



Environmental  
Assessment Office

# Application Information Requirements

## *Pattullo Bridge Replacement Project*

**Proposed by:**

**Ministry of Transportation and Infrastructure**

**March 23 2018**

*Pursuant to the Environmental Assessment Act, S.B.C. 2002, c.43*



## PREFACE TO THE AIR

The Application Information Requirements (AIR) specifies the information that BC Ministry of Transportation and Infrastructure (“the Proponent”) is required to provide in their Application for an Environmental Assessment Certificate (EAC Application or Application) under section 16(2) of the BC *Environmental Assessment Act* (Act).

The Proponent is proposing to develop the Pattullo Bridge Replacement Project (the proposed Project), as described in the Project Description posted on the EAO website <https://projects.eao.gov.bc.ca/p/pattullo-bridge-replacement/docs?folder=5> and as shown in Figures 18.1 and 18.2 of Section 18.0 (Appendices) of this document. The proposed Project will replace the existing Pattullo Bridge with a new four-lane bridge spanning the Fraser River just north and upstream of the existing bridge and, similar to the existing bridge, its approaches will connect to McBride Boulevard in the City of New Westminster and King George Boulevard in the City of Surrey, British Columbia. The proposed Project will also involve the removal of the existing bridge. Since the proposed Project is expected to cause direct physical disturbance of greater than or equal to 2 hectares of foreshore or submerged land, or a combination of foreshore and submerged land, below the natural boundary of the Fraser River, it is subject to a provincial environmental assessment (EA) review under Part 5 of the Reviewable Projects Regulation (B.C. Reg. 370/02) of the Act.

The BC Environmental Assessment Office (EAO) issued a Section 10 Order on November 9, 2016 confirming that the proposed Project requires an Environmental Assessment Certificate (EAC), pursuant to Section 10(1)(c) of the Act, before it may receive provincial permits to construct and operate the proposed Project.

### *Canadian Environmental Assessment Act 2012 (CEAA 2012) Applicability*

An environmental assessment as described in the Canadian *Environmental Assessment Act*, 2012 (CEAA 2012) is not required for the proposed Project as the proposed works are not included in the list of physical activities that constitute “designated projects”, as specified in the Regulations Designating Physical Activities.

While the proposed Project is not a “designated project”, the proposed works are located, in part, on land and water within Vancouver Fraser Port Authority’s (VFPA’s) jurisdiction, and are subject to a CEAA 2012 Section 67 determination by VFPA, as well as other federal authorities that issue approvals or authorizations, as applicable. VFPA is responsible for the administration, management and control of land and water within its jurisdiction. Proposed works and activities within or partially within the VFPA’s jurisdiction are required to obtain a Project and Environmental Review (PER) project permit to proceed.

Vancouver Fraser Port Authority and EAO have agreed to a harmonized approach to the environment assessment review process for the proposed Project, whereby the provincial EA process, incorporating VFPA’s federal requirements, will meet the respective assessment requirements of both the Province and VFPA’s PER process. In this harmonized approach to the EA, EAO will act as the lead agency and VFPA and other relevant federal departments will be represented on the Advisory Working Group established for the

EA. The harmonized approach established key process requirements for the EA, including the following:

- **Aboriginal Consultation:** EAO and VFPA will align consultation requirements and jointly identify the Aboriginal Groups whose asserted and established interests, including treaty rights and lands which may be impacted by the proposed Project.
- **Scope and Procedures:** EAO will develop the scope of the EA review in a manner which ensures that VFPA's requirements are incorporated. EAO will provide VFPA a draft of the section 11 Order so that VFPA may ensure their requirements are met by the scope, methods and procedures set out in the order.
- **Advisory Working Groups:** Experts from VFPA and experts from relevant federal agencies will be invited to participate in the appropriate Advisory Working Groups. The advisory working groups review and comment on project material (Valued Components Selection, Application Information Requirements, the Application, draft Assessment Report and decision referral materials) and comment on sufficiency of the EA and on the conclusions of the EA.
- **Valued Components and the Application Information Requirements:** VFPA will have input into the selection of Valued Components and other required information (as prescribed in CEAA 2012 and clarified by VFPA) to ensure that VFPA's requirements are incorporated.
- **Public Consultation:** Both the EAO and VFPA public consultation requirements will be incorporated into the EA process. The EA process and the Proponent's public consultation plan will meet BC EAO and VFPA requirements.
- **Separate Decisions:** The EA conclusions will, subject to any additional information which VFPA may require, inform VFPA's review of the Project to allow it to make its Section 67 determination on whether carrying out of the Project is likely to cause significant adverse environmental effects, pursuant to CEAA 2012.
- **Information Sharing:** EAO and VFPA will establish protocols for exchanging information, including draft materials, and for resolving issues.
- **Timelines:** EAO and VFPA will establish a work plan for the EA review process which incorporates EAO's prescribed timelines and VFPA's PER timelines to ensure that decision support materials are available within respective prescribed time limits.
- **Post Environmental Assessment:** Should the Project be certified, EAO will coordinate inspections with VFPA regarding conditions attached to the EA Certificate and VFPA will review and enforce any applicable conditions on VFPA lands and those related to its project permit.

### *List of Reviewing Agencies*

The following government agencies, municipal and regional agencies, and Aboriginal Groups<sup>1</sup>, invited by EAO to become Advisory Working Group members for the proposed Project, have had the opportunity to review and comment on the draft versions of the VC Selection and Rationale document. The first version that went out to public comment can be found here: <https://projects.eao.gov.bc.ca/p/pattullo-bridge-replacement/docs?folder=9>.

#### Provincial Agencies:

- Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD)
- Ministry of Environment and Climate Change Strategy (ENV)
- Ministry of Transportation and Infrastructure (MoTI)

#### Federal Agencies:

- Vancouver Fraser Port Authority (VFPA)
- Transport Canada
- Fisheries and Oceans Canada (DFO)
- Health Canada
- Public Works Canada

Public Services and Procurement Canada, although not part of the Working Group, will be available to provide advice on the Canadian National railway line as needed.

