie First Nation and Kwantlen First Nation.

[62] Aitchelitz First Nation, Skowkale First Nation, Skyway First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation, Yakweakwioose First Nation.

[63] Stó:lō Research and Resource Management Centre (2013). *People of the River Referrals Office: What we are,* http://www.srrmcentre.com/referrals.html, accessed November 14, 2016.

Office provides administrative, research, and technical support for consultation with 16 Aboriginal Groups[64] who are signatories to the Stó:lō Strategic Engagement Agreement (SEA).

### 14.10.2 Preliminary Strength of Claim Assessment

The entire 25 km of the Project corridor is within the asserted traditional territory identified in the Stó:lō Protective Writ and, while the majority of Aboriginal groups included in the Protective Writ have identified individual boundaries for the purposes of consultation, the entire writ boundary continues to be the asserted traditional territory and used for the purposes of consultation for Seabird Island Band, Shxw'ow'hamel First Nation, Skawahlook First Nation and Soowahlie First Nation (collectively, the Upper Stó:lō Aboriginal groups)[65].

Based on the ethnographic information reviewed, the traditional territories of the Upper Stó:lō Aboriginal groups, as descendants of the historic Tait and Ts'elxweyeqw Tribes, were understood by ethnographers to include parts of the Fraser Valley, the Lower Mainland east of Abbotsford and the Harrison Lake watershed.

While the information suggests that individuals from Upper Stó:lō Aboriginal groups may have utilized the South Arm of the Fraser River in accordance with Coast Salish kinship protocols, and the Fraser River was an important travel corridor for all Coast Salish people, there is no ethnographic or historical accounts indicating traditional use or occupation by Upper Stó:lō Aboriginal groups near the Project.

The People of the River Referrals Office provided EAO with additional information of Stó:lō traditional use of the Lower Mainland during the EA, which was reviewed by EAO. However, this review did not identify new information that specifically referenced the Upper Stó:lō Aboriginal groups, or other descendants of the historic Tait or Ts'elxweyeqw Tribes utilizing the areas in the vicinity of the Project prior to or at time of contact.

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[64] The Stó:lō communities include: Chawathil First Nation, Cheam First Nation, Leq'á:mel First Nation, Scowlitz First Nation, Shxw'ow'hamel First Nation, Skawahlook First Nation, Sumas First Nation, Aitchelitz Band, Shxwháy Village, Skowkale First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation, Yakweakwioose First Nation, Kwaw-Kwaw-Apilt First Nation, and Skwah First Nation.

[65] Where "Upper Stó:lō Aboriginal groups" is used in this Report in direct reference to the People of the River Referrals Office, this term should be read to apply to the Upper Stó:lō Aboriginal groups that are represented by that agency.

Based on current case law and EAO's review of all of the available information, EAO's preliminary assessment is that, as descendants of the historic Tait and Ts'elxweyeqw Tribes, Upper Stó:lō Aboriginal groups have a **weak *prima facie* claim of Aboriginal rights to fish, hunt and gather** in the vicinity of the Project and around the South Arm of the Fraser in proximity to the Project.

There is no information to indicate that the historic Tait or Ts'elxweyeqw Tribes occupied the area in the vicinity of the Project footprint around 1846 with sufficiency or exclusivity to support a *prima facie* claim to Aboriginal title for the Upper Stó:lō Aboriginal groups.

### 14.10.3 Involvement in the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Upper Stó:lō Aboriginal Groups' Aboriginal Interests, EAO is of the view that the duty to consult with the Upper Stó:lō Aboriginal groups lies at the low end of the *Haida* consultation spectrum.

Shxw'ow'hamel First Nation, Skawahlook First Nation and Soowahlie First Nation are represented by the People of the River Referrals Office. Seabird Island Band operates independently.

EAO sent letters on January 6, 2016 to the People of the River Referrals Office and Seabird Island Band describing the Project and EAO's proposed approach to consultation. These letters stated EAO's view that it did not anticipate any potential adverse impacts to the Aboriginal Interests of the Upper Stó:lō Aboriginal groups from the Project, and, as such, the Upper Stó:lō Aboriginal groups were not included on the Section 11 Order. Furthermore, EAO understood that the People of the River Referrals Office, on behalf of the Aboriginal Groups it represents, had deferred consultation on the Project to Katzie First Nation, Musqueam Indian Band, Tsawwassen First Nation, and Tsleil-Waututh Nation.

On January 15, 2016, EAO received a request from People of the River Referrals Office that, as the decommissioning of the Tunnel had subsequently been added as a Project component, they be included in consultation for the Project. EAO remains of the view that the potential for adverse impacts to Aboriginal Interests of Upper Stó:lō Aboriginal groups is remote; however, EAO amended the Section 11 Order and placed People of the River Referrals Office on Schedule C, to provide consultation at the notification level on behalf of the Upper Stó:lō Aboriginal groups that it represents.

EAO notes that People of the River Referrals Office are of the view that they should be consulted at a deeper level and included on Schedule B of the Section 11 Order.

No response to EAO correspondence was received from Seabird Island Band, and no further engagement with Seabird Island Band has taken place during this EA.

During the consultation process, the People of the River Referrals Office was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft Section 11 Order, the Application (via the public comment period), and on EAO's draft referral package. EAO also met with People of the River Referrals Office on July 16, 2016.

An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| January 16, 2016 | Email | People of the River Referrals Office responded to EAO's notification of the EA for the Project sent December 16, 2016, and follow-up letter of January 6, 2016 (transmittal letter including Schedule C information and draft Section 11 Order). People of the River Referrals Office noted they had received direction from S'ólh Téméxw Stewardship Alliance on January 12, 2016, that they are interested in inclusion on Schedule B on the Section 11 Order and participation in the Working Group. |
| March 8, 2016 | Letter | EAO notified People of the River Referrals Office of the final Section 11 Order. Responded to People of the River Referrals Office's email of January 15, 2016. EAO notified People of the River Referrals Office that they were included on Schedule C of the final Section 11 Order, relayed future consultation opportunities available during as per schedule C of the Section 11 Order, provided EAO's initial strength of claim assessment for People of the River Referrals Office, outlined next steps in the process, and invited People of the River Referrals Office to comment on EAO's initial strength of claim assessment. Requested comments on the Project Description and Key Areas of Study document by March 29, 2016. |
| April 27, 2016 | Email/Mail | EAO shared the Fraser River Areas Head Lease Report as per a previous request from People of the River Referrals Office. |
| May 10, 2016 | Letter | S'ólh Téméxw Stewardship Alliance requested EAO's presence at an upcoming meeting. |
| July 18, 2016 | Meeting | Meeting between People of the River Referrals Office/ S'ólh Téméxw Stewardship Alliance, EAO, Canadian Environmental Assessment Agency, and Ministry of Aboriginal Relations and Reconciliation to discuss the Project and the proposed WesPac Tilbury Project. Meeting discussion included discussion of how Section 11 Aboriginal consultation schedules are determined, substitution, People of the River Referrals Office presentation on their traditional territory, and concerns about the |

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| | | Project. Also provided EAO with the Stó:lō Atlas. |
| July 19, 2016 | Email | People of the River Referrals Office provided two essays about their Aboriginal Interests to EAO. |
| July 25, 2016 | Email | EAO notified People of the River Referrals Office of the acceptance of the Application for Review, providing information on the upcoming public comment period (August/September 2016) and opportunity to comment on EAO's draft referral package materials. |
| August 25, 2016 | Letter | Responded to People of the River Referrals Office and S'ólh Téméxw Stewardship Alliance information provided at July 18, 2016 meeting regarding the EA as well as regarding the proposed WesPac Tilbury Marine Jetty Project, in addition to the information provided via email July 19, 2016. Information included: EAO RSS feed; outlining provincial and federal EA thresholds; EAO's response regarding its review of ethnographic information provided by People of the River Referrals Office and S'ólh Téméxw Stewardship Alliance and explained why EAO's initial strength of claim assessment did not changed; outlined future opportunities for participation. |
| November 24, 2016 | Email (attachment) | EAO invitation to People of the River Referrals Office to comment on EAO's draft referral package, including draft technical assessment report, including Part C, draft CPD and draft TOC. |
| December 14, 2016 | Email (attachment) | People of the River Referrals Office provided a response regarding the EA for the Project including the draft referral package. |
| December 19, 2016 | Email (attachment) | EAO responded to People of the River Referrals Office's correspondence of December 14, 2016, including outlining EAO's consultation with People of the River Referrals Office during the course of the Project EA. |

### 14.10.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by People of the River Referrals Office during the EA:

*Methodology, Process and Engagement*

- Depth of consultation on the Project, specifically, inclusion on Schedule C of the Section 11 Order rather than Schedule B;
- Capacity funding to facilitate participation in the Project review process; and
- Concern about EA methodology, including strength of claim assessments, use of ethnographic information to determine depth of consultation, and concern that the 2013 ethnographic report used by EAO does not accurately portray their use of and relationship with the land.

### 14.10.5 Potential Impacts of the Project on the Upper Stó:lō Aboriginal groups Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the Project on the Aboriginal Interests of Upper Stó:lō Aboriginal groups. These potential impacts are characterized by considering how the Project could affect several factors important to the ability of Upper Stó:lō Aboriginal groups to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

EAO considered all information available, including from public sources as well as relevant technical issues raised by the People of the River Referrals Office in the following assessments of the potential impacts of the Project on the Aboriginal Interests of the Upper Stó:lō Aboriginal groups. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about the Upper Stó:lō Aboriginal groups from available sources is described below.

<u>Impacts on Freshwater Fishing, and Marine Fishing and Harvesting</u>

EAO understands that for the Upper Stó:lō Aboriginal Groups, salmon fishing contributed the greatest amount of food, and as with other Central Coast Salish groups, dried salmon was a particularly important stored winter food. The five miles of the Fraser River Canyon upstream of Yale were particularly important for catching and drying salmon. Salmon were caught in the canyon with dip nets and in smaller rivers with gaff hooks, weirs and by other means, including in smaller streams in the lower

Fraser Valley. Other fish caught by Upper Stó:lō Aboriginal groups included sturgeon, trout, and eulachon. Upper Stó:lō Aboriginal Groups reportedly fished for eulachon in the vicinity of Fort Langley and at the mouth of the Pitt River. The Upper Stó:lō Aboriginal groups are also understood to have traded for fresh or dried clams with Aboriginal groups located further downstream along the Fraser River.

The People of the River Referrals Office raised specific issues and concerns on behalf of the Upper Stó:lō Aboriginal Groups regarding potential effects to fish, fish habitat and water quality at the location of the Tunnel removal and further upstream including:

- Potential adverse effects of the Project on fish and fish habitat, including related to Tunnel removal; and
- The potential adverse impacts to the Fraser River, water quality and the salmonids that migrate through this segment of the Fraser River.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report. Section 13 of Part C also discusses potential impacts of the Project on Aboriginal Interests.

The People of the River Referrals Office raised potential adverse effects to the Fraser River, water quality and the salmonids that migrate through this segment of the Fraser River as a concern. As is discussed in greater detail in the fish and fish habitat section of this Report, EAO does not anticipate potential adverse effects to fish, including related to injury or mortality from crushing or entrainment to be of a magnitude that adversely affects the population integrity of species in the vicinity of the Project area, or further upstream along migration routes.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines, fish habitat offset plan. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan.

In consideration of the available information, the Proponent’s proposed mitigation measures, EAO’s proposed conditions of any EAC issued, and EAO’s analysis of residual and cumulative effects to fish and fish habitat and hydrology as discussed in section 13.1 of this Report, the Project is not expected to result in any impacts to the

Upper Stó:lō Aboriginal groups' asserted Aboriginal rights to fish.

Impacts on Other Traditional and Cultural Interests

The People of the River Referrals Office did not raise specific issues and concerns with potential Project impacts relating to other traditional or cultural Interests of the Upper Stó:lō Aboriginal groups.

Potential adverse effects related to other traditional and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

There is not anticipated to be an overlap between the Upper Stó:lō Aboriginal groups' archaeological and cultural heritage interests with the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance including visual quality and noise), human health and (atmospheric noise and air quality), and as discussed in section 13.4 of this Report, the Project is not expected to result in any impacts to the Upper Stó:lō Aboriginal groups' other Aboriginal and cultural Interests.

## 14.11 Semiahmoo First Nation

### 14.11.1 Context

Semiahmoo First Nation is a Central Coast Salish group whose asserted traditional territory includes part of the Lower Mainland area in BC, including sections of the Fraser River and the Strait of Georgia. Semiahmoo First Nation members historically spoke the Həḿq̓əmiḿəm (pronounced "Hul-ka-MEE-num") language.

Semiahmoo First Nation has one reserve, fronting Semiahmoo Bay (part of Boundary Bay) at the Canada-United States border, about 1 km southeast of White Rock. The reserve, covering approximately 129 ha, is home to 51 of the Nation's 97 registered

members. Portions of the reserve have been successively taken up for public purposes, including for the construction of Highway 99 in 1962. While the Highway 99 corridor runs adjacent to the eastern border of the reserve, the Project area does not include this section of the Highway 99 corridor.

Semiahmoo First Nation's asserted traditional territory is centred on Boundary Bay, takes in the Lower Fraser River and adjacent lands downstream of the confluence with the Sumas River, all of the Gulf Islands south of Gabriola Island, the San Juan Islands, most of Bellingham Bay, and the Nooksack River.

### 14.11.2 Preliminary Strength of Claim Assessment

The majority of the Project corridor, approximately 22 km, on the southeast end, including the location of the new bridge, is within the asserted traditional territory of Semiahmoo First Nation.

In Canada, the Boundary Bay area was considered by ethnographers as Semiahmoo First Nation's core territory. The information also indicates that Cannery Point and the Nicomekl and Campbell Rivers were used by the Semiahmoo people for fishing, hunting and gathering resources.

During the EA, Semiahmoo First Nation provided information that chum salmon runs were traditionally an important food source, which was harvested by Semiahmoo First Nation in the Fraser River area around Salmon River and Kanaka Creek, near what today is Fort Langley. EAO understands this area upstream of the Project, as well as downstream near Point Roberts and Boundary Bay were important fishing areas for Semiahmoo.

EAO understands that traditionally the South Arm of the Fraser River was a widely used travel corridor by many Aboriginal Groups in the area, and although Semiahmoo First Nation's traditional fishing practices are understood to have occurred near the vicinity of Fort Langley further upstream, together the information supports an inference that Semiahmoo First Nation may also have used the river in proximity to the Project corridor.

EAO's preliminary assessment is that Semiahmoo First Nation has a **moderate *prima facie* claim of Aboriginal rights to fish** in the South Arm of the Fraser River in proximity to the Project corridor and a **weak-to-moderate *prima facie* claim of Aboriginal rights to hunt and gather** in the vicinity of the Project area.

There is no information to indicate that Semiahmoo First Nation occupied the Project area with sufficiency or exclusivity at around 1846 to support a claim to Aboriginal title to the Project footprint.

### 14.11.3 Involvement in the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Semiahmoo First Nation's Aboriginal Interests, EAO is of the view that the duty to consult with Semiahmoo First Nation lies at the low–to-mid-range of the *Haida* consultation spectrum. Semiahmoo First Nation is listed in Schedule B of the draft Section 11 Order.

Semiahmoo First Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Semiahmoo First Nation was invited to attend Working Group meetings on January 21, March 10, and September 20-21, 2016, and was invited to attend site visits and to meet with EAO staff directly. EAO did not receive any comments or responses to meeting requests and invitations from Semiahmoo First Nation throughout the course of the EA.

The Proponent began consulting with Semiahmoo First Nation in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events have included 10 face-to-face meetings, including meetings with Semiahmoo First Nation Chief and Council, a site visit, sharing of Project-related materials, email exchanges and phone calls. The Proponent provided Semiahmoo First Nation with two rounds of funding, one in pre-Application phase and the other in Application Review phase, to support their involvement.

A summary of the Proponent's engagement activities with Semiahmoo First Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| December 2, 2014 | Phone | Meeting between Semiahmoo First Nation, EAO and the Proponent. Proponent introduced the Project Description and Proposed Studies document; EAO outlined the EA process and consultation. |
| May 11, 2016 | Letter | EAO wrote Semiahmoo regarding ethnographic information it received in regards to the proposed WesPac Tilbury Marine Jetty Project, which also resulted in EAO reconsidering its initial assessment of Semiahmoo's initial strength of claim for Aboriginal Interests on the Project. |

| | | |
|---|---|---|
| October 4, 2016 | Email (attachment) | EAO invitation to Semiahmoo First Nation to comment on early section of Part C. |
| October 18, 2016 | Meeting (teleconference) | Meeting between EAO, the Proponent, Semiahmoo First Nation, Katzie First Nation, and Kwantlen First Nation. EAO provided an update on the status of the EA, and the three First Nations communicated concerns with regards to the EA process, including consultation and funding, discussion of cumulative effects, interest in management and monitoring plans. |
| November 22, 2016 | Email (attachment) | EAO invitation to Semiahmoo First Nation to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Semiahmoo First Nation to comment on EAO's draft Part C. |

### 14.11.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Semiahmoo First Nation during the EA:

*Methodology, Process and Engagement*

- Concern around the adequacy of the EA methodology as well as the effectiveness of the EAO process to address their concerns;
- Stated that EA studies are not meaningful and instead are check boxes; and
- Semiahmoo First Nation also expressed concern with the Proponent's procurement strategy and has requested further dialogue with respect to business opportunities. EAO understands the Proponent acknowledged the concern and committed to continue to work with Semiahmoo First Nation in an effort to address this and any other Project-related concerns.

*Cultural and Social Impacts*

- Increased traffic near the Peace Arch border crossing a concern that could impact Semiahmoo First Nation's access to their community;
- Concerns were raised regarding restricted access for emergency vehicles due to border traffic and from changes resulting from the Project; and
- Concern regarding the amount of time that tolls are in place.

*Environmental Effects*

- Consideration of cumulative effects on Aboriginal rights, assessment of cumulative effects in regards to the inclusion of other reasonably foreseeable

projects and activities, and absence of a comprehensive study of cumulative effects on the Fraser River; and

- Concerns about potential effects of change in air quality resulting from increase in traffic volumes due to the Project.

### 14.11.5 Potential Impacts of the Project on Semiahmoo First Nation's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Semiahmoo First Nation's Aboriginal Interests. These potential impacts area characterized by considering how the Project could affect several factors important to Semiahmoo First Nation's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Semiahmoo First Nation for the preparation and submission of Traditional Use, Traditional Knowledge or other studies. Semiahmoo First Nation did not submit a TUS.

EAO considered all information available, including from public sources as well as relevant technical issues raised by Semiahmoo First Nation in the following assessments of the potential impacts of the Project on Semiahmoo First Nation's Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Semiahmoo First Nation from available sources is described below.

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

Semiahmoo First Nation report 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. Sturgeon and eulachon once served as an important substitute for other fisheries; however, current conservation measures prohibit retention of these species. Semiahmoo First Nation reports that they are not currently engaged in commercial salmon fisheries. Semiahmoo First Nation also reports that currently they are not participating in the commercial crab fishery, but has conveyed an interest in becoming involved in commercial shellfish harvesting, particularly of geoduck, and in developing aquaculture and commercial harvesting of sea cucumber.

Semiahmoo First Nation identified several concerns related to potential effects to fish and fish habitat, including:

- Species of cultural and economic importance such as eulachon, sturgeon, and salmon;
- Potential effects of pile driving, blasting and underwater noise generated by Tunnel decommissioning and other construction activities, specifically on migrating salmon;
- Cumulative effects on the Fraser River impacting existing fish stocks, and view that economic development should not be pursued until stocks recover to higher levels;
- Potential effects on Fraser River flow rates and sediment transport and disposition in Boundary and Semiahmoo Bays after Tunnel removal; and
- Spills of hydrocarbons from refueling or leaks in construction equipment/vessels, including human waste. Spills from accidents during construction and operations.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Semiahmoo First Nation's concerns regarding underwater noise effects on fish, EAO notes that this pathway was considered in EAO's Report. In regards to Semiahmoo First Nation's concerns about potential effects to white sturgeon from the

Project, sturgeon was one of five sub-component species assessed. EAO considered that fish species of conservation concern including white sturgeon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity will not be adversely affected. In regards to Semiahmoo First Nation's concerns about sediment transport and disposition in Boundary and Semiahmoo Bays from Tunnel removal, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups. EAO has also proposed conditions requiring a noise management plan be developed in consultation with Aboriginal Groups.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

Semiahmoo First Nation report named places in the vicinity of the Project area, including an important reef-net location for sockeye and a site where clams were harvested in another summer residence of the Semiahmoo. Important salmon fishing areas have been previously identified by Semiahmoo First Nation as including but not limited to Cannery Point on the southeast tip of the Point Roberts Peninsula and the Nicomekl and Little Campbell rivers that feed into Boundary Bay, where sturgeon was also taken. Semiahmoo First Nation said that they fished in the Fraser River in the summer season at *Tl'ektines,* in the vicinity of the north end of the Tunnel. They have previously "acknowledged that Cowichan Tribes fished in the South Arm of the Fraser River and that access to this area was gained by the Semiahmoo First Nation via a

series of marriage ties between Semiahmoo First Nation and Cowichan Tribes". Semiahmoo First Nation has also said that they have access rights to the Salmon River and Kanaka Creek, which both join the Fraser River in the vicinity of MacMillan Island, near Fort Langley.

Shellfish were also important to Semiahmoo First Nation, and Boundary Bay has been characterized as formerly one of the most productive shellfish harvesting locations on the Pacific coast. This feature is said to have made it a key shellfish harvesting location for Semiahmoo First Nation and other First Nations. Semiahmoo First Nation reports that the focus of their sea mammal harvesting was on seals. They have said that seals travelled as far up the Fraser River as Harrison Lake in pursuit of salmon. Semiahmoo First Nation identified specific issues and concerns with potential Project impacts relating to specific locations and access to fishing and marine resource harvesting activities:

- Protection of their ability to harvest within the Project area; and
- Potential interference with fishing activity during decommissioning of the Tunnel and the importance of working closely with communities to ensure negative effects are avoided.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. EAO has not received information from Semiahmoo First Nation indicating fishing activities occur within this 7.5 km stretch of the river, and as such does not anticipate potential for construction activities to impact access to Semiahmoo First Nation fishing activities. EAO also anticipates that any potential disruption to access to fishing areas for Aboriginal Groups to fishing areas within the 7.5 km stretch of river described above would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km

downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure, and this is not expected to affect Semiahmoo First Nation, as EAO understands Semiahmoo First Nation is not currently fishing in this area.

EAO notes that due to the proximity of the southeast end of the Project corridor and Mud Bay (at the Highway 99/Highway 91 interchange), there is a possibility of overlap between residual effects to human health from atmospheric noise during construction for several months and Semiahmoo First Nation shellfish harvesting, in the case that Semiahmoo First Nation's Boundary Bay shellfish harvesting included Mud Bay, within 500 meters of the Project alignment.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise, and as discussed in section 13.1 of this Report, the Project is expected to result in Negligible impacts to Semiahmoo First Nation's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Species harvested in proximity to the Project area include beaver, waterfowl and migratory birds. During the EA, Semiahmoo First Nation identified the following concerns and comments related to potential effects to wildlife and wildlife habitat, including:

- Potential light and noise effects on wildlife; and
- Potential effects of the bridge structure on species such as waterfowl, migratory birds and bats.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operations as well as a marine mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed a condition requiring a noise management plan.

While EAO understands from the Application that Semiahmoo First Nation did express concerns to the Proponent related to protection of its ability to harvest within the Project area, Semiahmoo First Nation hunting has been previously reported as concentrated in and around lands to the east of Boundary Bay, on both the Canadian and American sides of the border. EAO notes that no specific sites of importance for Semiahmoo First Nation are understood to overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application. As discussed in section 13 of Part C of this Report which discusses potential impacts of the Project on Aboriginal Interests generally, EAO anticipates that potential disruptions to access to hunting and trapping areas for any Aboriginal Groups currently participating in such activities would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Semiahmoo First Nation's asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, marine mammals, land use and visual quality (specifically sensory disturbance, including visual quality and noise), and human health man health(atmospheric noise), and as discussed in section 13.2 of this

Report, the Project is expected to result in Negligible impacts to Semiahmoo First Nation's asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

Semiahmoo First Nation report gathering various species of aquatic plants, berries, devil's club, rose hip, stinging nettle, and the wood, bark, or roots of various tree species. Semiahmoo First Nation reportedly practiced selective burning to boost berry plant growth.

Semiahmoo First Nation identified the following concerns and comments related to potential effects to gathering activities:

- Protection of Semiahmoo First Nation's ability to harvest within the Project area;
- Invasive plant species and proposed plans to manage presence during construction; and
- Use of culturally significant plants in planting plans and importance of obtaining input from Semiahmoo First Nation on plant selection.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect vegetation species which EAO understands pertain to Semiahmoo First Nation's asserted Aboriginal rights to gather.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-

risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

Semiahmoo First Nation report that the lower Fraser River in the vicinity of the Project including Deas (which overlaps with the Project footprint) and Tilbury (upstream of the Project area) Islands, has been identified as an area where gathering may still occur. There is potential for construction activities to impact access or gathering activities where construction may overlap temporally with future gathering activities. However, there is not anticipated to be much overlap between areas identified as gathering areas by Semiahmoo First Nation and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO also considered that other gathering areas for Semiahmoo First Nation are understood to be outside both the LAA and RAA for vegetation. EAO has proposed a condition requiring a traffic and access management plan to be developed in consultation with Aboriginal groups to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically sensory disturbance, including visual quality and noise) and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible impacts to Semiahmoo First Nation's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

Semiahmoo First Nation has expressed that the use of lands and resources has a spiritual and sacred element not readily separated from practical considerations. Legendary stories, which relay that people related to the first ancestors, who descended from the sky, were transformed by Khaals (i.e., a mythical leader) into physical and biological elements of the landscape, and remain relatives of the Semiahmoo First Nation. Semiahmoo First Nation named places in the vicinity of the Project area, including three sites on the eastern aspect of the Point Roberts Peninsula, fronting Boundary Bay, including Chelhtenem or Tsel-lhtenem, at Cannery or Lilly Point, which has been previously identified as a summer residence of the Semiahmoo, as well as an important reef-net location for sockeye; clams were harvested in another summer

residence of the Semiahmoo. Another named place previously identified along the main stem of the Fraser River upstream of the Port Mann Bridge.

Semiahmoo First Nation has reported that their ability to pursue a traditional economy has been “severely limited” by urbanization and contamination of their food supply within their traditional territory. They are seeking to restore or maintain, within that territory, the conditions necessary to promote the exercise of ancestral uses in the future.

Semiahmoo First Nation identified concerns and comments regarding archaeological and cultural heritage interests including:

- Aboriginal participation and Project-related opportunities, including community preparedness and cultural recognition and naming;
- Social effects of the Project such as Semiahmoo First Nation’s knowledge transmission, language loss, dependency and social interaction;
- Protection of archaeological and heritage resources, including intangible heritage sites, and protection of cultural and archaeological sites that are known to exist or may be discovered within the Project area;
- Participation in archaeological fieldwork and review of archaeological draft reports; and
- Concern that the Proponent’s archaeological consultant will not work effectively with Aboriginal Groups based on experience on past projects.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

There is not anticipated to be an overlap between Semiahmoo First Nation’s archaeological and cultural heritage interests with the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

There is potential for changes to quality of experience at unspecified important locations for Semiahmoo First Nation to occur, in particular in relation to changes in atmospheric noise during construction and operations, and visual conditions during operation. These effects are not fully mitigable or reversible. However, the sites which have previously been mentioned which are of importance to Semiahmoo First Nation insofar as EAO is aware are not anticipated to be affected, including Boundary Bay and Canoe Pass.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at sites of importance to Semiahmoo First Nation; however, as previously noted EAO does not know of any such sites in close proximity to the Project.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Semiahmoo First Nation, such as spiritual or storied sites, or named places, potentially affected by the Project, although EAO is unaware of any such sites in the vicinity of the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise and air quality), and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible impacts to Semiahmoo First Nation's other traditional and cultural interests.

## 14.12 Squamish Nation

### 14.12.1 Context

Squamish Nation describe themselves as the descendants of Coast Salish ancestors that lived in what are now known as the Greater Vancouver area, Gibson's Landing, and Squamish River watershed.

Squamish Nation has 26 reserves, mostly located around Howe Sound and along the southern portions of the Squamish River, and with 2,232 of 4,176 registered members residing on Squamish Nation's reserve lands. The Project area does not overlap any current or former Squamish Nation reserve lands.

### 14.12.2 Preliminary Strength of Claim Assessment

Approximately 9 km of the Project corridor overlaps with Squamish Nation's asserted traditional territory on the northwest end of the corridor on Lulu Island, including the portion of the Tunnel crossing that is north of Deas Island.

The core territory for Squamish Nation is described by some ethnographers to include the Howe Sound and the Squamish River Valley, with Burrard Inlet and access to the Fraser River upstream from the Project area described as part of the secondary territory. The available information indicates that Squamish Nation travelled to the Fraser River to fish salmon, eulachon, and sturgeon and to harvest wapato.

In February 2016, Squamish Nation provided EAO with *Opinion Report: Squamish fishing on the Fraser River* (July 30, 2013) (Inglis report), which described pre-contact cultural and economic significance of the Fraser River fishery. The Inglis Report notes that salmon was part of the Squamish seasonal round and that the Fraser River is the only source of sockeye. It also outlined that, prior to contact, Squamish travelled to the Fraser River to take part in the abundant fishery upriver in the Fraser Valley, past what became Fort Langley. Hudson's Bay Company journals note that Squamish may have accessed the Fraser River by way of Burrard Inlet to the north. However, EAO also understands that the South Arm of the Fraser River was widely used as a travel corridor by many Aboriginal groups in the area, which could support the inference that Squamish may have also used this route.

Based on the above, EAO is prepared to assume that Squamish could have utilized the area in proximity to the Project for fishing given the known use of the river further upstream, Squamish presence at Fort Langley and the general accessibility of the area. EAO revised its initial assessment of Squamish's Aboriginal right to fish in the vicinity of

the project to a **moderate *prima facie* claim of Aboriginal rights to fish** in the South Arm of the Fraser River, based on current case law and a review of the currently available information**.**

EAO's preliminary assessment is also that Squamish Nation has a **weak *prima facie* claim of Aboriginal rights to hunt and gather** on Lulu Island in the vicinity of the Project area.

There is no information to indicate that Squamish Nation sufficiently or exclusively occupied the portions of Lulu Island in proximity to the Project area at around 1846 to support a claim to Aboriginal title to the Project footprint.

### 14.12.3 Involvement in the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Squamish Nation's Aboriginal Interests, EAO is of the view that the duty to consult with Squamish Nation lies at the low-to-mid end of the *Haida* consultation spectrum. Squamish Nation was moved from Schedule C of the draft Section 11 Order to Schedule B of the final Section 11 Order.

Squamish Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Squamish Nation was invited to attend Working Group meetings on March 10, and September 20-21, 2016, and was invited to attend site visits and to meet with EAO staff directly.

EAO did not invite Squamish to the January 21, 2016, Working Group meeting, as the meeting occurred in advance of Squamish Nation being placed on Schedule B of the Section 11 Order. EAO has not received any comments or responses to meeting requests and invitations from Squamish Nation throughout the course of the EA.

The Proponent began consulting with Squamish Nation in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events has included 6 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Squamish Nation with two rounds of funding, one in pre-Application phase and the other in Application Review Phase, to support their involvement.

A summary of the Proponent's engagement activities with Squamish Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| February 15, 2016 | Letter | Squamish Nation letter responding to EAO's initial strength of claim and draft Section 11 Order transmittal letter of January 6, 2016, including the Inglis Report. |
| March 8, 2016 | Letter | EAO notified Squamish Nation about the final Section 11 Order, and responded to Squamish Nation's letter to EAO of February 2016, notifying Squamish that after reviewing the Inglis report Squamish had been moved from Schedule C to B in the final Section 11 Order. EAO provided a revised initial review of the claims of Aboriginal Interests for Squamish Nation. |
| October 4, 2016 | Email (attachment) | EAO invitation to Squamish Nation to comment on an early draft section of Part C. |
| November 22, 2016 | Email (attachment) | EAO invitation to Squamish Nation to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Squamish Nation to comment on EAO's draft Part C. |

### 14.12.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Squamish Nation during the EA:

*Environmental Impacts*

- Need for evaluation on impacts to ecological services for all ecosystems within the vicinity of the Project.

### 14.12.5 Potential Impacts of the Project on Squamish Nation's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Squamish Nation's Aboriginal Interests. These potential impacts are characterized by considering

how the Project could affect several factors important to Squamish Nation's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this Report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Squamish Nation for the preparation and submission of traditional use, traditional knowledge or other studies. Squamish Nation submitted a TUS: *Review of George Massey Tunnel Project April 2016*.

EAO considered all information available, including from public sources as well as relevant technical issues raised by Squamish Nation in the following assessments of the potential impacts on the Project on Squamish Nation's Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Squamish Nation from available sources is described below.

<u>Impacts on Freshwater Fishing, and Marine Fishing and Harvesting</u>

Squamish Nation report that, historically, they harvested Fraser River sockeye, based on family ties with other Aboriginal Groups.

Squamish Nation identified several concerns related to potential effects to fish and fish habitat, including:

- Concern about potential for accidents and malfunctions associated with the Project, specifically, spills of hydrocarbons from refueling or leaks in construction equipment/vessels;
- Potential impacts from increased shipping as a result of Tunnel removal;
- Concern about water quality and sediment issues, pointing to the need for a comprehensive understanding of potential ecological impacts and core sampling;
- Potential effects of underwater noise and light on migrating salmon, including

that generated by Tunnel decommissioning and other construction activities;

- Disturbance to benthic and aquatic invertebrates and their habitat;
- Species of cultural and economic importance such as eulachon, sturgeon, and salmon (noting new studies have proven that hard surface runoff from roads will kill salmon within two hours of exposure); and
- Potential effects on Fraser River flow rates after Tunnel removal, and potential effects of run off and drainage, and pointed to innovative stormwater solutions and bioengineering techniques.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to concerns about redistribution from sedimentation, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

In regards to Squamish Nation's concerns regarding benthic invertebrates, such effects are not anticipated to occur as a result of the Project, because given the nature of the Fraser River, aquatic and benthic invertebrate communities within or adjacent to the Project alignment are considered resilient to physical disturbance and would recover rapidly from any disturbance. In addition, given the limited spatial and temporal interactions between Project activities and benthic aquatic invertebrates, it is anticipated that potential effects would be negligible. As such, EAO notes that there are no adverse effects anticipated to benthic invertebrates from the Project.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation

channel”[66]. Any such future plans would be subject to review under the VFPA’s Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO’s proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO’s view that following mitigation measures, the risk of such an accident is considered to be low.

The Fraser River is reportedly the only source for sockeye in Squamish Nation territory, and fishing sockeye on the Fraser is integral to Squamish Nation culture.

According to DFO records, Howe Sound and the Squamish River have been the key areas for Squamish Nation salmon harvesting, and specifically within Pacific Fishery Management Area (PFMA) 28, subareas 28-2 to 28-4. EAO understands from the Proponent’s Application that Squamish Nation does not currently fish in the Fraser River for FSC purposes; however, for many years, including initiating a formal request to DFO in 2011, Squamish Nation say they have sought an increase to their Fraser River sockeye allocation for FSC purposes through an extension of their FSC fishing area to include the Lower Fraser River. Squamish Nation has said that by expanding their FSC fishing area to include the Lower Fraser River, they would be able to fish Fraser River

[66] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

sockeye the way their ancestors did (i.e., directly) and re-establish their historical connections to the area. EAO understands that, at this time, other Aboriginal Groups currently fishing in the Project area may be asked by Squamish Nation to fish on their behalf.

Squamish Nation identified specific issues and concerns with potential Project impacts relating to specific locations and access to fishing and marine resource harvesting activities:

- Protection of their ability to fish within the Project area;
- Access to the Fraser River and the potential to displace fishing vessels;
- Potential impacts from construction and demolition of structures on the ability of Squamish Nation community members to participate in traditional activities on the land and water, specifically fishing in and around the Project area and as relates to timing;
- Fishing patterns and practices have adapted to the Tunnel in the riverbed and removal of the Tunnel may impact these established patterns and practices;
- Effects of construction and decommissioning-related barging activities on Squamish Nation fishing activities; and
- Concern that removal of the Tunnel would impact established fishing patterns and practices, including related to increased shipping on the Fraser River.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. EAO has not received information from Squamish Nation indicating fishing activities are currently being undertaken by members of Squamish Nation within this 7.5 km stretch of the river, and as such does not anticipate potential for construction activities to impact access to Squamish Nation fishing activities. Recognizing that while Squamish Nation wishes to expand fishing activities for FSC purposes into the South Arm of the Fraser River, this is not currently occurring. EAO also anticipates that any potential disruption to access for Aboriginal Groups to fishing areas within the 7.5 km stretch of river described above would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused

by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure, and this is not expected to affect Squamish Nation, as EAO understands Squamish Nation is not currently fishing on the Fraser River.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise), and as discussed in section 13.1 of this Report, the Project is expected to result in Negligible impacts to Squamish Nation's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Past, present, or desired future hunting or trapping of resources by the Squamish Nation were not identified in the vicinity of the Project area either in the available sources that were reviewed or by Squamish Nation.

Squamish Nation identified the following concerns and comments related to potential effects to wildlife and wildlife habitat, including:

- Potential light and noise effects on wildlife; and
- Potential effects of the bridge structure on species such as waterfowl and migratory birds.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (fish and marine mammals) of this Report. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operations as well as a marine mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed a condition requiring a noise management plan.

EAO understands from the Application that Squamish Nation expressed concerns related to the protection of its ability to harvest within the Project area. However, EAO notes that no specific sites of importance for Squamish Nation were identified by Squamish Nation or the available information, and there is thus no overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application. EAO anticipates that potential disruptions to access to hunting and trapping areas for any Aboriginal Groups currently participating in such activities would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Squamish Nation's asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area, and, as mentioned above, EAO does not understand Squamish to have historically or currently hunted in the Project area.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, marine mammals, land use and visual quality (specifically sensory disturbance, including visual quality and noise), and

human health (atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible impacts to Squamish Nation's asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

Past, present, or desired future gathering of terrestrial resources by the Squamish Nation were not identified in the vicinity of the Project area either in the available sources that were reviewed or by Squamish Nation.

Squamish Nation identified concerns related to potential effects to vegetation, including:

- Invasive plant species and proposed plans to manage presence during construction; and
- Inclusion of culturally significant plants in planting plans and opportunity for Squamish Nation in the identification of plants, and planting work.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests. EAO is of the view that the Project does not have the potential to affect vegetation species which EAO understands pertain to Squamish Nation's asserted Aboriginal rights to gather.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction.

The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

While Squamish Nation communicated to the Proponent their concerns that potential Project impacts could adversely affect their ability to harvest within the Project area, no information was provided that indicates Squamish nation traditionally gathered plants from within the Project area. EAO also considered that traditional gathering areas of importance to Squamish Nation are understood to be outside both the LAA and RAA for vegetation. Furthermore, there is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO has proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible impacts to Squamish Nation's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

Archaeology and cultural heritage interests were not identified for or by Squamish Nation in the vicinity of the Project area identified in the sources reviewed.

Squamish Nation identified concerns and comments regarding archaeological and cultural heritage interests including:

- Protection of archaeological and heritage resources, including intangible heritage sites, that are known to exist or may be discovered within the Project area;
- Participation in archaeological fieldwork and review of archaeological draft reports;
- Potential effect to Squamish Nation's knowledge transmission, language loss, dependency, and social interaction; and

- Aboriginal participation and Project-related opportunities, including cultural recognition and naming, specifically interpretive signage by highway including road signs and kiosks.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

There is not anticipated to be an overlap between Squamish Nation's archaeological and cultural heritage interests with the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

There is potential for changes to quality of experience at unspecified important locations for Squamish Nation to occur, in particular in relation to changes in atmospheric noise during construction and operations, and visual conditions during operation. These effects are not fully mitigable or reversible. EAO does not anticipate sites of importance to Squamish Nation to be affected based on currently known information.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at sites of importance to Squamish Nation; however, as previously noted EAO is not aware of such sites in close proximity to the Project.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Squamish Nation, such as spiritual or storied sites, or named places, potentially affected by the Project, although EAO is unaware of any such sites in the vicinity of the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and

recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance including visual quality and noise), human health (atmospheric noise and air quality), and land use, and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible impacts to Squamish Nation's other traditional and cultural interests.

## 14.13 Stz'uminus First Nation

### 14.13.1 Context

Stz'uminus First Nation is a Central Coast Salish group, is a "band" under the *Indian Act,* and is a member of the Cowichan Nation Alliance and the Hul'qumi'num Treaty Group. Stz'uminus First Nation has engaged directly with the Proponent and EAO on this Project and also collectively as a member of the Cowichan Nation Alliance.

Stz'uminus First Nation's main present-day community is located in Ladysmith on southeast Vancouver Island. Stz'uminus First Nation members historically spoke the Hul'qumi'num (pronounced "Hul-ka-MEE-num") language. Of Stz'uminus First Nation's 1,296 registered members, 712 live on reserve.

The asserted traditional territory of the Stz'uminus First Nation generally includes parts of South-eastern Vancouver Island, the southern Gulf Islands, a portion of the Lower Mainland, and the waters of the Salish Sea to the Sunshine Coast including the lower portion of Howe Sound, Haro Strait, the Strait of Juan de Fuca and the South Arm of the Fraser River up to Yale.