#### Municipal and Regional Agencies:

- City of New Westminster
- City of Surrey
- Metro Vancouver
- Fraser Health Authority

Aboriginal Groups identified in Schedule B of the Section 11 Order<sup>2</sup> issued on August 8<sup>th</sup>, 2017:

- Cowichan Tribes
- Halalt First Nation
- Katzie First Nation
- Kwantlen First Nation
- Kwikwetlem First Nation

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<sup>1</sup> "Aboriginal Groups" means those Aboriginal entities identified in Schedule B of the Order issued on August 08, 2016 under Section 11 of the Act.

<sup>2</sup> Aboriginal Groups are listed in alphabetical order.



- Lake Cowichan First Nation
- Lyackson First Nation
- Musqueam Indian Band
- Penelakut Tribe
- Semiahmoo First Nation
- Squamish Nation
- Stz'uminus First Nation
- Tsawwassen First Nation
- Tseil-Waututh First Nation

The environmental, social, economic, heritage, and health components to be assessed as part of the EAC Application (i.e. valued components or VCs), and the process followed in selecting and appropriately defining them, is described in detail in the Valued Component Selection and Rationale Document (Appendix 18.4 of the this document). A draft of this document was submitted to the EAO on June 21, 2017 and made available to the Advisory Working Group members and the public for review and comment. Comments received from EAO, Advisory Working Group members and the public were considered by the Proponent when revising the Valued Component Selection and Rationale Document and in preparing this AIR.

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## TABLE OF CONCORDANCE

A Table of Concordance will be included in the Application. The Table of Concordance will demonstrate where the requirements in the Application Information Requirements (AIR) are found in the Application, with volume, section, and page references and following the format of Table 1. A well-constructed Table of Concordance will assist in a timely Application evaluation to determine whether the Application contains the required information.

**Table 1: Example Table of Concordance between AIR and Application**

| AIR Section & Page No. | AIR Title | AIR Section Language | Application Section Title | Application Volume Section, Sub-Section, Page Number | Relevant Appendix |
|------------------------|-----------|----------------------|---------------------------|------------------------------------------------------|-------------------|
|                        |           |                      |                           |                                                      |                   |

## ABBREVIATIONS AND ACRONYMS

|                                            |                                                                                                                                                                                                               |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Aboriginal Groups/Indigenous Groups</b> | All Aboriginal Groups or aboriginal entities as defined in Section 35(2) of the <i>Constitution Act, 1982</i> of Canada as set out in Schedules B and C of the Section 11 Order issued by EAO for the Project |
| <b>ATK</b>                                 | Aboriginal Traditional Knowledge                                                                                                                                                                              |
| <b>AIA</b>                                 | Archaeological Impact Assessment                                                                                                                                                                              |
| <b>AIR</b>                                 | Application Information Requirements                                                                                                                                                                          |
| <b>AOA</b>                                 | Archaeological Overview Assessment                                                                                                                                                                            |
| <b>Application</b>                         | Application for an Environmental Assessment Certificate                                                                                                                                                       |
| <b>BATNEC</b>                              | Best Availability Technology Not Entailing Excessive Cost                                                                                                                                                     |
| <b>BCAA</b>                                | British Columbia Automobile Association                                                                                                                                                                       |
| <b>BCBC</b>                                | Business Council of British Columbia                                                                                                                                                                          |
| <b>BCEAA</b>                               | British Columbia's <i>Environmental Assessment Act</i>                                                                                                                                                        |
| <b>BIA</b>                                 | Business Improvement Association                                                                                                                                                                              |
| <b>CACs</b>                                | Criteria Air Contaminants                                                                                                                                                                                     |
| <b>CAD</b>                                 | Consultative Areas Database                                                                                                                                                                                   |
| <b>CCTV</b>                                | Closed Circuit Television                                                                                                                                                                                     |
| <b>CEAA 2012</b>                           | <i>Canadian Environmental Assessment Act 2012</i>                                                                                                                                                             |
| <b>CL</b>                                  | Canada Line                                                                                                                                                                                                   |
| <b>CMS</b>                                 | Changeable Message Sign                                                                                                                                                                                       |
| <b>CO</b>                                  | Carbon Monoxide                                                                                                                                                                                               |
| <b>dAIR</b>                                | Draft Application Information Requirements                                                                                                                                                                    |
| <b>DFO</b>                                 | Fisheries and Oceans Canada                                                                                                                                                                                   |
| <b>EA</b>                                  | Environmental Assessment                                                                                                                                                                                      |
| <b>EAC</b>                                 | Environmental Assessment Certificate                                                                                                                                                                          |
| <b>EAO</b>                                 | British Columbia Environmental Assessment Office                                                                                                                                                              |
| <b>EPA</b>                                 | United States of America Environmental Protection Agency                                                                                                                                                      |
| <b>FLNRORD</b>                             | Ministry of Forests, Lands, Natural Resource Operations and Rural Development                                                                                                                                 |
| <b>GDP</b>                                 | Gross Domestic Product                                                                                                                                                                                        |
| <b>GEB</b>                                 | Golden Ears Bridge                                                                                                                                                                                            |
| <b>GHGs</b>                                | Greenhouse Gases                                                                                                                                                                                              |
| <b>GMTR</b>                                | George Massey Tunnel Replacement Project                                                                                                                                                                      |
| <b>Hr</b>                                  | Hour                                                                                                                                                                                                          |
| <b>HHWL</b>                                | Higher High Water Level                                                                                                                                                                                       |
| <b>ICBC</b>                                | Insurance Corporation of British Columbia                                                                                                                                                                     |
| <b>IC</b>                                  | Intermediate Component                                                                                                                                                                                        |
| <b>ITS</b>                                 | Intelligent Transportation System                                                                                                                                                                             |
| <b>Km</b>                                  | Kilometre                                                                                                                                                                                                     |
| <b>LOA</b>                                 | Length Overall                                                                                                                                                                                                |
| <b>LSA</b>                                 | Local Study Area                                                                                                                                                                                              |