Stz'uminus First Nation, as a member of the Hul'qumi'num Treaty Group, assert a territory of core Aboriginal title lands and a broader traditional fishing territory, as described in its Statement of Intent to the BC Treaty Commission. Of particular relevance to this Project, is the assertion of Aboriginal rights and title described as including "the south arm of the Fraser River, including Canoe Pass, up to and including

Douglas Island, with lands on the north shore of the south arm up to Sapperton Channel (New Westminster), the islands in the south arm of the Fraser River and the south bank of the Fraser River along Canoe Pass up to Deas Island"[67]. Cowichan Nation Alliance clarified to EAO during the EA that it this assertion of Aboriginal title includes the entire Project footprint, including the Steveston and Highway 17A interchanges.

Stz'uminus First Nation, along with other Island Halkomelem speaking groups, traditionally utilized the lands and waters on both sides of the Strait of Georgia. Locations of importance to Stz'uminus First Nation, along with the other Cowichan Nation Alliance members, along the South Arm of the Fraser River in the vicinity of the Project, include but are not limited to Tl'uqtinus, spanning the north shore from approximately opposite Tilbury Island and downstream towards Deas Island, and Hwlhits'um or Xwulit'sum, on Canoe Pass. Both of these areas are considered by Cowichan Nation Alliance members, including Stz'uminus First Nation, as ancestral village and resource sites. Cowichan Nation Alliance is working to re-establish a permanent land base at Tl'uqtinus for residential and/or commercial purposes.

### 14.13.2 Preliminary Strength of Claim Assessment

The entirety of the Project corridor is within the asserted traditional territory of the Stz'uminus First Nation.

In the ethnographic and historic sources, members of the Hul'qumi'num Treaty Group were often all referred to as "Cowichan". Occasionally "Cowichan" was also used to refer to a broader group that included all of the Central Coast Salish or Halkomelem speaking people. This lack of clarity in the information means it is sometimes difficult to attribute historical references of "Cowichan" use to individual Aboriginal groups or collectives of particular Aboriginal groups.

However, where historical information indicates the presence and use of the Project area by Cowichan people in a manner that makes it unclear which Aboriginal group was being described, EAO has not used this information to undermine the exclusivity component of Aboriginal title for Stz'uminus First Nation's preliminary strength of claim assessment or other members of the Hul'qumi'num Treaty Group.

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[67] Hul'qumi'num Treaty Group Statement of Intent. BC Treaty Commission website. http://bctreaty.net/soi/soihulquminum.php (accessed August 26, 2016).

The information reviewed indicates that Stz'uminus First Nation traditionally occupied village sites on the east coast of Vancouver Island at Kulleet Bay and Ladysmith Harbour.

It is understood that Cowichan people have historically been residents of Vancouver Island and other Gulf Islands, and travelled annually to the South Arm of the Fraser River to fish for salmon and sturgeon, including prior to and around the time of contact below and upstream of the Project. Based on current case law and a review of the currently available information and on a descendancy from the historic Cowichan people, EAO's preliminary assessment is that Stz'uminus First Nation has a **strong *prima facie* claim of Aboriginal rights** to fish, gather and hunt in the areas in proximity to the Project area, including the South Arm of the Fraser River.

In November 2014, Cowichan Tribes, Stz'uminus, Penelakut and Halalt First Nations filed an *Amended Notice of Civil Claim* seeking a declaration of Aboriginal title to an area described as the Tl'uqtinus Lands and fishing rights to the South Arm of the Fraser River. It is noted that the claimed Tl'uqtinus lands on Lulu Island on the South Arm of the Fraser River are 2 – 3 km upstream from the Project and do not overlap the Project footprint. The assessment of the strength of claimed Aboriginal title to the Project area was conducted to inform the scope of consultation regarding this Project. It is a preliminary assessment only, considering only information reasonably available at the time of consultation and is not based on an exhaustive review of all information and legal issues related to this potential claim, and does not reflect the Crown's opinion of whether the court will ultimately decide in favour of the First Nation in any litigation.

EAO is of the view that the available information suggests Cowichan people did not traditionally occupy the Project footprint with the intention of controlling this land, although given the relative proximity of the Project to the claimed village sites, an inference can be made that Cowichan people may have utilized this area for resource harvesting activities.

The Project footprint appears to be at the western edge of an area identified by ethno-historians as a boundary between the traditional territories of several different Aboriginal Groups: Musqueam Indian Band to the west and north, Tsawwassen First Nation to the southwest, and Kwantlen First Nation to the south and east. Some early ethnographers identified an area of land at the intersection of these traditional territories as not attributed to any Aboriginal Group. The information also indicates that the Fraser River and surrounding area was a particularly rich resource area and the sheer abundance of resources may have reduced the need or practicality of defending use by others. In fact, information indicates that multiple Aboriginal groups may have fished, hunted and

gathered within the vicinity of the Project footprint, which raises questions regarding whether exclusivity of use of the Project area can be established by the Cowichan people. EAO notes that Cowichan Nation Alliance has communicated to EAO that it does not agree with these conclusions.

Based on the above and on a descendancy from the historic Cowichan people, EAO's preliminary assessment is that 'Stz'uminus First Nation has a **moderate *prima facie* claim of Aboriginal title** to the portions of the Project footprint inclusive of the Highway 17A and Steveston Highway interchanges at the Project footprint. EAO acknowledges that Cowichan Nation Alliance disagrees with this conclusion and is of the view that it has a strong *prima facie* claim of Aboriginal title to the Project area.

#### 14.13.3 Involvement of the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Stz'uminus First Nation's Aboriginal Interests, EAO is of the view that the duty to consult Stz'uminus First Nation lies at the mid-to-high end of the *Haida* consultation spectrum. Stz'uminus First Nation is listed in Schedule B of the Section 11 Order.

Cowichan Nation Alliance has raised concerns regarding the Crown's initial assessment of the strength of its asserted Aboriginal title claims, communicating its view that both the sufficiency and exclusivity requirements are clearly met to support a strong prima facie claim in the vicinity of the Project area. After corresponding with Cowichan Nation Alliance about this difference in views, EAO determined that while it did not agree that the strength of claim assessment should be changed, it would be appropriate to consult with Stz'uminus First Nation and the other Cowichan Nation Alliance members at the deep end of the Haida spectrum in an effort to address Cowichan Nation Alliance's concerns.

Stz'uminus First Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Stz'uminus First Nation was also invited to attend Working Group meetings, site visits, and to meet with EAO staff directly.

The Proponent began consulting with Stz'uminus First Nation in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events has included 14 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Stz'uminus First Nation with two rounds of funding, one

in pre-Application phase and the other in Application Review Phase, to support their involvement.

A summary of the Proponent's engagement activities with Stz'uminus First Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| November 6, 2014 | Meeting | Initial meeting between Cowichan Tribes, Stz'uminus First Nation, EAO and the Proponent. Proponent introduced the Project Description and Proposed Studies document; EAO outlined the EA process and consultation. |
| January 21, 2016 | Working Group meeting | Stz'uminus First Nation unable to attend (Cowichan Nation Alliance represented by Halalt First Nation). |
| February 5, 2016 | Meeting | Meeting between Cowichan Nation Alliance, Proponent and EAO to discuss Project concept, presentation of the draft AIR, Cowichan presentation of their asserted Aboriginal Interests, and EAO presentation of the EA process. |
| February 24, 2016 | Letter | Cowichan Nation Alliance comments on the draft AIR related to employment estimates, economic benefits, VC selection, traditional knowledge, cumulative effects, air and water quality, underwater noise, fish and fish habitat, and existing marine use. Responses were provided by the Proponent to all Working Group member comments on the draft AIR. |
| March 10, 2016 | Working Group meeting | Stz'uminus First Nation unable to attend (Cowichan Nation Alliance represented by Halalt First Nation and Cowichan Tribes). |
| March 23, 2016 | Letter | Cowichan Nation Alliance provided round 2 comments on draft AIR. EAO responded to Cowichan Nation Alliance via letter on April 29, 2016. |
| March 29, 2016 | Letter | Responded to EAO's January 6, 2016 transmittal letters outlining EAO's initial strength of claim assessment for Cowichan groups and disagreeing with EAO's conclusions. EAO followed up with Cowichan Nation Alliance members at March 30/16 meeting, and responded via letter on April 25, 2016. |
| March 30, 2016 | Meeting | Meeting with Cowichan Nation Alliance members (except Stz'uminus First Nation) and the Proponent. Provided overview of what was covered at the March 10, 2016, Working Group meeting in Vancouver, reviewed the revised draft AIR and discussed EAO's strength of claim assessment. Cowichan Nation Alliance expressed interest and concern in economic benefits, including through procurement, for its members, and its views that economic impact on Aboriginal Groups should be a VC. |
| April 29, 2016 | Letter | EAO responded to Cowichan Nation Alliance comments on the 2nd version of the draft AIR. Provided response to Cowichan Nation Alliance on: future planned use of lands and resources for Cowichan Nation Alliance members, cumulative effects assessment and Part C of the draft AIR. |
| May 11, 2016 | Letter | Cowichan Nation Alliance provided further details to accompany Cowichan Nation Alliance's second round of draft AIR comments, specifically, on future planned |

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| | | uses in the vicinity of the Project. Comments were shared with the Proponent to incorporate into the Working Group tracking table, and the AIR was finalized on May 24, 2016. |
| May 27, 2016 | Letter | Cowichan Nation Alliance Responded to EAO's letter of April 25, 2016, including the Fraser River Head Lease report that was provided at that time. Expressed concern about: the consultation process including that the BC report was not provided earlier to Cowichan Nation Alliance; EAO's initial strength of claim assessment, including EAO's interpretation of the Kennedy and Brealey reports); Cowichan Nation Alliance's views of its strong Aboriginal title claim; use of the term "Cowichan"; presence of other Aboriginal Groups in the vicinity of the Project footprint at 1846; Coast Salish land use patterns; Cowichan intention and capacity to control the land; impacts to Aboriginal title including adverse effects to Cowichan people's ability to manage and make decisions over land use, economic development aspirations for the land; a request for deep consultation and accommodation and concern about draft Part C of the Application. |
| July 22, 2016 | Letter | EAO responded to Cowichan Nation Alliance's July 29, 2016 letter to the Proponent. Provided response to their comments on the revised Application, including noise thresholds at regional parks, regarding the cultural heritage management plan, air quality, and inclusion of discussion around Tl'uqtinus. |
| August 22, 2016 | Letter | EAO Responded to Cowichan Nation Alliance's letter of May 27, 2016, regarding Crown consultation and EAO's initial strength of claim assessment, confirming that EAO retains its views from its initial strength of claim assessment of Aboriginal title. |
| September 6, 2016 | Letter | Penelakut Tribe submitted comments on the Application on behalf of Cowichan Nation Alliance |
| September 7, 2016 | Letter | Cowichan Tribes submitted comments on the Application on behalf of Cowichan Nation Alliance. |
| September 19, 2016 | Working Group Site Tour | Cowichan Nation Alliance unable to attend. |
| September 20-21, 2016 | Working Group meeting | Cowichan Tribes (day 1) and Halalt First Nation (day 2) attended on behalf of Cowichan Nation Alliance by webinar; however, Cowichan Tribes communicated after the meeting that they had been unable to hear the audio well enough to participate in the meeting. |
| September 26, 2016 | Meeting | EAO meeting with Cowichan Nation Alliance post-Working Group meeting of Sept 20/21 and Cowichan Nation Alliance comments on the Application, particularly on air quality, noise, health, and fish and fish habitat. |
| September 30, 2016 | Email (attachment) | EAO invitation to Stz'uminus First Nation to comment on early section of Part C. |
| October 19, 2016 | Letter | Cowichan Tribes submitted comments on the Application (round 2) on behalf of Cowichan Nation Alliance. |
| October 21, 2016 | Letter | Penelakut Tribe submitted comments on the Application (round 2) on behalf of Cowichan Nation Alliance. |
| November | Email (attachment) | EAO invitation to Stz'uminus First Nation to comment on EAO's draft referral |

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| 22, 2016 | | package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Stz'uminus First Nation to comment on EAO's draft Part C. |
| December 2, 2016 | Email (attachment) | Cowichan Tribes provided comments on EAO's draft referral package on behalf of Cowichan Nation Alliance. |
| December 13, 2016 | Email (attachment) | Cowichan Tribes provided comments on EAO's draft Part C on behalf of Cowichan Nation Alliance. |
| January 5, 2017 | Email (attachment) | EAO response to Stz'uminus First Nation (Cowichan Nation Alliance members) response regarding EAO's draft referral package and Part C. |
| January 13, 2017 | Email (attachment) | Cowichan Nation Alliance provided its separate submission to the Ministers to EAO. |

### 14.13.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Stz'uminus First Nation during the EA:

*Methodology, Process and Consultation*

- Concern regarding the EA process and associated timelines throughout the process. EAO sought to address this issue by having webinar/teleconference options for all Working Group meetings for this Vancouver based Project, giving as much notice as possible regarding upcoming Working Group meetings, and offering to meet after or before every Working Group meeting with Cowichan Nation Alliance on Vancouver Island, with or without the Proponent;
- Concern expressed regarding the lack of resources and funding for Aboriginal communities;
- Concern about the adequacy of the methodology to address social and cultural effects on Stz'uminus First Nation;
- Raised the issue that ethnographical content in reports did not accurately represent Stz'uminus First Nation's historical presence within the Project area;
- Noted that identification of requirements including international agreements or other agreements should be included in the Crown's constitutional obligations to Aboriginal Groups
- Disagreement with EAO's methodology for consideration of cumulative effects on Aboriginal rights, including measurement against a pre-industrial baseline;

and

- Communicated that their concerns also relate to how cumulative effects are considered in regards to Aboriginal rights, and have expressed concern about the absence of comprehensive study on cumulative effects on the Fraser River.

*Cultural and Social Impacts*

- Concern regarding contaminants and the sustainability of vital habitats that are necessary to support their members;
- Concern that Proponent used TransLink Regional Transit Model which assumes future transit infrastructure will be built;
- Concern about Aboriginal participation and Project-related opportunities, including: community preparedness; and cultural recognition and naming;
- Concerns regarding social effects of the Project on Stz'uminus First Nation's ability to transfer knowledge, language loss, dependency and social interaction, and ability to participate in socio-cultural practices; and
- Concern regarding the potential increase in traffic and consequent increase in associated noise and vibration due to the increased capacity of the new bridge, as well as the choice of building materials in relation to noise and vibration.

*Health and Human Safety*

- Concern that Aboriginal health was not considered separately in a disaggregated manner in the Human Health section and that current conditions along the foreshore and in the Fraser River have not been properly considered in the human health assessment;
- View that transit modelling assumptions are not conservative enough, with potential implications for human health effects related to air quality, including the assumption that vehicle emissions will be less in 2031 due to new technologies;
- Expressed concerns about low frequency noise during construction and operation, noting its association with adverse effects to both human health and disturbance to wildlife and that it was a gap in the Application that low frequency noise was not assessed; and
- Seasonal difference in noise effects would be required to better understand effects to traditional use.

### 14.13.5 Potential Impacts of the Project to Stz'uminus First Nation's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests are generally provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Stz'uminus First Nation's Aboriginal Interests. These potential impacts are characterized by considering how the Project could affect several factors important to Stz'uminus First Nation's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this Report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Stz'uminus First Nation for the preparation and submission of Traditional Use, Traditional Knowledge or other studies. Stz'uminus First Nation worked with other Cowichan Nation Alliance members and submitted three TUS.[68]

[68] *Cowichan Nation Traditional, Current, and Planned Future Use of the George Massey Tunnel Replacement Bridge Project Area,* prepared by Candace Charlie for Cowichan Tribes, on behalf of the Cowichan Nation Alliance (August 9, 2015); *George Massey Tunnel Replacement Project: Cowichan Occupation and Use of the Project Lands*, prepared by Dorothy Kennedy for David Robbins of Woodward and Co., Counsel for the Cowichan Tribes, on behalf of the Cowichan Tribes (August 25, 2015); and *Historical Geography of Cowichan Land Use and Occupancy Lower Fraser River: Map Series and Report*, prepared for Woodward and Company and the Cowichan Tribes by Kenneth G. Brealey (May 31, 2010).

EAO considered all information available, including from public sources as well as relevant technical issues raised by Stz'uminus First Nation, in the following assessments of the potential impacts on the Project on Stz'uminus First Nation's Aboriginal Interests. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Stz'uminus First Nation from available sources is described below.

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

Stz'uminus First Nation historically harvested the following species on the South Arm of the Fraser River: sockeye and pink salmon, sturgeon, shellfish, and marine mammals.

Areas within the wider Fraser River estuary were also utilized by Hul'qumi'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.

Stz'uminus First Nation identified concerns related to potential Project effects to fish and other marine resources including:

- Effects to fish and fish habitat, including species of cultural and economic importance such as eulachon, sturgeon and salmon, from pile driving, blasting, and underwater noise generated by Tunnel decommissioning and construction activities, in the South Arm of the Fraser River as well as Deas and Green Sloughs;
- Operational effects of vibration from the bridge during operation, and road and bridge runoff, including from maintenance activities, on fish and fish habitat;
- Harm to fish caused by oil and grease, and other debris from inside the Tunnel entering the Fraser River during Tunnel decommissioning;
- Potential changes to the Fraser River South Arm and Deas Slough after removal of the Tunnel due to increased hard shoreline/riprap around Bridge supports which may adversely affect eulachon spawning;
- Adverse effects to pink salmon run if instream work related to Tunnel decommissioning occurs in 2023;
- Least risk timing windows do not take into account critical timing for spawning

salmon, trout and char migrating upstream through the Project footprint, including: pink, chum, Coho, Chinook, and sockeye salmon, coastal cutthroat and steelhead trout, Dolly Varden and bull trout;

- Adverse effects to fish from increased noise due to increase in marine vessel traffic in response to the decommissioning and removal of the Tunnel;
- Both light and noise effects were raised as having potential adverse effects on fish;
- Concerns related to river hydraulics, including: change in flow rates after Tunnel removal; whether extreme weather events had been adequately considered in the River Hydraulics model; potential for contaminants in the tunnel and how this may affect tunnel decommissioning;
- With regards to sediment and water quality, concerns included potential effects of run-off and drainage and the use and disposal of dredged and other material in the river as well as general concerns related to dredging of the Fraser River;
- View that habitat offsetting plans should be discussed or finalized at the EA stage; and
- Contaminated sites were also identified by Cowichan Nation Alliance as a concern, as were risk of potential accidents and malfunctions, including spills of hydrocarbons from refueling or leaks in construction equipment or vessels, including human waste, as well as spills from accidents during construction and operations.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report. In regards to Stz'uminus First Nation's concerns about potential effects to eulachon from the Project, eulachon were one of five sub-component species assessed. EAO considered that fish species of conservation concern including eulachon have higher sensitivity and lower resilience, and determined while adverse effects to individual fish may occur, overall population integrity will not be adversely affected. Furthermore, EAO notes that the bridge supports would not be in-stream. In regards to Stz'uminus First Nation's concerns about river hydraulics, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO discusses its assessment of potential effects of the Project on river hydraulics and river morphology in the lower Fraser River in section 4.2, and is of the view that residual effects to hydrology would not be significant. EAO has also proposed a condition requiring development of a river bed and hydrology

management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel"[69]. Any such future plans would be subject to review under the VFPA's Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

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[69] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

Cowichan Nation Alliance has previously reported that now filled-in sloughs and streams in or near Highway 99 once supported Coho and eulachon, which they traditionally harvested. Cowichan Nation Alliance reports that Tl'uqtinus was used year-round for harvesting purposes, although the information reviewed by EAO suggests use may have been largely on a seasonal basis. Stz'uminus First Nation also used other habitation sites in the area, including one at Steveston, on the southwest end of Lulu Island.

Members of the Cowichan Nation Alliance have been attempting to restore former fisheries within the Fraser River through 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 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 is in ongoing, active litigation over its asserted fishing rights on the South Arm of the Fraser River.

Stz'uminus First Nation participates in the Hul'qumi'num Fisheries Limited Partnerships (HFLP), a commercial fishing business, with Penelakut Tribe and Halalt First Nation. Species harvested through this enterprise are crab (one Area H licence, outside the vicinity of the Project), prawn (two local/coast wide licences), halibut (one licence and annual TAC quota), herring (13 gillnet and 1 seine), rockfish (two Area Inside licences, which EAO understands may overlap the vicinity of the Project, targeting yelloweye, quillback, copper, china, and tiget), sablefish (annual TAC quota), and salmon (five Area E gillnet licences, which EAO understands may overlap the vicinity of the Project). Commercial fisheries for halibut and sablefish are generally undertaken off the west coast of Vancouver Island.

Stz'uminus First Nation identified several concerns with potential Project impacts relating to specific locations and access to fishing and marine harvesting activities, including:

- Size of the RAA being too limited to account for potential adverse effects to migrating fish;
- Baseline conditions for fish and fish habitat as they relate to Aboriginal Interests were not considered from a pre-contact perspective;

- Access to the Fraser River and the potential to displace or interfere with Aboriginal fishing; and
- Stz'uminus First Nation's use and navigation of the areas surrounding the Project, potentially affecting future ability to fish and to harvest, including in-water and upland of the South Arm of the Fraser River.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. Although there is potential for construction activities to impact future fishing activities at the claimed *Tl'uqtines* Lands in the case that they overlapped temporally with construction, EAO understands that while Stz'uminus First Nation is interested in expanding their future fishing activities in the vicinity of the Project, current fishing activities are intermittent. EAO anticipates that any potential disruption to access to fishing areas for Aboriginal Groups would be local, short-term and infrequent.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise), and as discussed in section 13.1 of this Report, the Project is expected to result in Minor impacts to Stz'uminus First Nation's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Cowichan Nation Alliance has previously reported that Highway 99 was built on what was once a prime harvesting location for deer, ducks, and geese, among other species. Canada goose, northern shoveler, and green-winged teal would have been available year-round. The south shore of Lulu Island, along the South Arm of the Fraser River, has been reported as a prime spot for trapping beaver, mink, and muskrat; bear, grouse, elk, squirrel, and porcupine were also hunted by the Cowichan people on the South Arm. The Cowichan Nation Alliance as a group has stated a desire to resume the harvest of traditional resources in the Project area.

Cowichan Nation Alliance has also stated that its members revere bald eagles, which were not hunted. Elders of the Cowichan Nation Alliance members have indicated that eagle numbers in the Richmond area have been dwindling each year. Breeding habitat along the Highway 99 corridor on Lulu Island has been previously noted as a concern.

Stz'uminus First Nation identified concerns and comments related to potential effects to wildlife and wildlife habitat including:

- Effects on wildlife from degradation of air quality associated with the Project, particularly during construction;
- Vibration, light and noise effects were raised as having potential adverse effects on wildlife; and
- The bridge structure's effects on species such as waterfowl and migratory birds.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operations as well as a marine mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed a condition requiring a noise management plan. Stz'uminus First Nation identified concerns and issues related to specific locations and access to hunt and trap including:

- Stz'uminus First Nation's ability to harvest in the Project area; and
- Stz'uminus First Nation's use and navigation of the areas surrounding the Project, potentially effecting future ability to harvest, including in-water and upland of the South Arm of the Fraser River.

EAO understands that while Stz'uminus First Nation is interested in expanding their hunting and trapping activities within the vicinity of the Project, hunting and trapping are not currently taking place in the Project area by Stz'uminus First Nation.

Disruption of access to hunting and trapping areas could occur during construction, where construction may overlap temporally with future potential hunting and trapping activities. EAO anticipates that potential disruptions to access to future hunting and trapping areas would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

While EAO notes that sites of importance for Stz'uminus First Nation's (including the Highway 99 corridor, along the Fraser River, and south shore of Lulu Island) overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application, EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Stz'uminus First Nation's asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal groups in the area.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations could affect quality of experience for Stz'uminus First Nation's future potential hunting and trapping activities, although EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and that it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, land use and visual quality (sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Stz'uminus First Nation's asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

Cowichan Nation Alliance report plants that were traditionally gathered included wild rose, rose hips, crabapples, elderberries, horsetail, Labrador tea, Indian hemp, trembling aspen, mock orange, Oregon grape, maple leaves, cranberries, blueberries, blackberries, wapato, bulrushes/reeds (stth'equn), as well as seaweed. Available information indicates that berries were traditionally harvested from bogs in the vicinity of the historic Tl'uqtinus site and fire was used to maintain open areas for the berry bushes from encroachment from pine trees.

Stz'uminus First Nation identified the following concerns and comments related to potential effects to traditional plants:

- Culturally important vegetative species should have been considered as VCs including species collected for: food, fibres in textiles and nets, building attributes, and construction of baskets, needles, and harpoons (e.g. mock orange, Oregon grape, crabapple, Labrador tea);
- Adverse effects on vegetation including from new shading due to the Bridge, contaminated water run-off, contaminated debris from infrastructure, accidents and vehicles, garbage from increased traffic, air quality, and dust/smothering of vegetation;
- Adverse effects to SARA-listed native streambank lupine from the Project at Deas Island Regional Park and a request that an impact assessment be conducted for all at-risk plant species and ecosystems within the LAA;
- Adverse effects on wetlands and watercourses due to stormwater and road

runoff, as well as from vibrodensification impact;

- Invasive plant species and proposed plans to manage their presence during construction; and
- Request that culturally significant plants be used in revegetation plans.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

Cowichan Nation Alliance report that in the marshy areas south of Canoe Passage near Brunswick Point – in the area of Xwulit'sum, or place for cutting (cattails) – as well as in the area of Tl'uqtinus and across the Fraser River on Tilbury Island, several varieties of cattails and rushes (stth'equn) were once harvested, although these locations do not fall within the Project footprint. Berries and other plants were gathered and cultivated by the ancestors of the Cowichan Nation Alliance member bands at Tl'uqtinus, and were harvested from other locations in the Project area.

Cowichan Nation Alliance has indicated that they wish to see existing bogs on Lulu Island near the Highway 99 corridor – specifically, one near Williams Road (which runs perpendicular to Highway 99) and another near the Richmond Nature Park (bisected by Highway 99 at Westminster Highway) – protected to support future use of traditional resources, like berries and other bog ecosystem flora. At Tl'uqtinus, which is currently surrounded by blueberry farms, Cowichan Nation Alliance has raised the potential for their former berry grounds to be re-established.

Stz'uminus First Nation identified the following concerns and comments with potential Project impacts relating to specific locations and access to gathering activities:

- Stz'uminus First Nation's ability to harvest in the Project area; and
- Stz'uminus First Nation's use and navigation of the areas surrounding the Project, potentially effecting future anticipated ability to harvest, including in-water and upland of the South Arm of the Fraser River.

EAO understands that Stz'uminus First Nation is interested in expanding their future gathering activities in the vicinity of the Project, however current gathering activities are not taking place.

There is potential for construction activities to impact future potential access or gathering activities where construction may overlap temporally with future gathering activities. There is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO understands that upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails would be reconnected, and shoreline areas restored after construction. EAO has also proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered that Tilbury Island and Hwlhits'um (Canoe Pass), sites of importance for Stz'uminus First Nation's traditional gathering, are outside both the LAA and RAA for vegetation.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at gathering areas could affect quality of experience for Stz'uminus First Nation's future anticipated activities. It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Stz'uminus First Nation's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

Locations along the South Arm of the Fraser River of importance to the Cowichan Nation Alliance members in the vicinity of the Project include, but are not limited to, the Tl'uqtinus Lands, spanning the north shore from approximately opposite Tilbury Island, downstream towards Deas Island, and Hwlhits'um or Xwulit'sum, on Canoe Pass. Both of these areas are considered by Cowichan Nation Alliance members as ancestral village and resource sites, which EAO understands includes part of the Tl'uqtinus site.

Stz'uminus First Nation identified concerns and comments including:

- Potential impacts to Stz'uminus First Nation's asserted title, rights and culture;
- Increase in noise levels on Deas Island, as Cowichan Nation Alliance members intention to use Deas Island Regional Park in the future;
- Cowichan Nation Alliance raised concerns about potential health effects (air quality and noise) to future residents of the Tl'uqtinus village site which they intend to re-establish. They noted the site cannot be compared to other land uses in the area, as the use of these areas requires lower levels of noise;
- Protection of archaeological and heritage resources, including intangible heritage sites and specific concern for any effects on the Tl'uqtinus site and potential archaeological values at interchanges from construction; and
- Stz'uminus First Nation expressed interest in participating in archaeological fieldwork and review of archaeological draft reports through the EA and consultation in any potential archaeological and heritage resource monitoring plan.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air

quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

In regards to concerns about increased noise levels on Deas Island, EAO understands that should Cowichan Nation Alliance re-establish residential and/or commercial use at their village site and use of Deas Island Regional Park for gathering and knowledge transmission purposes in the future, the Proponent would engage in focused discussions in relation to potential noise effects from the Project on Deas Island. EAO has proposed a condition requiring a noise management plan be development, which would include monitoring and adaptive management measures to ensure that noise effects are not greater than predicted in the Application.

There is not anticipated to be an overlap between Stz'uminus First Nation's archaeological and cultural heritage interests and the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

There is potential for changes to quality of experience at important locations for Stz'uminus First Nation, including Tl'uqtinus and Hwlhits'um (Canoe Pass), ancestral village sites, to occur, in particular in relation to changes in atmospheric noise during construction and operations, although EAO does not anticipate atmospheric noise to travel to the village sites, and visual conditions during operation. These effects are not fully mitigable or reversible. While effects on human health related to air quality and atmospheric noise are understood to have been a concern particularly at Stz'uminus First Nation's village site at Tl'uqtinus as it is hoped to be resettled at some point in the near future, EAO notes it has proposed a condition requiring development of a noise management plan to address Project-related noise during construction and operations, which would include a noise monitoring and follow-up program and a communication program to inform communities potentially affected by Project-related noise.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at Tl'uqtinus, although less likely at Hwlhits'um.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with

intangible cultural value or meaning to Stz'uminus First Nation, such as spiritual or storied sites, or named places, potentially affected by the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance including visual quality and noise), human health (atmospheric noise and air quality), and land use, and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible-to-Minor impacts to Stz'uminus First Nation's other traditional and cultural interests.

Impacts on Asserted Aboriginal Title

Cowichan Nation Alliance has asserted Aboriginal title to not only the Tl'uqtinus Lands, but to the Project footprint including between the Highway 17A and Steveston interchanges. Cowichan Nation Alliance has expressed its view that their asserted Aboriginal title includes the right to manage the land, determine the uses to which it can be put, and obtain any economic benefits from it. Cowichan Nation Alliance has advised that it is also working to re-establish culturally integral practices (e.g., harvesting fish, waterfowl, and plants) on the South Arm and at the mouth of the Fraser River, including at and about Tl'uqtinus, as well as a site on Tl'uqtinus for residential and/or commercial purposes. Stz'uminus First Nation indicated that future developments should include potential Stz'uminus First Nation's Aboriginal title and rights resulting from established rights or a declaration of Aboriginal title.

Cowichan Nation Alliance expressed concern about the need to assess traditional use, current use, as well as future planned use for the purposes of understanding potential adverse effects on Cowichan Nation Alliance member First Nations' Aboriginal rights and title.

Stz'uminus First Nation identified concerns and comments including:

- Potential impacts to Stz'uminus First Nation's asserted Aboriginal title, rights and culture;
- Effects on ability to enjoy and use title lands, including future use, from increased noise and light disturbance, obstruction of sunlight, and air pollution;
- Project footprint could impact Stz'uminus First Nation's ability to obtain lease income for benefit of future generations on their asserted Aboriginal title lands;
- Aboriginal participation and Project-related opportunities, including employment, training and contracting, economic development opportunities, and revenue sharing (from tolling);
- Potential air quality effects from the Project on the Tl'uqtinus site and Proponent's lack of modelling for construction-related emissions;
- Concern about air quality effects up river from the highway corridor near the Fraser River on Lulu Island, in the vicinity of the Tl'uqtinus site, including:
    - How the height of the bridge was considered in the air quality modelling; and
    - Request the LAA be extended 3 km downwind of the bridge;
- Re-establishment of a site on Tl'uqtinus site for residential and/or commercial purposes, and surplus land, including land recovery at Green Slough; and
- Effect of the Project on asserted Aboriginal title, including the right to decide how the land will be used, occupy and possess the land; the economic benefits flowing from the land, and to pro-actively use and manage the land.

In regards to concerns about potential air quality effects in the vicinity of the Tl'uqtinus site, EAO requested the Proponent provide an estimate of predicted construction-related emissions for the Project.[70] EAO has also proposed a condition requiring the development of a CEMP that would include measures to mitigate and manage air quality during construction. Regarding concerns about the height of the bridge in air quality modelling, the Proponent provided an analysis which considered traffic emissions from an elevated bridge will disperse over a larger area, resulting in ambient concentrations that are lower in comparison to a source that is closer to the ground. The

[70] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=55

Proponent concluded there would be no exceedances of ambient air quality objectives at the Tl'uqtinus site.

EAO has considered how the Project may impact each of the following three components of Stz'uminus First Nation's Aboriginal title claims overlapping the Project area: use and occupation, decision-making, and economic benefits.

In regards to potential effects to Stz'uminus First Nation's use and occupation of the area, EAO considered that the majority of construction works would be confined to relatively small areas during the construction, be temporary in nature, and for the road improvements would be within a pre-existing corridor. The nature of the new bridge would result in permanent changes to the landscape which could impact the practice/expression of Aboriginal Interests in the vicinity of the Project. Impacts related to visual quality are not mitigable, although again they will be limited in geographic extent. The analysis of potential residual effects on VCs relevant to other related Aboriginal Interests are low to moderate magnitude, and are not expected to be significant.

Regarding the decision-making component of Aboriginal title, EAO has actively consulted Stz'uminus First Nation in an attempt to better identify, understand, and resolve concerns relating to Aboriginal title. EAO considered that the Proponent has provided and would continue to provide capacity funding to support meaningful participation in future consultation activities with the Proponent and in the regulatory process.

EAO notes that Stz'uminus First Nation and Cowichan Nation Alliance have shared their view that the Project will prolong and exacerbate existing barriers to benefit economically from the Project area. EAO considered that the Proponent is actively engaged with Aboriginal Groups to ensure that local Aboriginal communities benefit directly from the Project, including opportunities related to employment, training and contracting. The Proponent would also encourage and support the use of Aboriginal and local businesses by encouraging suppliers and subcontractors to adopt local procurement. EAO's proposed Aboriginal engagement report condition would also require the Proponent to include description of actions taken or planned to provide training, construction monitoring, employment, business, and contracting opportunities to Aboriginal Groups.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to social, economic, environment, heritage, and health

VCs, and as discussed in section 13.5 of this Report, the Project is expected to result in Minor impacts to Stz'uminus First Nation's asserted Aboriginal title.

## 14.14 Tsawwassen First Nation

### 14.14.1 Context

Tsawwassen First Nation is a Central Coast Salish group located on the southern aspect of the Fraser River delta, on the west side of the peninsula that separates Boundary Bay from the Strait of Georgia. Tsawwassen First Nation entered into the Tsawwassen First Nation Final Agreement with Canada and BC which was negotiated under the BC Treaty Commission and came into effect on April 3, 2009.

Under the Tsawwassen First Nation Final Agreement, Tsawwassen Lands are located on the upland areas between the ferry terminal at Tsawwassen and the container port at Roberts Bank. Tsawwassen Lands are owned by Tsawwassen First Nation, and Tsawwassen First Nation has the right to self-government and the authority to make laws, as set out in the Tsawwassen First Nation Final Agreement. Use of Tsawwassen Lands is guided by the Tsawwassen First Nation Land Use Plan. Tsawwassen First Nation also owns 62 ha of land near Boundary Bay and on the Fraser River along Canoe Pass which remain under the jurisdiction of the Corporation of Delta. Roughly half (184) of the Tsawwassen First Nation's registered population (365) reside on Tsawwassen Lands. The Project area does not overlap any Tsawwassen Lands as defined by the Tsawwassen First Nation Final Agreement.

The Tsawwassen First Nation Final Agreement also provides Tsawwassen First Nation with harvesting rights in areas located within Tsawwassen Territory, which extends from the southern Gulf Islands to the area around Pitt Lake. 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, wildlife and migratory bird harvesting, and plant gathering. Under the Tsawwassen First Nation Final Agreement Tsawwassen First Nation has the right to harvest fish, aquatic plants, intertidal bivalves, wildlife, migratory birds, and plants; such rights are limited by measures necessary for conservation, public health, or public safety.

The entirety of the Project corridor (approximately 25 km) runs through Tsawwassen Territory. The Tsawwassen Fishing Area overlaps with the entire River-based portion of the Project, the Tsawwassen Wildlife Harvest Area and Migratory Bird Harvest Area overlaps with the entirety of the Project corridor, and two of the Tsawwassen Plant Gathering Areas at Burns Bog and the South Arm Marshes are within 1 - 2 km of the southern section of the Project corridor.

### 14.14.2 Environmental Assessments and the Tsawwassen First Nation Final Agreement

The Tsawwassen First Nation Final Agreement outlines the rights and obligations of the Province of British Columbia and Tsawwassen First Nation with regard to EAs and includes the following language:

Chapter 15, paragraph 3 of the Tsawwassen First Nation Final Agreement states that within Tsawwassen Territory, Tsawwassen First Nation has the right to participate in provincial environmental processes and to receive referrals on environmental matters from the Province on the same basis as local governments or other First Nations.

Chapter 15, paragraph 7 of the Tsawwassen First Nation Final Agreement requires that, if a proposed Provincial Project is located within Tsawwassen Territory, and may reasonably be expected to adversely affect Tsawwassen Lands, residents of Tsawwassen Lands or Tsawwassen First Nation rights set out in the Tsawwassen First Nation Final Agreement (Treaty Rights), BC will ensure that Tsawwassen First Nation:

- Receives timely notice of, and relevant available information on, the Provincial Project and the potential adverse environmental effects;
- Is consulted regarding the environmental effects of the Provincial Project; and
- Receives an opportunity to participate in any EA of that Provincial Project.

The term “consult” is defined in Chapter 1 of the Tsawwassen First Nation Final Agreement to mean provision to a party of:

- Notice of a matter to be decided;
- Sufficient information in respect of the matter to permit the party to prepare its views on the matter;
- A reasonable period of time to permit the party to prepare its views on the matter;
- An opportunity for the party to present its views on the matter; and
- A full and fair consideration of any views on the matter so presented by the party.

Under Chapter 15, paragraph 8 of the Tsawwassen First Nation Final Agreement, BC is required to give full and fair consideration to the comments received from Tsawwassen First Nation and will respond to comments received during the EA before a final decision is made.

In addition, the Tsawwassen First Nation Final Agreement states that BC may authorize uses of or dispose of provincial Crown land and any authorized use or disposition may affect the methods, times and locations of the harvest of fish, aquatic plants, intertidal bivalves, wildlife, migratory birds and plants under the Tsawwassen First Nation Final Agreement, provided that BC ensures that those authorized uses or dispositions do not deny Tsawwassen First Nation the reasonable opportunity:

- To harvest fish and aquatic plants in the Tsawwassen Fishing Area
- To harvest migratory birds in the Tsawwassen Migratory Bird Harvest Area, or
- To gather plants in a Tsawwassen Plant Gathering Area.

The Project is in proximity to the following areas defined in the Tsawwassen First Nation Final Agreement:

- Within the Tsawwassen Territory;
- Approximately 6 km from Tsawwassen Lands;
- Within the Tsawwassen Fishing Area where Tsawwassen First Nation have the right to harvest fish, aquatic plants and intertidal bivalves;
- Within the Tsawwassen Wildlife Harvest Area where Tsawwassen First Nation has the right to harvest wildlife;
- Within the Tsawwassen Migratory Bird Harvest Area where Tsawwassen First Nation has the right to harvest migratory birds; and
- Approximately 1-2 km from two Tsawwassen Plant Gathering Areas.

### 14.14.3 Involvement of the Consultation Process

Given the nature and location of the Project, and Tsawwassen First Nation’s rights outlined in the Tsawwassen First Nation Final Agreement, Tsawwassen First Nation is listed in Schedule B of the Section 11 Order.

Tsawwassen First Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Tsawwassen First Nation also attended Working Group meetings on January 21, and September 20-21, 2016, and was invited to attend site visits and to meet with EAO staff directly. Tsawwassen First Nation was unable to attend the Working Group meeting on March 10, 2016.

The Proponent began consulting with Tsawwassen First Nation in early 2013, before entering the EA process. The Proponent reports that consultation and information-sharing events has included 16 face-to-face meetings, email exchanges, and phone calls. The Proponent provided Tsawwassen First Nation with two rounds of funding, one in pre-Application phase and the other in Application Review Phase, to support their involvement.