|                               |                                                                                                                                                                                                                                |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>m</b>                      | Metre                                                                                                                                                                                                                          |
| <b>Mayors' Council</b>        | Mayors' Council on Regional Transportation                                                                                                                                                                                     |
| <b>MoTI</b>                   | Ministry of Transportation and Infrastructure                                                                                                                                                                                  |
| <b>MRN</b>                    | Major Road Network                                                                                                                                                                                                             |
| <b>New replacement bridge</b> | Proposed new 4-lane adaptable bridge per the Pattullo Bridge Replacement Project                                                                                                                                               |
| <b>New Westminster</b>        | City of New Westminster                                                                                                                                                                                                        |
| <b>NH<sub>3</sub></b>         | Ammonia                                                                                                                                                                                                                        |
| <b>NO<sub>x</sub></b>         | Nitrogen oxides                                                                                                                                                                                                                |
| <b>NPP</b>                    | Navigation Protection Program                                                                                                                                                                                                  |
| <b>O&amp;M</b>                | Operations and Maintenance                                                                                                                                                                                                     |
| <b>PBRep</b>                  | Proposed Pattullo Bridge Replacement Project (also referred to as Project)                                                                                                                                                     |
| <b>PER</b>                    | Project Environmental Review Process (a VFPA process)                                                                                                                                                                          |
| <b>PB</b>                     | Project Boundary - Includes the proposed Reference Concept plus additional area intended to capture a reasonable spectrum of possible design refinements, as well as reasonably anticipated areas of direct ground disturbance |
| <b>Permits</b>                | Term used collectively for all legal instruments                                                                                                                                                                               |
| <b>PM<sub>x</sub></b>         | Particulate Matter (X denotes size in microns)                                                                                                                                                                                 |
| <b>PMH1</b>                   | Port Mann / Highway 1 Improvement Project                                                                                                                                                                                      |
| <b>Proponent</b>              | Ministry of Transportation and Infrastructure                                                                                                                                                                                  |
| <b>PTZ</b>                    | Pan-tilt-zoom                                                                                                                                                                                                                  |
| <b>PY</b>                     | Person-year                                                                                                                                                                                                                    |
| <b>RSA</b>                    | Regional Study Area                                                                                                                                                                                                            |
| <b>RSBC</b>                   | Registered Statutes of British Columbia                                                                                                                                                                                        |
| <b>RSC</b>                    | Revised Statutes of Canada                                                                                                                                                                                                     |
| <b>SC</b>                     | Statute of Canada                                                                                                                                                                                                              |
| <b>SDOH</b>                   | Social Determinants of Health                                                                                                                                                                                                  |
| <b>SFPR</b>                   | South Fraser Perimeter Road Project                                                                                                                                                                                            |
| <b>SO<sub>2</sub></b>         | Sulfur dioxide                                                                                                                                                                                                                 |
| <b>SRA</b>                    | Soil Relocation Agreement                                                                                                                                                                                                      |
| <b>Surrey</b>                 | City of Surrey                                                                                                                                                                                                                 |
| <b>TAC</b>                    | Transportation Association of Canada                                                                                                                                                                                           |
| <b>TU</b>                     | Traditional Use                                                                                                                                                                                                                |
| <b>TransLink</b>              | South Coast British Columbia Transportation Authority                                                                                                                                                                          |
| <b>UTM</b>                    | Universal Transverse Mercator                                                                                                                                                                                                  |
| <b>VAFDP</b>                  | Vancouver Airport Fuel Delivery Project                                                                                                                                                                                        |
| <b>VC</b>                     | Valued Component                                                                                                                                                                                                               |
| <b>VDS</b>                    | Vehicle Detection Station                                                                                                                                                                                                      |
| <b>VFPA</b>                   | Vancouver Fraser Port Authority                                                                                                                                                                                                |
| <b>VOC</b>                    | Volatile Organic Compounds                                                                                                                                                                                                     |
| <b>YVR</b>                    | Vancouver International Airport                                                                                                                                                                                                |

## APPLICATION SUMMARY

The Application will include a summary, including the following:

- A summary of the proposed Project including the project scope, project benefits and applicable permits. If the proponent has already requested or intends to request concurrent permitting, this will also be stated.
- A brief overview of the assessment process including proposed Project reviewability, and the pre-application and application review stages of the EA.
- A brief overview of consultation approaches with Aboriginal Groups, the public and government agencies to date.
- A summary of the key issues raised by Aboriginal Groups, the public and government agencies.
- A summary of key adverse effects on Aboriginal Interests and mitigation measures.
- A summary of key effects, proposed mitigation measures and residual and cumulative effects on Valued Components.
- Proponent's conclusions regarding the potential for significant adverse effects on Valued Components.



# Application Information Requirements

## *Part A - Introduction*

## PART A - INTRODUCTION

## 1.0 OVERVIEW OF PROPOSED PROJECT PROPONENT DESCRIPTION

A letter confirming that British Columbia Ministry of Transportation and Infrastructure (MoTI) is replacing South Coast British Columbia Transportation Authority (TransLink) as the Proponent for the Pattullo Bridge Replacement Project can be found here: <https://projects.eao.gov.bc.ca/p/pattullo-bridge-replacement/docs?folder=5>.

The Application will:

- Describe the Proponent, including history, type of company or organization, affiliations;
- Provide contact information for the Proponent; and
- Include a list of parties involved in the preparation of the Application, their qualifications, and the section(s) for which they were responsible.

### 1.1 Description of Proposed Project

A description of the proposed Project is provided in the Project Description at:

<https://projects.eao.gov.bc.ca/p/pattullo-bridge-replacement/docs?folder=5>.

The Application will:

- Describe the purpose of the proposed Project from the perspective of the Proponent, and identify whether the objectives of the proposed Project relate to any broader private or public sector policies, plans, or programs;
- Describe the location of the proposed Project and the latitude and longitude coordinates of the site and include maps showing both regional context (identifying nearby communities and geographic features) and the specific location of the proposed Project;
- Describe the location of the proposed Project relative to Aboriginal Groups' asserted traditional territories, and/or Treaty Nation territories;
- Describe all phases of the proposed Project, including their duration and proposed scheduling;
- Describe all on-site and off-site components associated with the proposed Project, with figures;
- Describe the location of the proposed Project and main Project components relative to Vancouver Fraser Port Authority (VFPA) jurisdiction using a functional level site plan, to address VFPA's review requirements. The functional level plan will show the components of the proposed Project in relation to the limits of VFPA jurisdiction and the boundaries of VFPA leases. More specifically, the description of the proposed Project will show:

- Existing VFPA lease and property boundaries, easements and right-of-ways within VFPA jurisdiction;
- Location and description of existing and proposed structures located on VFPA lands and waters;
- Anticipated access points, based on implementation of the Reference Concept; and
- Anticipated construction and demolition laydown areas.
- Describe the activities associated with the components and phases of the proposed Project, with figures, including the following (based on implementation of the Reference Concept):
  - Description of expected construction and demolition staging activities, key staging requirements and constraints, and the most likely construction access and staging scenario(s), supported by a preliminary construction staging plan and description with key principles, figures, and requirements; and
  - Known access points, including roadways, driveways, parking areas, walkways, berths, gangways and docks.
- Provide conceptual drawings of the proposed new bridge and connecting roads (plan, elevations and sections), including the legal high water mark where applicable;
- Provide preliminary construction and demolition methodology, and key sequencing constraints;
- Provide a preliminary description of lot grading and utilities, including:
  - Utilities that are carried on the existing bridge structure and utilities that will be carried on the new bridge structure;
- Key utilities that are likely to be crossed and/or require relocation, or could be subject to potential Project-related adverse effects;
- Overview of baseline drainage conditions, as well as key drainage requirements, for the new infrastructure;
- Drainage and storm water management principles;
- Confirmation that drainage structures will not encroach into the vertical air draft clearance;
- Confirmation that drainage will be designed to minimize dripline encroachment into the two marine navigation channels;
- Design guidelines and requirements relating to oil/grit/water separators;
- Existing/proposed emergency vehicle access routes; and

- Conceptual design information on lighting.
- Provide conceptual drawings of proposed marine structures, based on the Reference Concept, including:
  - Preliminary site plan specific to proposed marine works, identifying existing marine structures and those intended to be removed or relocated, or otherwise impacted;
  - Drawing(s) that show minimum vertical and horizontal clearances for the proposed new Pattullo Bridge, relating to each of two navigation channels; and
  - Drawing(s) that illustrate structures in and adjacent to the Fraser River, in relation to the tidal Higher High Water and Lower Low Water lines, including water depth.
- Provide information on the Navigation Envelope Design, for each of the three project phases (i.e., current conditions, with both bridges in place, and after demolition of the existing bridge) including:
  - Restrictions on pier placement;
  - General information on scour protection and scour protection extents;
  - General information on navigation lighting; and
  - Risk assessment information on current design options.
- Provide information on dredging, including:
- Discussion on whether project-specific dredging may be required;
- A preliminary diagram of the anticipated dredge area if dredging may be required (assuming a conservative dredging area, i.e., a dredging area large enough to capture all reasonable variants);
- Timing of any proposed dredging in relation to fish sensitive periods; and
- Key requirements and constraints to reduce induced turbidity during any proposed dredging.
- Discuss the relevant history of the proposed Project, including exploratory or investigative history;
- Summarize existing and planned land and marine use that overlaps or may be potentially affected by the proposed Project components and activities, including:
  - Land ownership [e.g. private land, provincial Crown land, federal land (including VFPA

- lands and waters and Indian Reserves), Aboriginal title];
- Local government zoning or plans;
  - Tenures (municipal, provincial, federal), licenses, permits or other authorizations;
  - Non-tenured current land uses;
  - Current and planned marine use plans;
  - Provincial land use plans (e.g. Land and Resource Management Plans) and provincial land use designations (e.g. Agricultural Land Reserve, Old Growth Management Areas, Forests and Range Practices Act designations) and provincial land use management objectives;
  - VFPA Land Use Plan for potentially affected areas lying within VFPA jurisdiction;
  - Any other development or activities, whether or not directly related to the proposed Project;
  - Maps showing location of other uses referenced above in relation to the proposed Project; and
  - References to the Application section that assesses land use and potential overlaps/impacts in more detail.
- Provide information on current and projected traffic, including traffic distribution patterns, volumes, and potential traffic changes anticipated as a result of the proposed Project, including ultimate and construction-related traffic changes affecting VFPA lands as well as the implications and benefits to goods movement. This would include a consideration of traffic distribution throughout the day and impacts to access/egress into and out of VFPA-managed lands, including the Fraser Surrey Port Lands. For this assessment and supporting traffic management plans, relevant portions of VFPA's transportation guidelines will be used: <https://www.portvancouver.com/wp-content/uploads/2017/04/VFPA-PER-Transportation-Guidelines-FINAL-2015-12-07.pdf>.
  - Describe the Project's economic benefits.
    - Capital construction cost estimates, including:
      - Breakdown of costs (e.g. land, buildings, equipment) associated with the proposed Project;
      - Estimated operating costs over the life of the proposed Project, including breakdown of costs by category (e.g., labour, supplies and materials, administration); and

- Estimated costs for decommissioning/closure/abandonment/reclamation.
- Employment estimates including:
  - Direct employment to be created, by job category by project phase, in number of person year (PY) jobs for construction and decommissioning and full-time equivalent (FTE) jobs for operations. Direct employment estimates will be broken down into full-time, part-time and seasonal job categories;
  - Average wages, by major job category, for the construction and operating periods;
  - Breakdown of jobs that will be filled from local, provincial, national or international labour markets;
  - Indirect and induced employment to be generated, by project phase; and
  - Information about an employment strategy, if any.
- Contractor supply services estimates including:
  - List of the major types of businesses/contractors to be used, broken down at the local, provincial, and national level, by proposed Project phase;
  - Value of supply of service contracts expected, by proposed Project phase; and
  - Information about a local purchasing strategy, if any.
- Annual government revenues, by type (e.g. income tax, license rent, property tax, mineral tax) and jurisdiction (e.g. local, provincial, federal), for all phases of the proposed Project;
- Any benefits the proposed Project may have to the five pillars of assessment (Environmental, Economic, Social, Heritage and Health);
- All Canadian dollar estimates will be provided in real dollars, with an explanation of how they are measured (e.g. discount rates); and
- State all assumptions and references for the above information.

## 1.2 Applicable Authorizations

A list of required authorizations, to the extent that was known at the time, is available in the Project Description at <https://projects.eao.gov.bc.ca/p/pattullo-bridge-replacement/docs?folder=5>.

The Application will:

- List in table format (see example in Table 2 below) all applicable licenses, permits and/or

approvals that are already received or **expected to be** required for the phases of the proposed Project, and the associated responsible regulatory body; and

- State if the Proponent has or intends to request concurrent permitting under the Act pursuant to the Concurrent Approval Regulation (BC Reg. 371/2002).