The Proponent provided additional funding to Tsawwassen First Nation for their preparation and submission of the following study: *George Massey Tunnel Replacement Project: Project Impact Study: An assessment of potential impacts of the George Massey Tunnel Replacement Project on aspects of the TFN Final Agreement, and other considerations.*

A summary of the Proponent's engagement activities with Tsawwassen First Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| November 3, 2014 | Meeting (teleconference) | Meeting between Tsawwassen First Nation, Proponent, and EAO regarding the Project. Proponent introduced the Project Description and Proposed Studies document; EAO outlined the environmental assessment and consultation process. |
| November 12, 2014 | Meeting (teleconference) | EAO committed to provide Tsawwassen First Nation a letter outlining their understanding of EAO's rights and obligations under the Tsawwassen First Nation Final Agreement. |
| December 1, 2014 | Meeting/Open House | Open House held at Tsawwassen First Nation with Tsawwassen community members. Proponent introduced the Project Description and Key Areas of Study document; EAO outlined the EA and consultation process. |
| January 6, 2016 | Letter | EAO provided the letter committed to Tsawwassen First Nation on November 12, 2014, at the time it provided its transmittal letter regarding the Project. |
| March 29, | Meeting | Meeting between Tsawwassen First Nation, Proponent, and EAO to provide an |

| | | |
|---|---|---|
| 2016 | | overview of the March 10, 2016 Working Group meeting. EAO gave an overview of its presentation; the Proponent provided an overview of the revised draft AIR and responses to Working Group comments. |
| September 19, 2016 | Working Group Site Tour | Tsawwassen First Nation did not attend. |
| October 17, 2016 | Email (attachment) | EAO invitation to Tsawwassen First Nation to comment on early draft section of Part C. |
| November 22, 2016 | Email (attachment) | EAO invitation to Tsawwassen First Nation to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TOC. |
| November 23, 2016 | Email (attachment) | EAO invitation to Tsawwassen First Nation to comment on EAO's draft Part C. |

### 14.14.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Tsawwassen First Nation during the EA:

*Methodology, Process and Consultation*

- The EA process and associated timelines;
- Interest in an EA by the Canadian Environmental Assessment Agency and federal government participation in the regulatory process, including wanting clarity and certainty with respect to DFO's participation;
- Interested in capacity funding to facilitate participation in the EA process and for a Project-related Study, which was provided;
- Noted importance of ensuring appropriate use of information shared by Aboriginal Groups as it relates to confidentiality and dissemination of information; and communicated its view that Tsawwassen First Nation and Musqueam
  Indian Band's stronger presence in the Project area should be reflected in the way the Crown engages these groups in work related to the Project; and
- Inappropriateness/inadequacy of Marine Users Group for consultation with Tsawwassen First Nation.

*Social and Economic Impacts*

- Emphasized the importance of maintaining access to points connecting to

Tsawwassen, specifically access to Highway 17A;

- Concerns about the length of time tolls are in place;
- Concern about effects of increased traffic, urbanization, and industrialization, and unleashing of “pent up demand” from the Project;
- Interested in the rationale for removing the Tunnel, and the business case for tolling the new bridge; and
- Aboriginal participation and Project-related opportunities, including:
  - Potential employment, revenue-sharing (from tolling), training, contracting and economic development opportunities, with adequate training time to take full advantage of potential future Project work activities; and
- Community preparedness.

*Environmental Impacts*

- Cumulative effects assessment should take into consideration a pre-industrial baseline;
- Concerns about cumulative effects, including in regards to inclusion of other reasonably foreseeable project and activities, and regarding the absence of a comprehensive study on cumulative effects on the Fraser River.

*Health and Human Safety*

- Concern about potential effects of change in air quality resulting from increase in traffic volume due to the Project; and
- Concern that contamination from harvested species could be passed along to members.

### 14.14.5 Potential Impacts of the Project to Tsawwassen First Nation’s Treaty Rights under the Tsawwassen First Nation Final Agreement

A discussion of EAO’s assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally, which includes Treaty Rights, are provided in section 13 of this report. EAO recognizes that areas within the traditional territory of each Aboriginal Group may be particularly important and valuable for specific

qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the project on Tsawwassen First Nation's Treaty Rights. These potential impacts are characterized by considering how the Project could affect several factors important to Tsawwassen First Nation's ability to practice Treaty Rights. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Treaty Rights (e.g., fish) that were assessed in Part B of this Report;
- Impacts on specific sites of traditional use, where identified by Tsawwassen First Nation; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Treaty Rights.

EAO considered all information available, including from public sources as well as relevant technical issues raised by Tsawwassen First Nation, in the following assessments of the potential impacts on the Project on Tsawwassen First Nation's Treaty Rights. A discussion of the potential direct and indirect effects of the Project on Aboriginal Interests, including Treaty Rights, is provided in section 13 of this Report.

A summary of the information about Tsawwassen First Nation from available sources is described below.

<u>General Concerns Regarding Potential Impacts on Tsawwassen First Nation's Treaty Rights</u>

Tsawwassen First Nation raised the following general issues and concerns with potential Project impacts relating to their Treaty Rights:

- Obligations to Tsawwassen as a Treaty Nation must be recognized and consultation must be undertaken as set out in the Tsawwassen First Nation Final Agreement;
- Consideration of cumulative effects on Treaty Rights;
- Need for the Proponent to understand that Tsawwassen First Nation's Treaty Rights are not limited to how the right is currently being exercised. Instead,

impacts can include the potential loss of future opportunities for activities that were either not always practiced historically or that may or may not be currently being exercised; and

- Interest in the potential for Tsawwassen First Nation Treaty Rights to be assessed as VCs.

EAO notes that throughout the EA it has sought to communicate and fulfill its understanding of its responsibilities in regards to consultation with Tsawwassen First Nation under the Tsawwassen First Nation Final Agreement. In regards to Tsawwassen First Nation's concern regarding cumulative effects on Treaty Rights, for the reasons outlined in the following sections, EAO does not anticipate any cumulative effects on Treaty Rights as it does not anticipate significant adverse residual effects to any of the VCs considered in this Report, including to: fish and fish habitat and marine mammals (section 4.3), hydrology (section 4.2), land use and visual quality, particularly sensory disturbance (visual quality and noise) (section 5.2), human health, particularly atmospheric noise (section 7), marine use (section 5.3), terrestrial wildlife (section 4.4), vegetation (section 4.5), heritage (6).

Impacts on Tsawwassen First Nation Fishing Rights, Including Harvesting Aquatic Plants

Marine resources are largely discussed in Chapter 9 of the Tsawwassen First Nation Final Agreement. Fish, as defined under the Tsawwassen First Nation Final Agreement, includes fish, intertidal bivalves and other shellfish, crustaceans, and marine animals (excluding cetaceans), the parts of these fish, as well as their eggs, sperm, spawn, larvae, spat, juvenile stages and adult stages.

Domestic allocations for sockeye, chum pink, chinook, and Coho salmon, which are centrally important to Tsawwassen, are fished between April to November, though more commonly salmon fishing occurs between May and October.

Fraser River eulachon, a traditional species, are fished in Canoe Passage in limited quantities for specific domestic purposes, typically in April and May. Tsawwassen report that eulachon, once very abundant, in particular in Canoe Passage, is now only available for distribution to Elders. They have expressed concern that any impact to eulachon may lead to a complete collapse of the species. Herring, another traditional species of continuing importance, is not currently harvested, nor is herring spawn, which has been observed locally on crab traps.

Groundfish (i.e., rockfish, lingcod, halibut, dogfish, and sole) may also be harvested year-round. Tsawwassen report the return of halibut to the Roberts Bank area, and the harvesting of dogfish has occurred in the shallows near the Roberts Bank terminal. Sole, and flounder, present in Canoe Passage, are reported to be small, and some flounder appear to be diseased.

Since the Tsawwassen First Nation Final Agreement 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. Tsawwassen report commercial crab harvesting currently occurs in Crab Management Area I which includes the Fraser River upstream and downstream of the Project and the Strait of Georgia, from June through November.

Shrimp and prawn may be harvested at any time of year. Tsawwassen members report an interest in harvesting prawn on the eastern side of the Strait of Georgia, but no current harvesting has been reported.

Intertidal bivalves may be harvested in areas that do not overlap the project area, and Tsawwassen First Nation has expressed interest in developing shellfish aquaculture.

Aquatic plants (including attached and detached kelp and seaweeds) may be harvested at any time of day or year. These plants are specifically defined in the Tsawwassen First Nation Final Agreement as all benthic and detached algae, brown algae, red algae, green algae, golden algae and phytoplankton, and all marine and freshwater flowing plants, ferns and mosses, growing in water or soils that are saturated during most of the growing season (see “Gathering” section).

Tsawwassen First Nation has previously reported that bulrushes have been harvested for basketry, and also for their medicinal properties. Tsawwassen members have also previously reported that at one time, seaweed grew “all over” and would be, along with sea asparagus, harvested “all along the shoreline” of Tsawwassen First Nation’s main community, although there is currently little to none reportedly left in these areas.

Marine mammals, including porpoise, seals, and sea lions, were once harvested by Tsawwassen members within the mouth and estuary of the Fraser River. These marine animals (with the exception of porpoise, a cetacean) fall within the meaning of fish under the Tsawwassen First Nation Final Agreement. Tsawwassen First Nation has reported that the community does not currently harvest marine mammals and that there

is no desire to harvest marine mammals; however, they remain culturally important to the community.

Tsawwassen First Nation reports that seals are interfering with crab and fish harvesting, opening traps and damaging nets in search of food. They attribute this behaviour to an over-population of seals in this area, and a lack of Chinook (spring) salmon, a species declining in numbers. Seals have also been observed travelling further up the Fraser River than previously, including beyond the Alex Fraser Bridge. Tsawwassen First Nation has explained they are increasingly fishing closer to New Westminster to avoid conflict with the seals.

Tsawwassen First Nation identified several concerns related to potential effects to fish and aquatic plants and habitats, including:

- Importance of fish and fish habitat including species of cultural and economic importance such as eulachon, sturgeon and salmon, and salmon spawning grounds;
- Spills of hydrocarbons from refueling or leaks in construction equipment/vessels, including human waste, was also a concern, as were spills from accidents during construction and operations;
- Potential effects of pile driving, blasting and underwater noise generated by Tunnel decommissioning and other construction activities;
- Accommodation of construction windows for fish cycle spikes (i.e. 4 year sockeye and 2 year pink);
- Effects on Fraser River flow rates after Tunnel removal, and potential effects of run off from the bridge and drainage;
- Effects of lighting on fish, as well as effects of underwater noise generated by Tunnel decommissioning and other construction activities on migrating salmon;
- Use and disposal of dredged and other material in the river as well as general concerns related to dredging of the Fraser River; and
- Direct impacts on water quality which could affect fisheries resources.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat and marine mammals) and 4.2 (hydrology) of this Report.

In regards to Tsawwassen First Nation's concerns about potential effects to eulachon from the Project, eulachon were one of five sub-component species assessed (as were sturgeon). Sediment removal and construction works during least-risk timing windows for eulachon, including upstream-migrating adult eulachon, and eulachon larvae, are a primary mitigation measure to reduce potential adverse effects. EAO considered that fish species of conservation concern including eulachon and sturgeon have higher sensitivity and lower resilience, and is of the view that while adverse effects to individual fish may occur, overall population integrity will not be adversely affected. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

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). 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.

Canoe Passage was once a key sturgeon harvesting area. Neither sturgeon nor steelhead can currently be kept due to conservation concerns.

Tsawwassen report that physical access to Fraser River fisheries has changed. Chilukthan Slough, which at one time ran between Roberts Bank and the Fraser River, from north of Tsawwassen Lands to the Ladner area, was considered Tsawwassen's "short cut" to the Fraser River; the slough was filled long ago as a result of farm development, and was described as a "huge" loss by Tsawwassen Elders. Access to the Fraser River by water now involves a longer route around the existing Roberts Bank terminals and British Columbia Ferries Terminal. For canoe journeys, Tsawwassen members must navigate as close as possible to the terminals to and from the river to avoid shipping lanes, large vessel traffic, and shallow waters. Tsawwassen members report that the changes to current flows and sediment build up between the Roberts Bank terminal sand causeway to Westham Island are the reason that Canoe passage, an important fishing area and travel corridor to and from the South Arm of the Fraser River, has become difficult to transit other than at high tide. They report Canoe Passage has become narrower, which means that fewer fishing vessels are able to harvest in the area at any one time.

Tsawwassen report that from Sturgeon Bank south to Point Roberts, clams, cockles, mussels, oysters and abalone were once harvested by their members for food and other purposes such as trade and ceremonial regalia. Boundary Bay was considered an important harvesting area for bivalves, especially clams, cockles, and oysters, while scallops, sea cucumbers were taken from Boundary Bay through to Canoe Passage. Tsawwassen Elders report barnacles, which were harvested by being scraped from rocks, have reduced in size over the years. They also note that abalone, along with a large oyster bed (lying just south of the British Columbia Ferries Terminal), began to disappear after development in the Roberts Bank area (i.e. Roberts Bank terminals and British Columbia Ferries Terminal). The Elders have also reported that they stopped harvesting shellfish from the area before DFO put in place the existing biotoxin and sanitary closures, which restricts Elders from harvesting what was formerly a mainstay of their diet along the eastern side of the Strait of Georgia.

Tsawwassen Elders report changes to the foreshore north and south of their Lands (i.e., "our little beach"), to which they attribute access difficulties, decreases in species abundance, and compromised quality of resources, especially shellfish and crab.

Tsawwassen First Nation identified several concerns related to potential effects to specific locations and access to fish and marine resource harvesting activities, including:

- Potential increase in vessel traffic on the Fraser River as a result of the decommissioning of the Tunnel;
- Effects of construction during fishing season on fishing activities;
- Interference or displacement of fishing opportunities within the Project area;
- Potential interference with Aboriginal fisheries during decommissioning of the Tunnel, specifically as it relates to timing windows, and the importance of working closely with communities to ensure negative effects are avoided;
- Project activities may affect ability of Tsawwassen Members to participate in commercial fisheries;
- High volumes of sediment in Canoe Pass caused by Project construction, and
- generally, impact on fishing locations; and
- Requirement for a Harmful Alteration, Disruption and Destruction permit.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel"[71]. Any such future plans would be subject to review under the VFPA's Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough, the entirety of which is within the Tsawwassen Fishing Area. EAO understands that there is potential for construction activities to impact fishing activities in the Tsawwassen Fishing Area where active fishing may overlap temporally with construction. EAO anticipates that any potential

[71] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

disruption to access to fishing areas for Aboriginal Groups would be local, short-term and infrequent.

In regards to Tsawwassen members' concerns that the Project could contribute to the narrowing of Canoe Passage, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

In order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO understands the Proponent is working with Tsawwassen First Nation to address concerns about consultation via the Marine Users Group and to seek Tsawwassen First Nation's input on how they would like to be consulted on marine access matters during construction.

EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. This and the above conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential effects on Tsawwassen First Nation's fishing rights, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual

quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise), and as discussed in section 13.1 of this Report, the Project is expected to result in Minor impacts to Tsawwassen First Nation's fishing rights.

Under the Tsawwassen First Nation Final Agreement, BC may authorize uses or dispositions of provincial Crown land that may affect the methods, times and locations of the harvest of Fish and Aquatic Plants under the Tsawwassen Fishing Right, provided that BC ensures that those uses or dispositions do not deny Tsawwassen a reasonable opportunity to harvest Fish and Aquatic Plants in the Tsawwassen Fishing Area. EAO is of the view that the potential effects of the Project during both construction and operation stages would not result in a denial of Tsawwassen First Nation's reasonable opportunity to harvest fish and aquatic plants in the Tsawwassen Fishing Area, as per Chapter 9 of the Tsawwassen First Nation Final Agreement.

Impacts on Tsawwassen First Nation Right to Harvest Wildlife and Migratory Birds

The extent of the Tsawwassen Wildlife Harvest Area and Tsawwassen Migratory Bird Harvest Area is the same as the Tsawwassen Territory, which the Project crosses. Under the Tsawwassen First Nation Final Agreement, wildlife includes all vertebrate and invertebrate animals, including mammals, birds, reptiles, and amphibians, and the eggs, juvenile stages, and adult stages of these animals. The definition excludes fish, and therefore marine mammals. Migratory birds means birds, as defined under federal law enacted further to international conventions, and includes their eggs.

Tsawwassen's rights to harvest wildlife and migratory birds includes harvesting for domestic purposes and to trade or barter wildlife, wildlife parts, and migratory birds among themselves or with other Aboriginal people resident in BC. Harvested wildlife, wildlife parts (including meat and furs), migratory birds, and inedible migratory bird by-products (including down) may also be sold if the sale is permitted by federal, provincial,

and Tsawwassen law. Wildlife and migratory bird harvesting rights may be exercised on private land (with the owner's permission) and, in the case of migratory birds, within National Wildlife Areas (with Canada's permission). With respect to wildlife harvesting specifically, the Final Agreement acknowledges there is "limited existing opportunity to harvest Wildlife and [there is] the likely future diminution or loss of any meaningful opportunity to harvest Wildlife in the Tsawwassen Wildlife Harvest Area".

Tsawwassen First Nation stated that birds are no longer as abundant as they once were, with some species, such as the pheasant, now scarcely found and others, such as geese, preferring Boundary Bay over Roberts Bank. Ducks and geese remain an important winter food and source of feathers, used for ceremonial purposes. Tsawwassen First Nation report the number of hunters has diminished and along with it the opportunities for transference of knowledge to youth.

Tsawwassen First Nation report deer and bear were once hunted from Point Roberts through Tsawwassen to Burns Bog, as well as on the Gulf Islands, Tsawwassen members had traplines for muskrat, otters, beaver, raccoon and rabbits from present-day Tsawwassen Lands to Westham Island. Currently, they pursue large game (e.g., deer and elk), in areas far removed from Tsawwassen Lands. Although they did not report current hunting or trapping of small animals, they did note there are fewer reporting requirements for small game harvesting than for other species, and thus some degree of harvesting is probable.

EAO understands that, at present, Tsawwassen First Nation is not harvesting any wildlife or migratory bird species for which a conservation risk has been identified. Harvesting of migratory birds is permitted throughout the year.

Species harvested in the past include mallards, snow geese, and brant along the foreshore, and pintails, teals and widgeons in the back fields. Pheasants were previously taken "all over", and quail was also eaten. Other species identified as valuable are gadwall, goldeneye, bufflehead, and canvasback ducks; as well as Canada geese, gulls, and songbirds.

Tsawwassen First Nation identified several concerns related to potential effects to wildlife and migratory birds, including:

- Spills contaminating habitat, directly killing or poisoning animals;
- Increased wildlife mortality as a result of vehicle collisions and collision with infrastructure;
- Disturbance or displacement of species/migratory birds;

- Loss or degradation of wild/bird habitat;
- Potential light and noise effects on wildlife; and
- Potential effects of the bridge structure on species such as waterfowl and migratory birds and bats.

Potential adverse effects to wildlife, including migratory birds, are considered in section 4.4 (wildlife) of this Report, and address Tsawwassen First Nation's concerns noted above. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operations as well as a marine mammal management plan be developed in consultation with Aboriginal Groups.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

Specific species and harvesting sites (except Burns Bog for wildlife) are not identified in the Tsawwassen First Nation Final Agreement; however, locations near the Project area have been previously identified as preferred wildlife and migratory bird harvesting areas, particularly for deer, beaver, ducks, and geese. These locations include: the south side of Lulu Island; the small islands, sloughs, marshes, and tidal flats of the Lower Fraser River; and the tidal flats at Boundary Bay.

Tsawwassen hunters have previously described locations throughout their traditional territory as preferred harvesting areas for wildfowl, including all of what are now Tsawwassen Lands and nearby fields, the shoreline from northwest of the Roberts Bank causeway up to and including Brunswick Point, and areas in and around Westham Island.

Tsawwassen First Nation identified concerns related to potential effects to specific locations and access to wildlife and migratory birds and harvesting activities, including:

- Human presence and activities can lead to safety concerns related to the use of firearms for hunting wildlife resulting in a potential loss of opportunity for Tsawwassen First Nation Members to exercise Treaty Rights in some

locations; and

- Loss or restriction of harvesting activities over the status quo.

Disruption of access to hunting and trapping areas could occur during construction, where construction overlaps temporally with hunting and trapping activities. EAO anticipates that potential disruptions to access to hunting and trapping areas would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

While EAO notes that sites of importance for Tsawwassen First Nation's (including the south shore of Lulu Island) overlap with the LAA and RAA for the terrestrial wildlife species assessed in the Application, there are not expected to be residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the Project area.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise), as well as section 13 of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations could affect quality of experience for Tsawwassen First Nation's hunting and trapping activities, although EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and that it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

The Tsawwassen First Nation Final Agreement acknowledges that the Tsawwassen Wildlife Harvest Area is adjacent to a heavily urbanized area with "limited existing opportunity to harvest Wildlife such that BC's ability to authorize uses or dispositions of provincial Crown land "may result in Tsawwassen First Nation being without any meaningful opportunity to harvest under the Tsawwassen Right to Harvest Wildlife."

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, marine mammals, land use and visual quality (specifically sensory disturbance, including visual quality and noise), and human health man health(atmospheric noise), and as discussed in section 13.2 of this

Report, the Project is expected to result in Negligible-to-Minor impacts to Tsawwassen First Nation's rights to Harvest Wildlife and migratory birds.