At this stage, it is anticipated that the Proponent will not seek concurrent permitting under the Act pursuant to the Concurrent Approval Regulation (BC Reg. 371/2002).

**Table 2: Authorization Table**

| Name of Authorization                              | Statute and Authorizing Agency                                                                                                                               | Description of Need for Authorization                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Federal</b>                                     |                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                         |
| Category D Project and Environmental Review Permit | <i>Canada Marine Act</i> , SC 1998, c. 10; VFPA Planning and Development Department (VFPA is an authority that is enabled by the <i>Canada Marine Act</i> ). | An over-arching Project Permit will be required because the proposed Project will affect property managed by VFPA, or lands or waters located within VFPA jurisdiction.                                                                                                                                                 |
| Category B Project Review Permits                  | <i>Canada Marine Act</i> , SC 1998, c. 10; VFPA Planning and Development Department (VFPA is an authority that is enabled by the <i>Canada Marine Act</i> ). | May be required for investigation and assessment activities (e.g., archaeological impact assessment; geotechnical assessment) occurring on lands or waters located within VFPA jurisdiction.                                                                                                                            |
| Building Permit                                    | <i>Canada Marine Act</i> , SC 1998, c. 10; VFPA Planning and Development Department (VFPA is an authority that is enabled by the <i>Canada Marine Act</i> ). | May be required to erect temporary buildings and/or structures on VFPA property (e.g., as may be necessary for construction). Exceptions include certain in-water works such as mooring dolphins, pilings.                                                                                                              |
| Commercial Lease                                   | <i>Canada Marine Act</i> , SC 1998, c. 10; VFPA Real Estate Department (VFPA is an authority that is enabled by the <i>Canada Marine Act</i> ).              | A commercial tenure agreement between the Proponent and VFPA will be required for the new bridge and possibly also for undertaking temporary staging or construction works located on lands or waters located within VFPA jurisdiction.                                                                                 |
| s. 6(1) Approval                                   | <i>Navigation Protection Act</i> , SC 2014; Transport Canada (Navigation Protection Program).                                                                | Required because construction and operation of the new bridge, as well as removal of the existing bridge, will affect navigation in the Fraser River which is on the Act's List of Scheduled Waters.                                                                                                                    |
| s. 35(2)(b) Authorization                          | <i>Fisheries Act</i> , RSC. 1985, c. F-14; DFO.                                                                                                              | Required if the proposed Project cannot avoid or mitigate "serious harm to fish" as defined in the Act. A request for DFO review of the proposed Project will be submitted once detailed information on potential effects of the Project on fish/fish habitat and requirements for mitigation/offsetting habitat become |



| Name of Authorization | Statute and Authorizing Agency | Description of Need for Authorization                                              |
|-----------------------|--------------------------------|------------------------------------------------------------------------------------|
|                       |                                | known, after which DFO will determine whether or not an authorization is required. |

Table 2: Cont'd.

| Name of Authorization                | Statute and Authorizing Agency                                                                                                                                                                           | Description [of] Need for Authorization                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Federal (cont'd.)</b>             |                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                           |
| License                              | <i>Fisheries Act</i> , RSC 1985, c. F-14; General (Fisheries) Regulation; DFO.                                                                                                                           | Anticipated to be required for fish collection during environmental assessment; also may be required for salvage and relocation of fish during construction (to remove and relocate fish from instream work sites); may also be required to sample fish for the purpose of monitoring the effectiveness of offsetting habitat, as may be required by a DFO authorization (see row above). |
| Permit or Agreement                  | <i>Species at Risk Act</i> , SC 2002, c. 29; Environment and Climate Change Canada (Canadian Wildlife Service).                                                                                          | Required in the event the proposed Project entails salvage and relocation of SARA listed species during construction (to remove such species from harm's way).                                                                                                                                                                                                                            |
| Permit                               | <i>Migratory Birds Convention Act</i> , 1994, S.C. 1994, c. 22; Environment and Climate Change Canada                                                                                                    | May be required if vegetation clearing is to be undertaken during bird breeding period                                                                                                                                                                                                                                                                                                    |
| Approval                             | <i>Aeronautics Act</i> , RSC 1985, c. A-2; Canadian Aviation Regulations (SOR/96-433); Transport Canada.                                                                                                 | Required if the Project represents a potential obstruction to air navigation (in which case lighting and markings specific to air navigation are required).                                                                                                                                                                                                                               |
| Land Use Proposal Submission Form    | <i>Civil Air Navigation Services Commercialization Act</i> , SC 1996, c. 20; NAV CANADA (NAV CANADA is an authority that is enabled by the <i>Civil Air Navigation Services Commercialization Act</i> ). | NAV CANADA must approve all proposals for land use near airports and air navigation infrastructure before construction begins; a separate submission form must be submitted if tall cranes are used for construction.                                                                                                                                                                     |
| Notice of Removal                    | <i>Civil Air Navigation Services Commercialization Act</i> , SC 1996, c. 20; NAV CANADA (NAV CANADA is an authority that is enabled by the <i>Civil Air Navigation Services Commercialization Act</i> ). | Required to advise NAV CANADA that a tall structure(s) affecting land use near airports and air navigation infrastructure has been removed (relevant to removal of tall cranes used for construction).                                                                                                                                                                                    |
| <b>Provincial</b>                    |                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                           |
| Environmental Assessment Certificate | <i>Environmental Assessment Act</i> , SBC 2002, Chapter 43; EAO.                                                                                                                                         | A certificate is required because the proposed Project is considered to be a reviewable Project pursuant to the                                                                                                                                                                                                                                                                           |