Under the Tsawwassen First Nation Final Agreement, BC may authorize uses or dispositions of provincial Crown land that may affect the methods, times and locations of the Tsawwassen Right to Harvest Migratory Birds provided that BC ensures that those uses or dispositions do not deny Tsawwassen a reasonable opportunity to harvest under the Tsawwassen Right to Harvest Migratory Birds. EAO is of the view that the potential effects of the Project during both construction and operation stages would not result in a denial of Tsawwassen First Nation's reasonable opportunity to harvest Migratory Birds in the Tsawwassen Migratory Bird Area, as per Chapter 11 of the Tsawwassen First Nation Final Agreement.

Impacts on Tsawwassen First Nation Right to Gather Plants

Plants, as defined under the Tsawwassen First Nation Final Agreement, includes all flora and fungi but does not include aquatic plants (included in the definition for fish) or trees except for their bark, branches and roots.

Specific species harvested in Tsawwassen Plant Gathering Areas are not identified or defined in the Tsawwassen First Nation Final Agreement and Tsawwassen First Nation did not provide any specific harvesting information during the course of the EA.

Plant species and timber resources that may be found in the vicinity of the Project include *quxmin,* salal, bog blueberries, Indian hemp, cattails and rushes, St. John's wort, western red cedar, Douglas fir, western hemlock, western yew, black cottonwood, red-osier dogwood, and red alder. Plant species identified as important by Tsawwassen Elders or resource users include wild berries (e.g. blackberries, huckleberries, salmonberries, strawberries, snowberries, boysenberries, loganberries, raspberries, black caps, red caps), cherries, crabapples, wild onion, wild mint, rhubarb, Labrador tea, wild rose, thistle, Indian Consumption Plant, yellow or curly dock, devil's club, ferns, cascara bark, barberry bark, and stinging nettle. Traditional timber resources also include cherry, hazelnut, and willow trees; driftwood was also collected from the beach to smoke fish, but no community smokehouses remain.

Tsawwassen have reported that plants are mainly gathered in and around Tsawwassen Lands (where still available), and plans are currently underway to resume harvesting in designated areas and to support the transfer of traditional plant use knowledge to Tsawwassen youth. EAO is uncertain as to whether there is any overlap with the Project area and these designated areas.

Tsawwassen First Nation identified the following concerns and comments related to potential effects to plants and gathering activities:

- Changes in river hydrology affecting shorelines, tidal wetlands, mudflats, drainage channel and uplands of the South Arm Marshes Wildlife Management Area and adjoining areas that may lead to changes impacting members' ability to gather and use plants;
- Concern expressed regarding potential effects of removing the Tunnel on marshes along the river;
- Loss or degradation of plant harvesting areas, including damage by invasive plants;
- Human (construction) activities directly killing biota (collisions, pile driving and dredging);
- Spills contaminating habitat, directly killing or poisoning plants; and
- Use of culturally significant plants in planting plans.

Potential adverse effects to vegetation are considered in section 4.5 (vegetation) of this Report.

There is potential for construction activities to impact access to gathering activities where construction may overlap temporally with gathering activities. There is not anticipated to be any overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor, and which do not overlap with Tsawwassen's Plant Gathering Areas in the nearby South Arm Marshes Wildlife Management Area or the Burns Bog Ecological Conservancy Area.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed CEMP condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. A fish habitat offset plan has also been mentioned above. EAO has also proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants. Upland areas occupied by Tunnel

components during Tunnel removal would be revegetated, affected trails would be reconnected, and shoreline areas restored after construction. The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

EAO notes that both Tsawwassen Plant Gathering Areas in the vicinity of the Project (the South Arm Marshes Wildlife Management Area and within the Burns Bog Ecological Conservancy Area) are outside both the LAA and RAA for vegetation.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at gathering areas would affect quality of experience for Tsawwassen First Nation. It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed. While it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge, the northeastern edge of the South Arm Marshes Wildlife Management Area is within approximately 1 km from the Project corridor, on the Fraser River which EAO understands may have visual quality effects of greater than 1 km.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential effects to Tsawwassen First Nation's right to gather plants, as well as section 13 of Part C.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible impacts to Tsawwassen First Nation's rights to gather plants.

Under the Tsawwassen First Nation Final Agreement, BC may authorize uses or dispositions to a specified area that may affect the methods, times and locations of the Tsawwassen Right to Gather Plants provided that BC ensures that those uses or dispositions do not deny Tsawwassen a reasonable opportunity to gather under the Tsawwassen Right to Gather Plants. EAO is of the view that the potential effects of the Project during both construction and operation stages would not result in a denial of

Tsawwassen First Nation's reasonable opportunity to gather plants as provided for in Chapter 13 of the Tsawwassen First Nation Final Agreement.

Impacts on Tsawwassen First Nation Right to Practice Tsawwassen First Nation Culture

Tsawwassen's right to practice their culture, as well as use of the Hən̓q̓əmiṅəm language, is identified in the Tsawwassen First Nation Final Agreement Chapter 14. Several Hən̓q̓əmiṅəm place names for important heritage sites in the vicinity of the Project area are also identified in the Tsawwassen First Nation Final Agreement, including the following:

- ƛ'eqtinəs (or Tl'ektines), identified in the Tsawwassen First Nation Final Agreement as DgRs-17, which places it slightly upstream of the Project area on the north shore of the South Arm of the Fraser River;
- čičiləxwqən (Ladner Landing, DgRs-41), downstream of the Project area; and
- Xwlic'əm (Brunswick Point on Canoe Pass, DgRs-35), also downstream of the Project area.

Tsawwassen First Nation emphasizes the importance of the Fraser River to their members for fishing, transportation, recreation, and cultural purposes. Tsawwassen First Nation stresses the importance of their continued ability to fish, along with and the significance of fishing and associated activities to their community's culture and economy. Some traditional activities, such as spending time with Elders in the smokehouse, no longer occur, as the last smokehouse was demolished when Highway 17 was expanded.

Tsawwassen First Nation reports they have experienced the loss of important and organic means for community gathering and socializing to the foreshore areas to the north and south of Tsawwassen Lands (i.e. sc̓əwa'ən and c̓ayəm), both internally and with other nations with whom they have traditionally traded. This has also meant the loss of opportunities to pass down traditions related to the use of the beachfront to their youth.

Tsawwassen explain that participation in fishing, an integral element of Tsawwassen culture, is decreasing, due to diminishing stocks, increasing harvesting restrictions and higher costs related to having to travel farther to harvest traditional resources.

Tsawwassen First Nation identified the following concerns and comments related to their Treaty Right to practice Tsawwassen First Nation culture:

- Social effects of the Project on Tsawwassen First Nation's ability to transfer knowledge, language and participate in socio-cultural practices;
- Opportunities for cultural recognition and naming;
- Protection of archaeological and heritage resources, including intangible heritage sites;
- Participation in archaeological fieldwork and review of archaeological draft reports; and
- Potential for changes in the landscape to alter how Tsawwassen members use the area and their traditional uses, including storytelling.

The potential effects on biophysical components that support the culture of Tsawwassen First Nation have been discussed in other sections of this Report. EAO is of the view that Tsawwassen First Nation would not be denied a reasonable opportunity to harvest fish, aquatic plants, and migratory birds or to gather plants as provided for in the Tsawwassen First Nation Final Agreement.

EAO has also considered sections 6 (heritage), 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality), as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests There is not anticipated to be an overlap between Tsawwassen First Nation's archaeological and cultural heritage interests and the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Tsawwassen First Nation, such as spiritual or storied sites, or named places, potentially affected by the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for

members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

There is potential for changes to quality of experience for Tsawwassen First Nation's right to gather plants at the northeast portion of the South Arm Marshes Wildlife Management Area, in particular in relation to changes in atmospheric noise during construction and operations, and visual conditions during operation. These effects are not fully mitigable or reversible.

Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at important heritage sites identified in the Tsawwassen First Nation Final Agreement including Tl'ektines, Ladner Landing and Brunswick Point sites. However, these sites are more than 1 km away from the bridge so residual visual quality effects are not anticipated at these locations.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance, including visual quality and noise), and human health (atmospheric noise and air quality), and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible impacts to Tsawwassen First Nation's right to practice the culture of Tsawwassen First Nation culture and the Hən̓q̓əmin̓əm language.

## 14.15 Tsleil-Waututh Nation

### 14.15.1 Context

Tsleil-Waututh Nation are a Central Coast Salish people. The main Tsleil-Waututh Nation community is located in North Vancouver, on the shore of Burrard Inlet, approximately 2 km east of the north end of the Second Narrows Bridge, on Burrard Inlet 3. Two other reserves, Inlailawatash 4 and Inlailawatash 4A, are located on Indian Arm. Of 578 registered members, 287 reside on Tsleil-Waututh reserves. The Project area does not overlap any current or former reserve lands of the Tsleil-Waututh Nation.

Tsleil-Waututh Nation's asserted traditional territory, its Consultation Area, extends from the vicinity of Mount Garibaldi in the north to the 49th parallel (and beyond) in the south, to Gibsons in the west, and Coquitlam Lake in the east. Tsleil-Waututh Nation report that this Consultation Area encompasses all the waters and lands used by Tsleil-Waututh Nation during extensive seasonal rounds of travel and resource harvest, and include both areas exclusively occupied and governed by Tsleil-Waututh Nation,

and areas to which Tsleil-Waututh Nation is granted access according to Coast Salish protocols. The Project area lies fully within this Consultation Area.

Tsleil-Waututh have stated that all the lands and waters draining into Burrard Inlet and Indian Arm constitute their core territory (a subset of their Consultation Area), and that their use of the South Arm of the Fraser River was dependent on kinship ties with other Hən̓q̓əmin̓əm-speakers.

Tsleil-Waututh Nation has Aboriginal Interests that are known to overlap or lie in the vicinity of the Project corridor, which includes a portion of the South Arm of the Fraser River.

Tsleil-Waututh has identified past and ongoing effects that have altered and reduced use over time, constraining the current exercise of their Aboriginal Interests. Tsleil-Waututh has identified a desire to regain or increase, based on past patterns and levels of use, the exercise of Aboriginal Interests in relation to locations or resources that may be affected by Project components or activities.

### 14.15.2 Preliminary Strength of Claim Assessment

The entire 25 km of the Project corridor is within the asserted traditional territory of Tsleil-Waututh Nation.

The core territory for Tsleil-Waututh Nation is understood to include the Burrard Inlet and Indian Arm watersheds, which do not overlap with the Project area. In regards to activities on the Fraser River in the vicinity of the Project EAO understands salmon was part of Tsleil-Waututh Nation's seasonal round, which was accessed on the Fraser River through kinship ties with other Coast Salish groups. There is also information that historical trails connected Tsleil-Waututh territory to the Fraser River in the area around New Westminster, so it is understood that Tsleil-Waututh Nation had relatively easy access to the river. The south arm of the Fraser River is understood to have been a major travel corridor for all Coast Salish people, including Tsleil-Waututh Nation. Based on this information, EAO's preliminary assessment is that Tsleil-Waututh Nation has a **moderate *prima facie* claim of Aboriginal rights to fish** in the South Arm of the Fraser River in proximity to the Project.

With respect to Project components in the vicinity of Lulu Island and Delta, it is noted that these are also a significant distance from the area understood to be within Tsleil-Waututh Nation's core territory. During previous EAs, Tsleil-Waututh Nation informed EAO that they harvested eulachon, sturgeon, waterfowl, and cranberries from the Fraser River area. While it is understood that this traditional use was supported by

reference to activities and events that occurred in the 1860s, it is unclear whether this traditional use also occurred prior to contact (1792) in this area or whether contact with European settlers had changed resource harvesting practices in these intervening years, or to what extent. Based on this information, EAO's initial assessment to the areas within proximity of Project components in and around Lulu Island and Delta, north and south of the Fraser River is that Tsleil-Waututh Nation has a **weak-to-moderate *prima facie* claim of Aboriginal rights to hunt and gather** in this area.

While the Project is outside of the core territory asserted by Tsleil-Waututh Nation, EAO has been informed that Tsleil-Waututh Nation seasonally occupied villages or camps on the north and south arms of the Fraser River. However, the lack of ethnohistoric references to Tsleil-Waututh Nation in this area in the mid-1800s, an area that was otherwise well documented in the historic record regarding use of this area by other Aboriginal groups raises questions of Tsleil-Waututh Nation's sufficiency of occupation at around 1846. There is also no information that indicates Tsleil-Waututh Nation exclusively controlled any areas in the vicinity of the Project at around 1846. Thus, EAO's initial assessment is that Tsleil-Waututh Nation has a **weak *prima facie* claim to Aboriginal title** in the area of the Project.

EAO notes that Tsleil-Waututh Nation has communicated to EAO its disagreement with EAO's understanding that Tsleil-Waututh Nation's traditional uses in the south arm of the Fraser River may not have occurred prior to contact in 1792 and has noted that Tsleil-Waututh utilized the Fraser River and surrounding lands and waters via the foraging radii from their villages, and by their seasonal round prior to and as of 1846.

### 14.15.3 Involvement in the Consultation Process

Given the nature and location of the Project, and the potential impacts of the Project on Tsleil-Waututh Nation's Aboriginal Interests, EAO is of the view that the duty to consult with Tsleil-Waututh Nation lies at the low-to-mid end of the *Haida* consultation spectrum. Tsleil-Waututh Nation is listed in Schedule B of the Section 11 Order.

Tsleil-Waututh Nation was invited to review and provide comments on the Project Description and Key Areas of Study document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Tsleil-Waututh Nation attended Working Group meetings on January 21, March 10, and September 20-21, 2016, a site tour on September 19, 2016, and was invited to meet with EAO staff directly.

The Proponent began consulting with Tsleil-Waututh Nation in early 2014, before entering the EA process. The Proponent reports that consultation and information-sharing events has included face-to-face meetings, email exchanges and phone calls, including a meeting via phone between Tsleil-Waututh Nation, the Proponent and EAO on June 23, 2016 to review and respond to Tsleil-Waututh Nation's comments on the Application during Application Evaluation. Tsleil-Waututh Nation was also provided with revised sections of the Application to review during Application Evaluation. The Proponent provided Tsleil-Waututh Nation with two rounds of funding, one in pre-Application phase and the other in Application Review Phase, to support their involvement.

A summary of the Proponent's engagement activities with Tsleil-Waututh Nation is provided in the Proponent's Application and in the Proponent's Aboriginal Consultation Reports. An overview of EAO's key engagement activities is provided below:

| Date | Type of Engagement | Summary |
|---|---|---|
| November 20, 2014 | Phone | Meeting between Tsleil-Waututh Nation, EAO and the Proponent. Proponent introduced the Project Description and Proposed Studies document; EAO outlined the EA process and consultation. |
| February 10, 2016 | Letter | Tsleil-Waututh Nation provided comments on the draft Section 11 Order and EAO's initial assessment of Tsleil-Waututh Nation's strength of claim for the Project. |
| February 17, 2016 | Phone | EAO responded to Tsleil-Waututh Nation's letter of February 10, 2016, including regarding: Tsleil-Waututh's comments on the draft Section 11 Order; and concern about timelines for the EA. |
| February 19, 2016 | Tracking table (email) | Tsleil-Waututh Nation provided comments on the draft AIR. |
| March 9, 2016 | Letter | At the time of the notification of the final Section 11 Order (attached), EAO responded to Tsleil-Waututh Nation's response regarding the draft Section 11 Order and initial strength of claim assessment, as well as to their letter of February 10, 2016. |
| March 18, 2016 | Letter | EAO responded to Tsleil-Waututh Nation's February 19, 2016 comments on the draft AIR. |
| March 23, 2016 | Letter | Tsleil-Waututh's comments on the revised draft AIR for the Project. |
| June 13, 2016 | Tracking table (email) | Tsleil-Waututh Nation submitted comments during Application Screening. |
| July 6, 2016 | Email | Tsleil-Waututh Nation was provided an opportunity to comment on revised sections of the Application during Application Screening. |
| July 20, 2016 | Letter | Tsleil-Waututh Nation provided their response to the revised Part C and Marine Use Assessment for the Project during extended Application Screening. |
| July 20, 2016 | Email | Tsleil-Waututh Nation provided comments on revised version of the Application Part C Tsleil-Waututh Nation-specific section, general Part C section, and Marine Use Assessment Chapter, as offered by EAO on July 6, 2016. |
| August 26, 2016 | Tracking table (email) | Tsleil-Waututh Nation comments on the Application (round 1). |

| | | |
|---|---|---|
| October 17, 2016 | Tracking table (email) | Tsleil-Waututh Nation comments on the Application (round 2). |
| October 14, 2016 | Email (attachment) | EAO invited Tsleil-Waututh Nation to comment on early draft section of Part C. |
| November 3, 2016 | Email (attachment) | Tsleil-Waututh Nation provided EAO with comments on early draft section of Part C. |
| November 22, 2016 | Email (attachment) | EAO invitation to Tsleil-Waututh Nation to comment on EAO's draft referral package, including draft technical assessment report, draft CPD and draft TO C. |
| November 23, 2016 | Email (attachment) | EAO invitation to Tsleil-Waututh Nation to comment on EAO's draft Part C. |
| December 13, 2016 | Email (attachment) | Tsleil-Waututh Nation response regarding EAO's draft referral package. |
| December 14, 2016 | Email (attachment) | Tsleil-Waututh Nation response regarding EAO's draft Part C. |
| January 5, 2017 | Email (attachment) | EAO response to Tsleil-Waututh Nation response regarding EAO's draft referral package and Part C. |
| January 11, 2017 | Email (attachment) | Tsleil-Waututh Nation provided its separate submission to the Ministers to EAO. |

### 14.15.4 Summary of Key Issues and Concerns Raised

In addition to issues raised related to Aboriginal Interests in the next section, the following key issues and concerns were raised by Tsleil-Waututh Nation during the EA:

*Methodology, Process and Engagement*

- Capacity funding to facilitate participation in the Project review process, and for the Knowledge Study;
- Appropriate use of information shared by Tsleil-Waututh Nation;
- Concern about the adequacy of the EA methodology, including cumulative effects assessment methodology, and timelines associated with the EA process;
- The effectiveness and nature of the EA process and consideration of cultural assessment methodology;
- Consideration of cumulative effects on Aboriginal rights;
- Concern that water quality was assessed as an intermediate component and not a VC;
- Concerns about EAO's decision to combine the Economic and Social pillars for the purposes of this EA; and
- Importance in distinction between consultation and information sharing.

*Cultural and Social Impacts*

- Length of time the tolls are in place;
- View that potential impacts from the Project to Aboriginal Interests are inconclusive due to Aboriginal Cultural Health not being studied as part of the Human Health VC; and
- ALR lands soil lost from the Project compared to what is being gained, including time to reach equal soil nutrients and value.

*Environmental Effects*

- The absence of a comprehensive study of cumulative effects on the Fraser River and assessment of cumulative effects in regards to inclusion of other reasonably foreseeable projects and activities;
- Effects of climate change and extreme weather events;
- Effects on Southern resident killer whales within 10 km of Project area;
- A desire for input into areas for potential habitat enhancement and the importance of working with Tsleil-Waututh Nation in accordance with their stewardship policy;
- Impact of Project on Deas and Tilbury Sloughs and Duck, Barber and Woodward Island complexes;
- Wetland assessment (ecological services, productivity and biodiversity), particularly with respect to at-risk amphibians;
- Impacts of staging/laydown areas;
- Impacts to soil in the ALR; and
- Opportunities for adaptive measures, rather than focusing on no net loss.

*Health and Human Safety*

- Potential for suicide attempts from the new bridge and interest in considering mitigation in addition to barriers;
- Interest in an Aboriginal-specific HIA, and inclusion of cultural health in health assessment;
- A desire for air quality of the Pattullo Bridge Replacement project to be

considered in relation to the air quality of the GMT Project;

- Impacts to access to the waterways and cultural health of Aboriginal peoples, and its relation to the human health assessment; and
- Consideration of Aboriginal policies and guidelines as they relate to health.

### 14.15.5 Potential Impacts of the Project on Tsleil-Waututh Nation's Aboriginal Interests

A discussion of EAO's assessment approach and understanding of the potential impacts of the Project on Aboriginal Interests generally are provided in section 13 of this Report. EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices. These areas may also be used for traditional harvesting activities (e.g., hunting, trapping, fishing and gathering), by individual members or families.

The discussion in this section focuses on potential impacts of the Project on Tsleil-Waututh Nation's Aboriginal Interests. These potential impacts area characterized by considering how the Project could affect several factors important to Tsleil-Waututh Nation's ability to practice Aboriginal Interests. Where information was available, EAO considered the following:

- Biophysical effects to values linked to Aboriginal rights (e.g., fish) that were assessed in Part B of this Report;
- Impacts on specific sites of traditional use; and
- Impacts on social, cultural, spiritual, and experiential aspects of exercising Aboriginal Interests.

The Proponent provided additional funding to Tsleil-Waututh Nation for the preparation and submission of Traditional Use, Traditional Knowledge or other studies. Tsleil-Waututh Nation submitted a TUS entitled: *Tsleil-Waututh Knowledge Study for the George Massey Tunnel Project*.

EAO considered all information available, including from public sources (including the Proponent's Application for an EAC) as well as relevant technical issues raised by Tsleil-Waututh Nation in the following assessments of the potential impacts of the Project on Tsleil-Waututh Nation's Aboriginal Interests. A discussion of the potential

direct and indirect effects of the Project on Aboriginal Interests is provided in section 13 of this Report.

A summary of the information about Tsleil-Waututh Nation from available sources is described below, which includes information gathered from direct correspondence with Tsleil-Waututh Nation (including Working Group meetings, teleconferences, and written submissions including but not limited to correspondence received).

Impacts on Freshwater Fishing, and Marine Fishing and Harvesting

Marine resources were and remain central to Tsleil-Waututh Nation for subsistence and cultural life. Salmon was a food staple, as well a range of shellfish, including bivalves and crustaceans, sturgeon, groundfish, eulachon, herring and smelt, and aquatic plants such as seaweeds. Seals, porpoises, and sea lions were also harvested. Tsleil-Waututh Nation has said that access to different species of salmon was important because of their different qualities and requirements for preservation.

Tsleil-Waututh Nation identified several concerns related to potential effects to fish and fish habitat, including:

- Disturbance to benthic and aquatic invertebrates and their habitat;
- Species of cultural and economic importance such as eulachon, sturgeon, and salmon;
- Evaluation on impacts to ecological services for all ecosystems within the vicinity of the Project;
- Potential effects of light and underwater noise generated by Tunnel decommissioning and other construction activities on migrating salmon;
- Concern that Canoe Passage, which is part of the mouth of the Fraser River connecting it to the Salish Sea, was excluded in the LAA;
- Change in flow rates after Tunnel removal;
- Water quality and sediment issues, and potential effects of run off and drainage and a request for consideration of innovative stormwater solutions and bioengineering techniques;
- Use and disposal of dredged material in the river, as well as general concerns related to dredging of the Fraser River and cumulative effects from dredging associated with the proposed WesPac Tilbury Project;
- Spills of hydrocarbons from refueling or leaks in construction equipment,

including human waste;

- Quantity of fish habitat that would be created by habitat enhancement or offsetting; and
- Cumulative effects of rising marine vessel traffic through the South Arm of the Fraser River.

Potential adverse effects to fish and fish habitat, water quality and river hydraulics are considered in sections 4.3 (fish and fish habitat) and 4.2 (hydrology) of this Report.

In regards to Tsleil-Waututh Nation's concerns about potential adverse effects to benthic and aquatic invertebrates, such effects are not anticipated to occur as a result of the Project, because given the nature of the Fraser River, aquatic and benthic invertebrate communities within or adjacent to the Project alignment are considered resilient to physical disturbance and would recover rapidly from any disturbance. In addition, given the limited spatial and temporal interactions between Project activities and benthic aquatic invertebrates, it is anticipated that potential effects would be negligible. As such, EAO notes that there are no adverse effects anticipated to benthic invertebrates from the Project.

In regards to underwater noise and light effects on migrating salmon, EAO notes that underwater noise is a pathway considered and that both underwater noise and light effects on fish are considered in section 4.3 of EAO's Report. EAO also notes that Canoe Pass was considered in the RAA for fish and fish habitat.

In regards to Tsleil-Waututh Nation's concerns about water quality, changes in flow rates, and sediment issues, EAO anticipates most of the relocated sediments would remain within the LAA; negligible fine sediment volume beyond that would not be expected to measurably alter riverbed habitat quality or characteristics from baseline conditions. EAO discusses its assessment of potential effects of the Project on river hydraulics and river morphology in the lower Fraser River in section 4.2, and is of the view that residual effects to hydrology would not be significant. EAO has also proposed a condition requiring development of a river bed and hydrology management plan by a Qualified Professional, in consultation with Aboriginal Groups, and a condition requiring the Proponent to update hydraulic modelling based on final Construction plans to support mitigation planning.

Another proposed condition requires the Proponent to participate in any initiatives related to the monitoring, assessment, or management of cumulative environmental effects if requested by federal, provincial or regional government agencies. Potential

accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

In response to concerns from Aboriginal Groups about a potential increase in future vessel traffic on the Fraser River due to the removal of the Tunnel, EAO and the Proponent are not aware of any future plans for capital dredging. During the EA, the VFPA submitted a letter, which included a statement that "The port authority currently has no plans to dredge the Fraser River to create a wider or deeper navigation channel"[72]. Any such future plans would be subject to review under the VFPA's Project and Environmental Review (PER) process and consultation with potentially affected Aboriginal Groups. The Proponent has also communicated to EAO that any potential dredged material associated with Project activities would be appropriate for beneficial use and that Disposal at Sea is not considered.

EAO has proposed conditions requiring a fish and fish habitat management plan and fish habitat offset plan to be developed by a Qualified Professional in consultation with Aboriginal Groups and a condition requiring on-site water quality to be managed and monitored by a Qualified Professional during construction, including Tunnel removal, to ensure compliance with specific water quality guidelines. EAO has also proposed conditions requiring a drainage and stormwater management plan and a noise management plan be developed in consultation with Aboriginal Groups. Aboriginal Groups would also be required to be engaged with on design of infrastructure for the Project, including drainage, landscaping, lighting, and visual considerations, as part of the proposed Inter-Agency Working Group condition.

EAO's proposed CEMP to be developed by a Qualified Professional in consultation with Aboriginal Groups addresses waste management, erosion and sediment control, spill prevention and response for hydrocarbon storage, accidents and malfunctions, and air quality during construction. Potential accidents and malfunctions are also discussed in section 8 of this Report, which specifically speaks to potential spills of hazardous substances, and EAO's view that following mitigation measures, the risk of such an accident is considered to be low.

Tsleil-Waututh Nation reports they hold a close cultural and spiritual connection to salmon; however, sockeye salmon do not run in the tributaries of Burrard Inlet. Tsleil-Waututh Nation reported that their ancestors historically accessed sockeye on the

[72] https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=56

South Arm of the Fraser River through kinship ties, moving to the area in July and August, where they would reside at Tsleil-Waututh seasonal villages with other *Həńq̓ əmiǹəm̓*-speaking groups.

Fraser River sockeye remain a primary traditional food source for Tsleil-Waututh families, and salmon, herring and crab are among the species that contribute to the contemporary economy of Coast Salish peoples. Sturgeon and eulachon were also harvested. Currently, Tsleil-Waututh Nation occasionally receives Fraser River eulachon through relatives and cultural protocols. Sturgeon, due to its decline, is no longer a component of Tsleil-Waututh diet. It is their goal to participate in the recovery of these species and their habitats for future generations. Tsleil-Waututh Nation reports that they have an extensive Fraser River sockeye fishery each year and that they fulfill their communal allocation, although EAO notes that it is unclear whether there is any overlap with the Project area. The largest fishing effort occurs in August. Tsleil-Waututh Nation also communicated to the Proponent that they participated in, and continues to reserve the right to, a limited fishery for FSC purposes outside of the regular Tsleil-Waututh sockeye fishing season.

Tsleil-Waututh Nation report having access to PFMA 29 (which includes the South Arm of the Fraser River at the Project) for communal crab licences, and have been working with DFO through an access request process to recognize PFMA 29 for prawn and crab communal fisheries in the Tsleil-Waututh Nation's Crab Fishing Area.

Fishing is conducted under communal licenses on behalf of the community; distributions of fresh fish are made within the community in season and by preserved methods in the winter months. Tsleil-Waututh Nation participates in commercial fisheries through Salish Seas Limited Partnership, a business owned jointly with the Tsleil-Waututh Nation and Sliammon First Nation.

Tsleil-Waututh Nation identified specific issues and concerns with potential Project impacts relating to specific locations and access to fishing and marine resource harvesting activities:

- Potential effects to not only current marine use, but future and desired use;
- Tsleil-Waututh Nation's access to the Fraser River, the potential to displace fishing vessels, and protection of Tsleil-Waututh Nation's ability to harvest fish within the Project area; and
- Potential interference with Aboriginal fisheries during decommissioning of the Tunnel, particularly as it relates to timing, and the importance of working

closely with communities to ensure negative effects are avoided.

Disruption to access of fishing areas related to waterway access and increased marine traffic volume during construction could extend 2.5 km downstream and 5 km upstream of the Tunnel and Deas Slough. Although there is potential for construction activities to impact fishing activities in the South Arm of the Fraser River in the case that they overlapped temporally with construction, it is not clear from the information shared during the EA that Tsleil-Waututh Nation currently fishes in the vicinity of the Project area. Additionally, EAO anticipates that any potential disruption to access for Aboriginal groups to fishing areas within the 7.5 km stretch of river described above would be local, short-term and infrequent.

In the event Tsleil-Waututh Nation may fish the South Arm of the Fraser River, and in order to address concerns raised by Aboriginal Groups related to potential disruption of access, EAO has proposed a condition requiring the establishment of a Marine Users Group including Aboriginal Groups, and development of a marine access management plan during construction that would include a description of how any disruption caused by construction of the Project will be avoided or mitigated regarding access for members of Aboriginal Groups to carry out traditional use activities, and actions to inform Aboriginal Groups of anticipated Project schedules for marine-based activities during construction. EAO has also proposed a fisheries access condition during construction that would require the Proponent to ensure access to fisheries is not impeded during DFO Aboriginal or commercial fisheries openings, within 2.5 km downstream and 5 km upstream of the Tunnel. These conditions are anticipated to be effective in preventing potential adverse effects related to access.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations at nearby terrestrial receptors to fishing areas (including Deas Island Regional Park and portions of the Millennium Trail) could potentially affect quality of experience of fishing on the Fraser River. It is not anticipated that visual quality residual effects would extend beyond 1 km from the new bridge, although this effect could be experienced at a greater distance for those fishing on the river. A minor effect on quality of experience related to a potential change in noise during construction and traffic during operation and visual quality in the vicinity of the Fraser River is anticipated, although EAO notes that the landscape is already disturbed due to the existing Highway 99 corridor and infrastructure, and this may not affect Tsleil-Waututh Nation, as EAO previously noted it does not understand Tsleil-Waututh Nation to currently be fishing on the Fraser River.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), 7 (human health, particularly atmospheric noise), and 5.3 (marine use) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to fish, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to fish and fish habitat, marine use, hydrology, land use and visual quality (specifically sensory disturbance, including visual quality and noise), human health (atmospheric noise, and as discussed in section 13.1 of this Report, the Project is expected to result in Negligible impacts to Tsleil-Waututh Nation's asserted Aboriginal rights to fish.

Impacts on Hunting and Trapping

Deer, elk, black bear, seals, and waterfowl have been identified by Tsleil-Waututh Nation as hunted historically and continuously from within their asserted traditional territory.

Tsleil-Waututh Nation identified the following concerns and comments related to potential effects to wildlife and wildlife habitat, including:

- Potential effects to Tsleil-Waututh Nation's asserted right to harvest marine mammals and terrestrial wildlife in the Project area;
- Potential effects to not only current marine use, but future and desired use;
- Potential light and noise effects on wildlife;
- Potential effects of the bridge structure on species such as waterfowl and migratory birds; and
- Protection of large mammals including black-tail deer and clarification of Wildlife Accident Reporting System (WARS) On the Project Area.

Potential adverse effects to wildlife are considered in sections 4.4 (wildlife) and 4.3 (marine mammals) of this Report.

In regards to Tsleil-Waututh Nation's concerns about protection of large mammals, EAO notes that there are not any potential residual effects anticipated to occur from the Project to large mammals. EAO has proposed conditions that require wildlife and wildlife habitat management plans during construction and operations as well as a marine

mammal management plan be developed in consultation with Aboriginal Groups. EAO has also proposed a condition requiring a noise management plan.

Tsleil-Waututh Nation has reported that historically waterfowl were hunted while resident on the South Arm of the Fraser River in July and August, although it is unknown whether Tsleil-Waututh Nation members currently harvest waterfowl in or near the Project area.

EAO understands from the Application that Tsleil-Waututh Nation expressed concern related to the protection of its ability to harvest marine mammals and terrestrial wildlife within the Project area. As noted above, while EAO understands that Tsleil-Waututh Nation traditionally hunted for waterfowl in the South Arm of the Fraser River, EAO does not know whether this was in the vicinity of the Project or whether hunting in this area is currently being undertaken. As such, EAO does not anticipate disruption of access to hunting and trapping areas to occur during construction. EAO anticipates that any potential disruptions to access to hunting and trapping areas would be local, short-term to long-term depending on proximity to the new bridge, and frequent to continuous.

EAO understands that changes in atmospheric noise and visual conditions during construction and operations could affect quality of experience for Tsleil-Waututh Nation's hunting and trapping activities in the case Tsleil-Waututh Nation is currently hunting in the vicinity of the Project, although EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and that it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to hunt and trap, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect wildlife species which EAO understands pertain to Tsleil-Waututh Nation's asserted Aboriginal rights to hunt and trap, as there are not expected to be any residual adverse effects to wildlife species as a result of the Project that are understood by EAO to be hunted or trapped by Aboriginal Groups in the area.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to terrestrial wildlife, marine mammals, land use and

visual quality (specifically sensory disturbance, including visual quality and noise), and human health man health(atmospheric noise), and as discussed in section 13.2 of this Report, the Project is expected to result in Negligible impacts to Tsleil-Waututh Nation's asserted Aboriginal rights to hunt and trap.

Impacts on Plant Gathering

EAO understands that plants harvested by Tsleil-Waututh Nation in the South Arm of the Fraser River include berries, including cranberries.

Tsleil-Waututh Nation identified concerns related to potential effects to vegetation, including:

- Potential effects to Tsleil-Waututh Nation's asserted right to harvest vegetation in the Project area;
- Invasive plant species and proposed plans to manage presence during construction; and
- Inclusion of culturally significant plants in planting plans and opportunity for Tsleil-Waututh Nation in the identification of plants, and planting work.

Potential adverse effects to vegetation are considered in section 4.5 of this Report, as well as section 13 of Part C of this Report, which discusses potential impacts of the Project on Aboriginal Interests.

EAO is of the view that the Project does not have the potential to affect vegetation species which EAO understands pertain to Tsleil-Waututh Nation's asserted Aboriginal rights to gather.

EAO has also proposed a condition requiring the development of a vegetation management plan during construction, which Aboriginal Groups would be consulted on. The Proponent would also be required to undertake site habitat assessment surveys prior to commencing vegetation clearing, for red- and blue-listed plants and ecological communities. EAO has also proposed the Proponent be required to control invasive species during site preparation in advance of construction, construction and operations. The proposed construction environmental management plan condition would require the means by which invasive plant management, revegetation, and erosion and sediment control (among others) to be addressed, in consultation with Aboriginal Groups. EAO has also included a proposed condition, agricultural use, which would require the Proponent to provide a description of the means by which topsoil salvage and

reclamation would be implemented, which Aboriginal groups would be consulted on. Upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails will be reconnected, and shoreline areas restored after construction.

The Project is anticipated to have negligible effects to vegetation, both in regards to at-risk plant species and at-risk plant ecosystems, largely due to the nature of the Project, located in a highly disturbed area and in an existing transportation corridor.

On southern Lulu Island, near Number 5 Road (which runs parallel to the Highway 99 corridor one block to the west), Tsleil-Waututh Nation has stated that it harvested berries, and specifically cranberries, while resident on the Fraser River. Current gathering activities by Tsleil-Waututh members in or near the Project have not been provided by Tsleil-Waututh Nation during this EA.

While Tsleil-Waututh Nation communicated to the Proponent their concerns that potential Project impacts could adversely affect their ability to harvest within the Project area, no information was provided that indicates Tsleil-Waututh Nation traditionally gathered plants from within the Project area. Furthermore, there is not anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO has proposed a condition requiring a traffic and access management plan to be developed to avoid or mitigate disruption of access to harvest medicinal and food source plants.

EAO also considered sections 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]) and 7 (human health, particularly atmospheric noise) of this Report in its consideration of potential social, cultural, spiritual and experiential effects on the right to gather.

As EAO is not aware of any areas currently utilized by Tsleil-Waututh Nation for gathering in the vicinity of the Project aside from the cranberry gathering area mentioned above which EAO understands does not overlap with the Project footprint, EAO does not anticipate a temporal overlap to occur. Furthermore, there would not be anticipated to be much overlap between gathering areas and lands required for physical works, which are mostly within the existing Highway corridor and currently inaccessible. EAO understands that upland areas occupied by Tunnel components during Tunnel removal would be revegetated, affected trails would be reconnected, and shoreline areas restored after construction. EAO also considered that traditional gathering areas around No. 5 Road in Richmond for Tsleil-Waututh Nation are understood to be approximately 150 m outside both the LAA and RAA for vegetation.

It is understood that residual quality effects from atmospheric noise and visual qualities are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to vegetation, land use and visual quality (specifically sensory disturbance, including visual quality and noise), and human health (atmospheric noise), and as discussed in section 13.3 of this Report, the Project is expected to result in Negligible impacts to Tsleil-Waututh Nation's asserted Aboriginal rights to gather.

Impacts on Other Traditional and Cultural Interests

Tsleil-Waututh Nation has reported that all areas used for traditional purposes, such as fishing, hunting, and gathering are regarded as sacred. Tsleil-Waututh Nation have also explained that waterways within their asserted territory were the principal means of accessing places such as *ƛ'əqtinəs* (on the north shore of the Fraser River opposite Deas Island); *kwy-yowka* (on the south shore of Lulu Island), and *ʔəléqsən* (on the northern end of Westham Island) within the seasonal round of land and resource use.

Tsleil-Waututh Nation reported two historic canoe routes connecting Roberts Bank to Boundary Bay, Canoe Passage, the South Arm of the Fraser River and Sturgeon Bank, and two fishing villages, one opposite Deas Island in the Fraser River (associated with *ƛ'əqtinəs*) and the other at Cannery Point, on the southeastern corner of Point Roberts peninsula.

Tsleil-Waututh Nation identified concerns and comments regarding archaeological and cultural heritage interests including:

- Interest in opportunities for cultural recognition and naming;
- Concern about social effects of the Project on Tsleil-Waututh Nation's ability to transfer knowledge, language and participate in socio-cultural practices;
- Protection of archaeological and heritage resources, including intangible heritage sites;
- Participation in archaeological fieldwork and review of archaeological draft reports; and

- Request that First Nations permits be obtained before the commencement of archaeological work.

Potential adverse effects related to other Aboriginal and cultural interests are considered in sections 6 (heritage) of this Report. EAO also considered sections 5.3 (marine use), 5.2 (land use and visual quality, specifically sensory disturbance [visual quality and noise]), and 7 (human health, including both atmospheric noise and air quality) of this Report in its consideration of potential social, cultural, spiritual and experiential effects, as well as section 13 of Part C, which discusses potential impacts of the Project on Aboriginal Interests.

There is not anticipated to be an overlap between Tsleil-Waututh Nation's archaeological and cultural heritage interests with the Project footprint during operation, as the Project corridor does not overlap with known archaeological and cultural heritage interests. Culturally significant traditional activities, including the use of waterways to travel throughout their territory, are discussed in other sections of this report, including heritage and marine use chapters.

There is potential for changes to quality of experience at important locations for Tsleil-Waututh Nation to occur, in particular in relation to changes in atmospheric noise during construction and operations, and visual conditions during operation. These include to waterways of historic and cultural importance to Tsleil-Waututh Nation, as discussed previously. These effects related to atmospheric noise and visual conditions are not fully mitigable or reversible.

It is understood that residual visual quality effects are anticipated within 1 km of the bridge, however EAO notes that the landscape along and adjacent to the Highway 99 corridor is already disturbed and it is not anticipated that adverse effects to visual quality would extend beyond 1 km of the bridge. Changes to marine use during construction, including increased vessel traffic and related noise, could be experienced at sites of importance to Tsleil-Waututh Nation.

The Proponent also noted that while it had not identified archaeological or historical sites within the Project area during fieldwork, there may be other locations with intangible cultural value or meaning to Tsleil-Waututh Nation, such as spiritual or storied sites, or named places, potentially affected by the Project. Physical alterations to the landscape could also affect archaeological or historical sites and how landscape is experienced culturally. EAO has proposed a condition requiring an archaeological - heritage resources plan, which would be developed in consultation with Aboriginal Groups and which would include requirements to engage with Aboriginal Groups on an

ongoing basis, as well as proposed a condition requiring an Aboriginal cultural awareness and recognition plan that would be developed in consultation with Aboriginal Groups. Another proposed condition would require opportunities to be provided for members of Aboriginal Groups to participate in monitoring activities during construction, including construction activities that may affect traditional use and related environmental values.

In consideration of the available information, the Proponent's proposed mitigation measures, EAO's proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects to heritage, marine use, land use and visual quality (specifically, sensory disturbance including visual quality and noise), human health (atmospheric noise and air quality), and land use, and as discussed in section 13.4 of this Report, the Project is expected to result in Negligible impacts to Tsleil-Waututh Nation's other traditional and cultural interests.