| Name of Authorization           | Statute and Authorizing Agency                                                                                                  | Description of Need for Authorization                                                                                                                                                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 |                                                                                                                                 | BCEAA's Reviewable Projects Regulation (B.C. Reg. 370/2002).                                                                                                                                                                                                                      |
| Approval                        | <i>Dyke Maintenance Act</i> ; FLNR, Dyke Inspector or Deputy Dyke Inspector.                                                    | Required if the proposed Project entails temporary and/or permanent disturbance to, or modification of, the Fraser River dyke system. Concurrence from the local dyking authority would also be required.                                                                         |
| <b>Provincial (cont'd.)</b>     |                                                                                                                                 |                                                                                                                                                                                                                                                                                   |
| Soil Relocation Agreement (SRA) | <i>Environmental Management Act</i> , SBC 2003, c. 53; Contaminated Sites Regulation, B.C. Reg 375/96; Ministry of Environment. | Soils disturbed by construction that contain contaminants in concentrations that exceed applicable CSR standards would be subject to restrictions on reuse or relocation. A SRA may be required if contaminated soils are to be moved to locations other than approved landfills. |
| Heritage Investigation Permit   | <i>Heritage Conservation Act</i> , RSBC 1996, c. 187, s. 14; FLNR, Archaeology Branch.                                          | Required to conduct an Archaeological Overview Assessment (AOA) or an Archaeological Impact Assessment (AIA) during the EA phase (applies to non-federal lands).                                                                                                                  |
| Site Alteration Permit          | <i>Heritage Conservation Act</i> , RSBC 1996, c. 187, s. 12; FLNR, Archaeology Branch.                                          | Required if the proposed Project disturbs confirmed archaeological site(s) or values.                                                                                                                                                                                             |
| License of Occupation           | <i>Land Act</i> , RSBC 1996, c. 245; FLNR.                                                                                      | Required where construction will involve occupation of Crown Land.                                                                                                                                                                                                                |
| Easement or Right-of-way        | <i>Land Act</i> , RSBC 1996, c. 245; FLNR.                                                                                      | Required where the proposed Project will entail acquisition of additional right-of-way on Crown Land.                                                                                                                                                                             |
| Approval (Section 11)           | <i>Water Sustainability Act</i> , SBC 2014, c. 15; Water Sustainability Regulation, B.C. Reg. 36/2016, Part 2; FLNR.            | Required because construction is anticipated to cause "changes in and about a stream" as defined in the Act. Approval is expected to be required for changes affecting the Fraser River and other watercourses (i.e. tributaries to Fraser River).                                |
| Notification                    | <i>Water Sustainability Act</i> , SBC 2014, c. 15; Water Sustainability Regulation, B.C. Reg. 36/2016, Part 3; FLNR.            | Submission of a Notification(s) (rather than obtaining an Approval(s) as per row above) is expected to be required for some works affecting smaller watercourses (such as roadside ditches) in the proposed Project area.                                                         |
| s. 10 Approval                  | <i>Water Sustainability Act</i> , SBC 2014, c. 15; FLNR.                                                                        | Approval may be required for short-term water withdrawal from the Fraser River to support construction of the new bridge or                                                                                                                                                       |

| Name of Authorization        | Statute and Authorizing Agency                              | Description of Need for Authorization                                                                                                                                                                                                       |
|------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              |                                                             | demolition of the existing bridge.                                                                                                                                                                                                          |
| <b>Provincial (cont'd.)</b>  |                                                             |                                                                                                                                                                                                                                             |
| Permit                       | <i>Wildlife Act</i> , RSBC 1996, c. 488; FLNR.              | Required for salvage and relocation of wildlife potentially affected by construction (to enable sampling for wildlife presence during the EA phase and/or to relocate potentially affected wildlife out of harm's way during construction). |
| Permit                       | <i>Wildlife Act</i> , RSBC 1996, c. 488, FLNR.              | May be required to remove or relocate an eagle, peregrine falcon, gyrfalcon, osprey, or heron nest, even when the nest is not actively being used.                                                                                          |
| Permit                       | <i>Wildlife Act</i> , RSBC 1996, c. 488; FLNR.              | Required if construction entails hunting, trapping or killing nuisance animals (e.g., to complete removal of the existing bridge).                                                                                                          |
| <b>Other</b>                 |                                                             |                                                                                                                                                                                                                                             |
| Regional Permits (various)   | Various bylaws; Metro Vancouver.                            | Various permits may be required for works occurring within Metro Vancouver jurisdiction or affecting Metro Vancouver infrastructure.                                                                                                        |
| Municipal Permits (various)  | Various bylaws; City of New Westminster and City of Surrey. | Various permits may be required for works occurring within municipal jurisdiction or affecting municipal infrastructure.                                                                                                                    |
| Aboriginal Permits (various) | Requirement of various First Nations                        | Required in order to conduct AOA or AIA.                                                                                                                                                                                                    |

## 1.3 Project Design and/or Alternative Means of Carrying out the Proposed Project

The Application will include:

- An assessment of the alternative means of carrying out the proposed Project that are technically and economically feasible including, but not limited to, the alternatives identified in the AIR; and
- The rationale and criteria used to select the proposed means of undertaking the proposed project.
- The methodology and criteria used in the assessment of alternatives.

## 1.4 Alternatives to the Proposed Project

The Application will include:

- An assessment of the alternatives to the proposed Project that were that were technically and economically feasible including, but not limited to, the alternatives identified in the AIR.

Efforts to identify a solution for the aging Pattullo Bridge have been underway since 2006. Between 2012 and 2014, TransLink, along with its partners, undertook a comprehensive joint technical Strategic Review to develop and evaluate options to rehabilitate or replace the Pattullo Bridge. More than 25 alternatives were explored through technical and financial analysis and extensive public and stakeholder consultation, determining that replacement of the bridge was the most viable solution.

## 2.0 ENVIRONMENTAL ASSESSMENT PROCESS

### 2.1 Provincial EA Process

The Application will include:

- A statement that the proposed Project is subject to review under the Act, identifying the trigger(s) for the review under the Act.
- A statement that the Application has been developed pursuant to the AIR approved by EAO and complies with relevant instructions provided in the section 11 Order and any other direction provided by EAO.
- A table documenting applicable milestones, including, but not limited to, issuance of section 10 and 11 Orders, working group meetings, any public comment periods or open houses and the issuance of the AIR), including links to documents on EAO's public website.
- A list of the government agencies and Aboriginal Groups that participated in the EA; a summary of their participation; and, a list of the key issues raised by each party and the status of issue resolution (with cross-references, as appropriate, to other sections of the Application that deal further with consultation and issues raised).
- A summary of public participation in the EA, a list of the key issues raised, and the status of issue resolution (with cross-references, as appropriate, to other sections of the Application that deal further with consultation and issues raised).

### 2.2 Federal EA Process

The Canadian Environmental Assessment Agency has confirmed that the proposed Project does not require a federal environmental assessment pursuant to the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). However, as mentioned in the Preface, the proposed Project is located, in part, on federal lands and water within VFPA jurisdiction and will be subject to a Project and Environmental Review (PER). Section 67 of CEAA 2012 requires federal authorities, including VFPA, to assure them that projects that are allowed to be carried out on federal lands by their decisions are not likely cause significant adverse environmental effects as defined under section 5 of CEAA 2012. The proposed Project is also expected to require at least one approval or authorization from Transport Canada (Navigation Protection Program) and Fisheries and Oceans Canada (DFO). Given the role of these approvals/authorizations in allowing the proposed Project to proceed on federal land, Section 67 of CEAA 2012 will apply to Transport Canada and DFO decisions related to works associated with the Project.

The Application will include:

- A statement that the proposed Project is not a CEAA 2012 “designated project” but that an environmental effects determination will be required for those components of the project occurring on federal lands, as per Section 67 of CEAA 2012;
- An overview of the relevant provisions of CEAA 2012 that apply to the proposed Project;
- Discussion on the federal and provincial review process for the proposed Project, including a summary of the EAO and VFPA approach to a harmonized environmental review of the Project;
- A statement that the proposed Project includes physical works and activities on federal lands under VFPA jurisdiction, and requires a Project and Environmental Review Permit from VFPA;
- A statement that the proposed Project meets the criteria of a Category D project in the PER process, which is carried out to address VFPA’s responsibilities under the *Canada Marine Act*, and to meet applicable requirements of CEAA 2012.

Potential Project-related effects as defined in section 5(1) and 5(2) of CEAA 2012 will be assessed for relevant Valued Components, as outlined in Section 3.4 of this AIR under Consideration of CEAA 2012 Requirements.

# Application Information Requirements

*Assessment of Environmental, Economic, Social,  
Heritage and Health Effects*

## **PART B - ASSESSMENT OF ENVIRONMENTAL, ECONOMIC, SOCIAL, HERITAGE AND HEALTH EFFECTS**

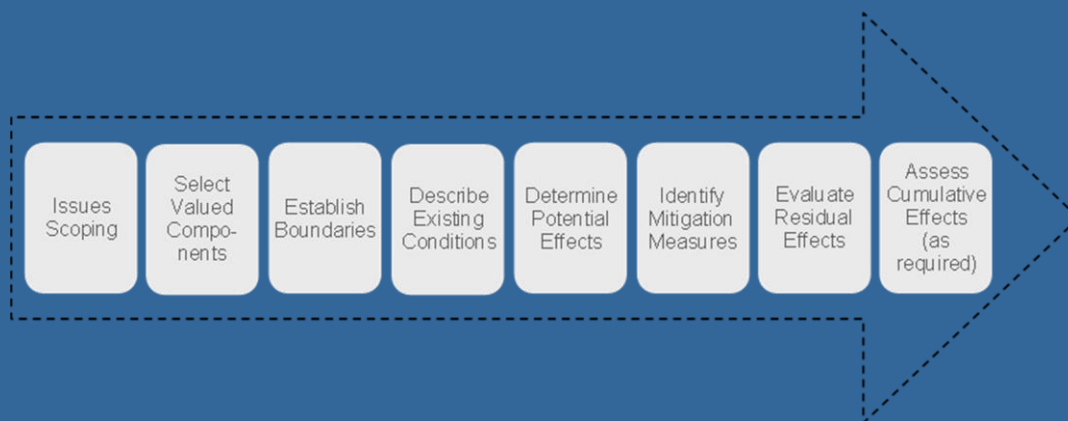


### 3.0 ASSESSMENT METHODOLOGY

This section of the Application must describe the methods used to assess the potential adverse effects of the [proposed](#) Project. The assessment methodology must be based on the EAO's [Guideline for the Selection of Valued Components and Assessment of Potential Effects](#) (September 2013), and follow the methodological steps shown in Figure 1.

See EAO's [Guideline for the Selection of Valued Components and Assessment of Potential Effects](#) for a more detailed discussion about the methodology.

**Figure 1: Summary of Methodological Steps**



#### 3.1 Issues Scoping and Selection of Valued Components

The following Valued Components (VCs) will be assessed for potential Project-induced adverse effects:

- Fish and Fish Habitat;
- Vegetation;
- Wildlife;
- Economic Activity;
- Marine Use;
- Land Use;
- Community Cohesion;
- Visual Quality;
- Heritage Resources;
- Physical Determinants of Human Health; and
- Social Determinants of Human Health.

In addition, the following environmental components that are not the ultimate receptors of proposed Project-related effects but are part of the effects pathways, will be studied as intermediate components (ICs) to support the assessment of the VCs listed above:

- Fraser River Hydraulics and Morphology;
- Soil and Groundwater;
- Surface Water and Sediment Quality;
- Noise and Vibration;
- Air Quality, including greenhouse gases (GHGs);
- Lighting; and
- Shading.

The process used to select and define the VCs, as well as the proposed methodology for assessing existing conditions and potential Project-related effects of each VC and IC is provided in the Valued Component Selection and Rationale Document (Appendix 18.4 of this document). The VC Selection and Rationale Document was submitted in draft to the EAO on June 21, 2017 and made available to the Advisory Working Group members and the public for review and comment. Comments received from EAO, Advisory Working Group members, and the public informed the refinement of the above VCs and ICs.

The Application will summarize the process and methodologies used to identify and select the VCs for assessment. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the AIR.

## **3.2 Assessment Boundaries**

### **3.2.1 *Spatial, Temporal, Administrative and Technical Boundaries***

The Application will describe the methods used in identifying spatial, temporal, administrative and technical boundaries. Information on spatial, temporal, administrative and technical boundaries for each VC and IC will be included in the appropriate VC sections of this document and will encompass all relevant project phases, components and activities. The Application will include the rationale for any differences in boundaries from those presented in the final AIR.

The spatial boundary maps for VCs and ICs will clearly identify parts of the project footprint located on lands and waters that lie within VFPA jurisdiction to allow VFPA to identify specific components of the Project that require a VFPA Project Permit and would therefore be subject to a CEAA 2012 section 67 determination.