# 15 Weighing Impacts on Aboriginal Interests with Other Interests

The Crown has a responsibility to weigh the potential impacts and accommodations on Aboriginal Interests with other societal interests, including the social, environmental and economic benefits of the Project. This evaluation is an important component informing the Ministers' decision regarding the decision on whether to approve the Project. In weighing the Project benefits with the impacts on Aboriginal Interests, EAO holds the view that the following factors regarding the Project are relevant to consider:

- Importance of the Project to the local, regional, and provincial economy;
- Nature of the Project;
- Resources or values that may no longer be available for future generations; and
- Benefits of the Project to affected Aboriginal communities.

EAO has summarized the estimated Project benefits during construction and operations in section 2.5.2 of this Report. The nature of the Project including the Project components and activities are described in section 2.2 of this Report.

## 15.1 Project Importance to the Regional and Provincial Economy

The Project is expected to address substantial traffic and safety challenges along the Highway 99 corridor that affect the efficient movement of people and goods within the region. It also offers an opportunity for regional and provincial economic growth and job creation.

According to the Proponent, the Project's capital construction cost is expected to be approximately $ 3.5 billion. The Project would generate economic impacts through direct expenditures on goods and services, creation of employment opportunities and generation of tax revenues for local, provincial and federal governments. Project construction is expected to provide $ 518 million in tax revenue, of which $135 million would be provincial tax revenue.

The Proponent estimates that over the Project's life span, direct Project expenditures in BC (excluding labour costs) would be $15 million to $25 million. Operating expenditures would generate up to $1.6 million per year in provincial tax revenue to BC and $2.2 million in federal tax revenue. Annual municipal tax revenue in BC is estimated to be $0.3 million during operations. The Project is also expected to create procurement opportunities for businesses.

The Proponent estimates that construction would create approximately 9,000 direct construction jobs, or 11,000 direct FTEs and 8,500 indirect FTEs. During operations, the Project would create 60 - 90 new direct jobs, the majority of which are expected to be filled locally or from within BC.

## 15.2 Resources or Values That May No Longer Be Available for Future Generations

Traditional subsistence activities such as hunting, fishing, gathering and trapping may be altered as a result of the Project, which could manifest itself through changes to local harvesting locations and access, and behavioural alteration or sensory disturbance of environmental resources.

Although EAO believes there could be potential impacts to resources or values of importance to Aboriginal Groups, the majority of this disturbance and impact would be expected to be low in magnitude as assessed in Part B of this Report. EAO is of the view that the Proponent has made efforts to demonstrably avoid areas of high value for Aboriginal Groups by building on existing disturbed lands wherever possible, minimizing clearing wherever possible, by designing the bridge to be a clear span across the Fraser River, and committing to not impede Aboriginal fisheries activities including through a proposed condition, and providing appropriate mitigation measures to reduce the potential effects of the Project.

Further consultation and analysis to support the development of management and monitoring plans prior to construction will require that any additional key mitigation

measures are implemented to ensure potential impacts are minimized, as required by EAO's proposed EAC conditions.

## 15.3 Benefits of the Project to Affected Aboriginal Communities

For Aboriginal Groups, the Project would have the potential to provide important economic opportunities, including capacity-building initiatives to support employment, contracting and business development through identifying economic opportunities tailored and specific to each Aboriginal Group under agreements with the Proponent that would remain confidential.

The Proponent has provided and would continue to provide economic benefits to support capacity-building opportunities specific to Aboriginal Groups prior to and during the construction phase of the Project. These opportunities include:

- Providing capacity funding to support meaningful participation in consultation activities with the Proponent and in the regulatory process;
- Identifying training and capacity building partnerships or other arrangements for potentially affected Schedule B Aboriginal Groups and local communities that will increase opportunities for participation;
- Encouraging and supporting the use of Aboriginal and local businesses by encouraging suppliers and subcontractors to adopt local procurement; and
- The Proponent would continue to communicate its employment and subcontracting opportunities that are available.

## PART D – CONCLUSIONS

Based on:

- Information contained in the Proponent's Application and the supplemental information provided during Application Review;
- The Proponent's and EAO's efforts at consultation with Aboriginal Groups, government agencies, including local governments, and the public, and the Proponent's commitment to ongoing consultation;
- Comments on the Project made by Aboriginal Groups and government agencies, including local governments, as members of EAO's Working Group, and the Proponent's responses to these comments;
- Comments on the Project received during the public comment period, and the Proponent's responses to these comments;
- Issues raised by Aboriginal Groups regarding potential impacts of the Project and the Proponent's responses and best efforts to address these issues;
- The design of the Project as specified in the proposed Schedule A (CPD) of the EAC to be implemented by the Proponent during all phases of the Project; and
- Mitigation measures identified as proposed conditions in Schedule B (TOC) of the EAC to be undertaken by the Proponent during all phases of the Project.

EAO is satisfied that:

- The EA process has adequately identified and assessed the potential adverse environmental, economic, social, heritage and health effects of the Project, having regard to the proposed conditions set out in Schedule B (TOC) to the EAC;
- Consultation with Aboriginal Groups, government agencies, and the public have been adequately carried out and that efforts to consult with Aboriginal Groups will continue on an ongoing basis;
- Issues identified by Aboriginal Groups, government agencies, including local governments, and the public, which were within the scope of the EA, were adequately and reasonably addressed during the review of the Application;
- Practical means have been identified to prevent or reduce any potential adverse environmental, social, economic, heritage or health effects of the Project such that no direct or indirect significant adverse effect is predicted or expected;

- The potential for adverse effects on the Aboriginal rights and title of Aboriginal Groups has been avoided, minimized or otherwise accommodated to an acceptable level; and
- The provincial Crown has fulfilled its obligations for consultation and accommodation to Aboriginal Groups relating to the issuance of an EAC for the Project.

The provincial Minister of Environment and the Minister of Community Sport and Cultural Development will consider this assessment report and other accompanying materials in making their decision on the issuance of an EAC to the Proponent under the Act.

# APPENDIX 1: Assessment Methodology

## Environmental Assessment Methods

In this Report, EAO assesses whether the Project is likely to have significant adverse environmental, economic, social, heritage and health effects, including cumulative effects, having regard for the mitigation measures proposed in the Application or otherwise developed through the provincial process, in addition to conditions proposed by EAO.

To conduct this assessment, EAO followed the methods outlined in its *Guideline for the Assessment of Valued Components and Assessment of Potential Effects* (2013). This section provides a brief summary of the methodology followed.[73] The general steps in EAO's EA process are shown in Figure 5.

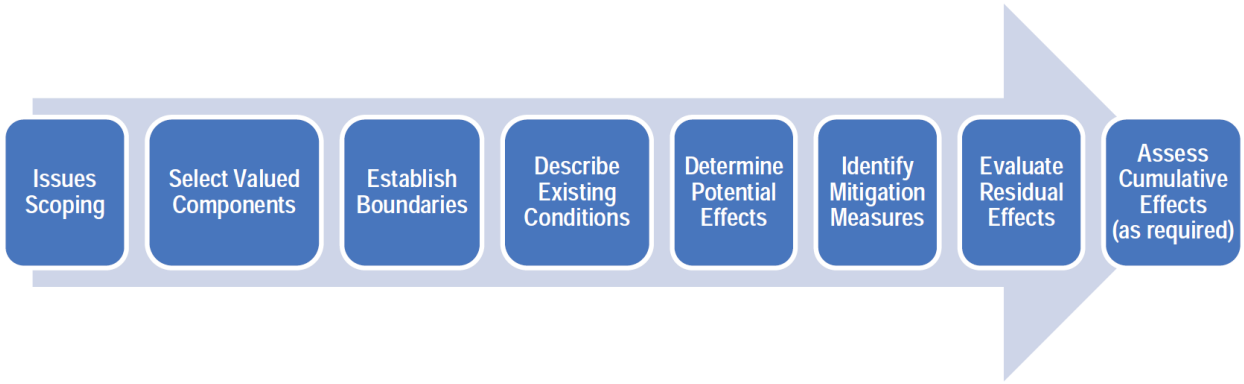


**Figure 5: EAO's Environmental Assessment Methods**

EAs in BC use a values-based framework to promote a comprehensive, yet focused, understandable, and accessible assessment of the potential effects of proposed projects. This framework relies on the use of VCs as a foundation for the assessment. VCs are components of the natural and human environment that are considered by the Proponent, public, Aboriginal Groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance.

Appropriate VCs are identified and selected during the pre-Application phase of the EA. Ultimately, the VCs required to be in the Application are established by EAO upon

[73] The *Guideline for the Assessment of Valued Components and Assessment of Potential Effects* is available at http://www.eao.gov.bc.ca/pdf/EAO_Valued_Components_Guideline_2013_09_09.pdf.

issuance of the AIR. Much of the early part of the Pre-Application phase is focused on consultation on the VCs, key indicators, study area boundaries and technical requirements with Working Group members, including Aboriginal Groups and the public.

*Study Boundaries*

Assessment boundaries serve to define the scope or limits of the assessment. They encompass the areas within and times during which the Project is expected to interact with the VCs (spatial and temporal boundaries). These boundaries are discussed in the Application for each VC.

Spatial boundaries encompass the areas within which the Project is expected to have potential effects on the selected VCs. The study areas generally include the:

- Project footprint – the area directly disturbed by the Project's physical works and activities;
- Local Assessment Area – varies by VC, and is based on the zone of influence within which the VC is most likely to be affected by the Project construction and operations; and
- Regional Assessment Area – provides context for the assessment of potential project effects, and is typically based on a natural transition (e.g., watershed boundary, ecological zone) or on an artificial delineation (e.g., political or economic district or zone) that is relevant to the VC. The RAA is often, but not always, used as the spatial boundary for the assessment of potential cumulative effects.

Temporal boundaries encompass the periods during which the Project is expected to have potential effects on the selected VCs. The temporal phases discussed under each VC are construction and operation, and the duration of effect is assessed as the length of time it would persist.

*Assessment of Valued Components*

For each selected VC, the Application describes the existing conditions within the study area in sufficient detail to enable potential Project-VC interactions to be identified, understood and assessed. The description of existing conditions includes, as relevant, natural and/or human-caused trends that may alter the environmental or socio-economic setting irrespective of the changes that may be caused by the Project or other projects and activities in the local area.

The assessment then considers the potential interactions of the Project with the VC, and the potential effects that could arise. These potential effects are identified and described, and an analysis is presented of the potential adverse effects resulting from the Project.

The assessment then describes the mitigation measures that would be incorporated into the project, including site and route selection, project scheduling, project design, and construction and operation procedures and practices. Consistent with the Ministry of Environment's Environmental Mitigation Policy and Procedures, EAO considers mitigation to be any practical means or measures taken to avoid, minimize, restore on-site, compensate or offset potential adverse effects. Also described are standard mitigation, BMPs, EMPs, contingency plans, Emergency Response Plans (ERPs), and other practices proposed to be implemented.

The residual effects on each VC are then identified. Residual effects are those effects remaining after the implementation of all mitigation measures, and are, therefore, the expected consequences of the project for the selected VCs. To inform the determination of the significance of a residual (adverse) effect, it is necessary to characterize the residual effect.

Residual effects are usually described using standard criteria: context, magnitude, extent, duration, reversibility and frequency. These criteria, as well as likelihood, are summarized in the following box.

***Summary of Criteria for Characterizing Residual Effects***

**Context** refers primarily to the current and future sensitivity and resilience of the VCs to change caused by the Project. Consideration of context draws heavily on the description of existing conditions of the VC, which reflect cumulative effects of other projects, and activities that have been carried out, and especially information about the impact of natural and human-caused trends in the condition of the VC.

**Magnitude** refers to the expected size or severity of the residual effect. When evaluating magnitude of residual effects, consider the proportion of the VC affected within the spatial boundaries and the relative effect (e.g., relative to natural annual variation in the magnitude of the VC or other relevant characteristic).

**Extent** refers to the spatial scale over which the residual effect is expected to occur.

**Duration** refers to the length of time the residual effect persists (which may be longer than the duration of the physical work or activity that gave rise to the residual effect).

**Reversibility** pertains to whether or not the residual effect on the VC can be reversed once the physical work or activity causing the disturbance ceases.

**Frequency** refers to how often the residual effect occurs and is usually closely related to the frequency of the physical work or activity causing the residual effect.

**Likelihood** refers to whether or not a residual effect is likely to occur. It may be influenced by a variety of factors, such as the likelihood of a causal disturbance, occurring or the likelihood of mitigation being successful. Generally speaking, the residual effects described in the assessment comprise the best prediction of what is likely to occur as a result of a proposed Project, assuming a suite of proposed mitigation is implemented.

The identification of significant adverse residual effects is a requirement of the Act. When determining significance for each VC, consideration should be given to how each of the criteria for characterizing residual effects informs the determination of significance. Significance may be determined based on a quantitative or qualitative threshold that describes the point beyond which a residual effect would be considered significant. In some instances, thresholds established for some VCs by legislation, regulation, or regulatory standard are used.

Once the residual effect prediction has been described in terms of significance and likelihood, it is important to explain the level of confidence in each prediction. The level of confidence, typically based on expert judgement, characterizes the level of uncertainty associated with both the significance and likelihood determinations. Specifying the level of confidence associated with these determinations allows the decision-maker to better evaluate the risk associated with the Project. The assessment of confidence also informs the need for and scope of monitoring or other follow-up programs, including adaptive management.

Significance is usually determined for both the residual effects of the Project and the cumulative effects. This is critical for making an informed decision about the Project. It is important to understand the characteristics and significance of the potential project-specific residual effects in order to also understand the relative contribution of the Project to cumulative effects. The cumulative effects assessment is discussed further below.

*Cumulative Effects Assessment*

If the Project is expected to result in any residual adverse effects on the selected VC, the need for a cumulative effects assessment must be considered. It is important to note that this consideration must be made for all residual adverse effects, not only for those predicted to be significant.
Where there is a residual adverse effect, the assessment of cumulative effects for reviewable projects should consider other past, present and reasonably foreseeable

projects and activities, which were identified in the AIR. The general steps for a cumulative effects assessment are shown in **Figure 6**. The likelihood of a cumulative interaction with other projects and activities, and the Project's contribution to the overall cumulative effect, should together inform the cumulative effects assessment undertaken.

EAO evaluates cumulative effects by considering how the Project's residual effects interact with the residual effects of other past, present and reasonably foreseeable projects and/or activities included in the Proponent's cumulative effects assessment, as described in Application Section 3.10.1. These projects and activities are discussed, where relevant, under the cumulative effects section for each VC in this Report.

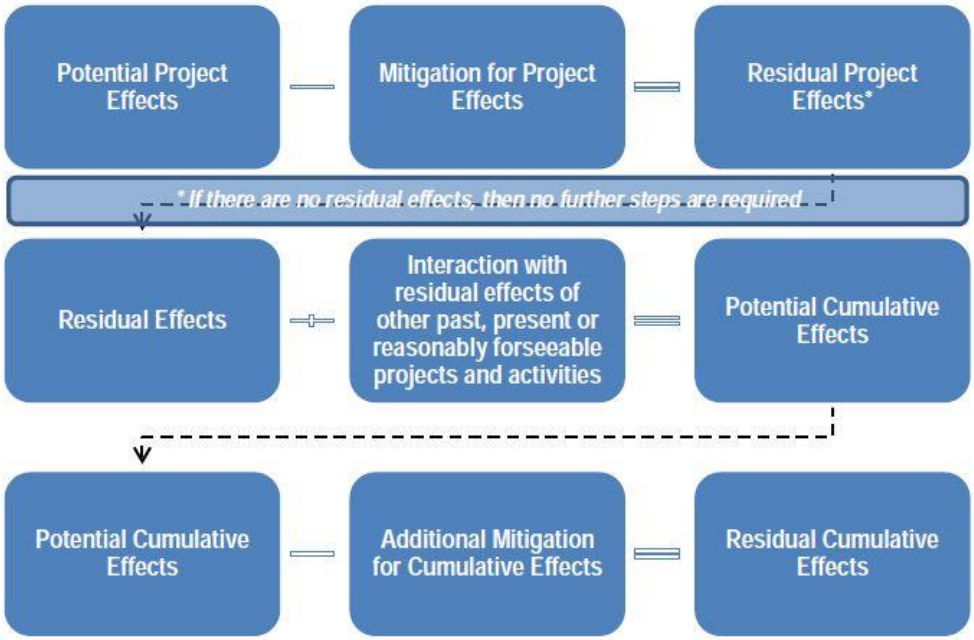


**Figure 6: Steps to Determine Residual Effects and Cumulative Effects**

*Environmental Assessment Certificate Documentation*

If an EAC is issued, it would include a CPD and TOC. The CPD describes what is certified by an EAC. It consists primarily of a description of the infrastructure of the Project, and describes all essential elements of the Project proposed by the Proponent, taking into account any changes to the Project that occurred during the EA. If an EAC is issued for the Project and the Proponent subsequently proposes to vary from the CPD, an amendment to the EAC would be required.

If the Ministers decide to issue an EAC, they may attach legally binding conditions to it under section 17(3)(c)(i) of the Act. A condition is a legally binding requirement set by Ministers to which a holder of an EAC must adhere. A set of proposed conditions is provided to Ministers as part of the referral package. As part of their decision regarding whether or not to grant an EAC, Ministers determine which conditions would be attached to the EAC.

*Compliance and Enforcement*

EAO has a Compliance and Enforcement Program (C&E Program), the primary responsibility of which is compliance oversight and enforcement of EAC conditions on all projects subject to the Act in BC.

The C&E Program builds on the expertise and resources of other agencies, including the Compliance and Enforcement Branch of FLNRO, Ministry of Energy and Mines (MEM), Oil and Gas Commission (OGC), Conservation Officer Service, and the Environmental Protection Division of the Ministry of Environment.

EAO conducts extensive planning to ensure effective, risk-based compliance oversight. The two key plans prepared by EAO compliance staff are:

- Compliance Management Plans (CMPs) – After a project has been certified, EAO compliance staff prepare a CMP in collaboration with partner agencies. The CMP outlines the general approach to compliance oversight for the Project and clarifies inter-agency responsibilities for inspecting and enforcing the EAC conditions. This plan is updated as the Project progresses.
- Annual Inspection Plans – Each fiscal year, EAO plans its administrative (e.g., desk-based) and field-based inspections for the year in keeping with risk-based criteria developed by EAO and the targets specified in MOE's Service Plan. Unplanned inspections are also conducted in response to new information received by EAO, public and Aboriginal Group complaints or in follow-up to previous inspections.

When information from an inspection, EAC holder self-report, public or Aboriginal Group complaint or partner agency indicates that a certificate requirement may have been breached, EAO compliance staff conduct an investigation to collect the evidence necessary to determine if enforcement action is warranted. Investigations vary in effort and length of time depending on the nature and complexity of the non-compliance. Often, partner agencies are involved in the investigations.

Throughout the life of a project, EAO and compliance partners collaborate to ensure the project is constructed and operated according to the EAC.

## APPENDIX 2: LIST OF WORKING GROUP MEMBERS

**Provincial Government**
Agricultural Land Commission
Fraser Health
Ministry of Community, Sport and Cultural Development
Ministry of Forests, Lands and Natural Resource Operations
Ministry of Transportation and Infrastructure
TransLink
Vancouver Coastal Health

**Federal Government**
Environment and Climate Change Canada
Transport Canada
Vancouver Fraser Port Authority

**Local Government**
City of Richmond
Corporation of Delta
Metro Vancouver

**Aboriginal Groups**
Cowichan Tribes
Halalt First Nation
Katzie First Nation
Kwantlen First Nation
Lake Cowichan First Nation
Lyackson First Nation
Musqueam Indian Band
Penelakut Tribe
- Hwlitsum[74]

Semiahmoo First Nation
Squamish Nation
Stz'uminus First Nation
Tsawwassen First Nation
Tsleil-Waututh Nation

[74] This reference to the Hwlitsum is not intended to signify any change in the position that the Province may have taken in other contexts in relation to the duty to consult with this group.

## APPENDIX 3: WORKING GROUP COMMENT TRACKING TABLES

The following are links to the Working Group tracking tables developed during pre-Application and Application Review.

Working Group comment tracking table on the draft Application Information Requirements:
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=23

Working Group comment tracking table on the Application – posted January 2017:
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=68

## APPENDIX 4: PUBLIC COMMENT TRACKING TABLES

The following are links to the public comment tracking tables developed during the pre-Application public comment period and the Application Review public comment period.

Public comment tracking table on the Project Description and Key Areas of Study document during pre-Application phase (January 15 to February 15, 2016):
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=14

Public comment tracking table on the Application (August 3 to October 3, 2016):
https://projects.eao.gov.bc.ca/p/george-massey-tunnel-replacement/docs?folder=59