## **3.3 Existing Conditions**

For each VC section, (Environmental, Economic, Social, Heritage and Health), the Application will include: A description of the existing (or baseline) conditions within the study area in sufficient detail to enable potential project-VC interactions to be identified, understood, and assessed:

- A description of the quality and reliability of the existing (or baseline) data and its applicability for the purpose used, including any gaps, insufficiencies and uncertainties, particularly for the purpose of monitoring activities.
- Reference to natural and/or human-caused trends that may alter the environmental, economic, social, heritage and health setting, irrespective of the changes that may occur as a result of the proposed Project or other project and/or activities in the area.
- An explanation of if and how other past and present projects and activities in the study area have affected or are affecting each VC.
- Documentation of the methods and data sources used to compile information on existing (or baseline) conditions, including any standards or guidelines followed.
- Where additional project and VC-specific field studies are conducted, the scope and methods to be used will follow published documents pertaining to data collection and analysis methods, where these are available. Where methods used for the assessment deviate from applicable published guidance, the rationale for the variance will be provided in the Application.
- Description of Aboriginal Traditional Knowledge (ATK) used in the VC assessment.

The Application will contain the existing (or baseline) technical reports in the Appendices and will summarize key findings contained in these technical reports directly in the Application, in a manner that allows the reader to understand each VC's effects assessment.

### 3.4 Potential Effects

The Application will summarize the overall process and methodologies used to identify and assess the potential effects of the proposed Project on the identified VCs.

For each VC/IC section, the Application will:

- Identify the potential interactions of the proposed Project and the considered and selected VCs/ICs.
- Identify and describe the potential adverse effects resulting from the proposed Project.
- Demonstrate how feedback from Aboriginal Groups, the public, stakeholders and government agencies on VC selection and assessment was incorporated, as appropriate.

The Application will identify any project activity-VC/IC interactions that were excluded from further assessment, including the methods and criteria used to justify the exclusion and input received from EAO, government agencies, Aboriginal Groups and the public regarding the exclusion.

For VCs/ICs along the pathway of effects on other VCs/ICs, all receptor components and effect pathways will be clearly identified.

### Consideration of CEAA 2012 Requirements

For each applicable VC, the Application will include an assessment of potential Project-related effects as defined in subsection 5(1) or 5(2) of CEAA 2012. For clarity, assessment of potential effects of each VC under the economic, social, heritage and health pillars will include consideration of environmental effects as defined in subsections 5(1)(c)(i), (ii) and (iv), which relate to potential effects of Project-induced changes to the environment on Aboriginal peoples' health and socio-economic conditions, and physical heritage, including any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. Assessment of potential effects of Project-related changes to the environment on the current use of land and resources for traditional purposes per section 5(1)(c)(iii) of CEAA 2012 will be presented within the Application section that summarizes the results of assessments pertaining to statutory requirements under CEAA 2012.

The assessment of CEAA 2012 section 5(1) and 5(2) factors will consider Aboriginal perspectives and Aboriginal Traditional Knowledge (ATK), where available publicly, or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies. If it is determined that the Project will not result in environmental effects defined in subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

### 3.5 Mitigation Measures

For each VC/IC section, the Application will:

- Describe the approach to identify and analyze mitigation measures, including any management and compensation plans proposed by the Proponent, which will be implemented to address potential effects.
- Describe the mitigation measures incorporated into the proposed project, including site and route selection, project scheduling, project design (e.g. equipment selection, placement, emissions abatement measures), and construction and operation procedures and practices.
- Describe any standard mitigation assumed or proposed to be implemented, including consideration of best management practices, environmental management plans, environmental protection plans, contingency plans, emergency response plans, and other general practices.
- Clearly indicate how the mitigation measures will mitigate the potential adverse effects on the VC/IC.
- Provide the rationale for the proposed mitigation measures, including why further avoidance or reduction measures for adverse effects may not be considered feasible, and the need for and scope of any proposed compensation or offset.

- Evaluate the anticipated success of each mitigation measure and describe rationale and analysis for these evaluations. If there is little relevant/applicable experience with a proposed mitigation measure and there may be some question as to its effectiveness, describe the potential risks and uncertainties associated with use of the mitigation.
- Include the time required for mitigation to become effective, to enable understanding of the duration of residual effects and the temporal characteristics of reversibility.
- Summarize the mitigation measures for potential Project effects by project phase and identify any mitigation measures that are in management or compensation plans.

### **3.6 Characterization of Residual Effects**

The Application will describe, in a table format, the residual effects using the residual effects criteria of context, magnitude, extent, duration, reversibility, and frequency, as defined in EAO's Guideline for the Selection of Valued Components and Assessment of Potential Effects. Where feasible, these criteria will be described quantitatively in the Application for each VC Residual effects that cannot be characterized quantitatively will be assessed qualitatively using clearly-defined terms.

The use of any qualitative terms (e.g. high, moderate, low, etc.) will be accompanied by distinct definitions for each of these rankings. An explanation will be included for the conclusion reached for each criterion used to characterize a residual effect.

Any residual effects identified on ICs along the pathway of effects of other VCs/ICs will be described in sufficient detail to support the assessment and characterization of potential effects on the receptor VCs/ICs.

### **3.7 Likelihood**

The Application will assess the likelihood for all residual adverse effects using appropriate quantitative or qualitative terms and sufficient description to understand how the conclusions were reached. Definitions of any qualitative terms, such as 'low', 'moderate', or 'high' probability will be provided.

### **3.8 Proponent's Determination of Significance**

The Application will present the process and methodology used to define and evaluate the significance of residual effects, including how the term "significance" has been used in relation to each VC using quantitative and qualitative thresholds.

A conclusion of significance of residual adverse effects will be provided for each VC.

If environmental effects, as defined in subsections 5(1) or 5(2) of CEAA 2012, are identified for a VC, the Application will describe residual adverse effects, if any, in a manner that allows VFPA and other Federal Authorities to draw conclusions on the significance of those effects.

### 3.9 Confidence and Risk

The Application will summarize the process and methodology used to evaluate the levels of confidence associated with residual effects predictions and in particular, how any identified uncertainty may affect either the likelihood or the significance of the predicted residual effect. The Application will also describe any measures to reduce uncertainty through monitoring, adaptive management or other follow-up programs.

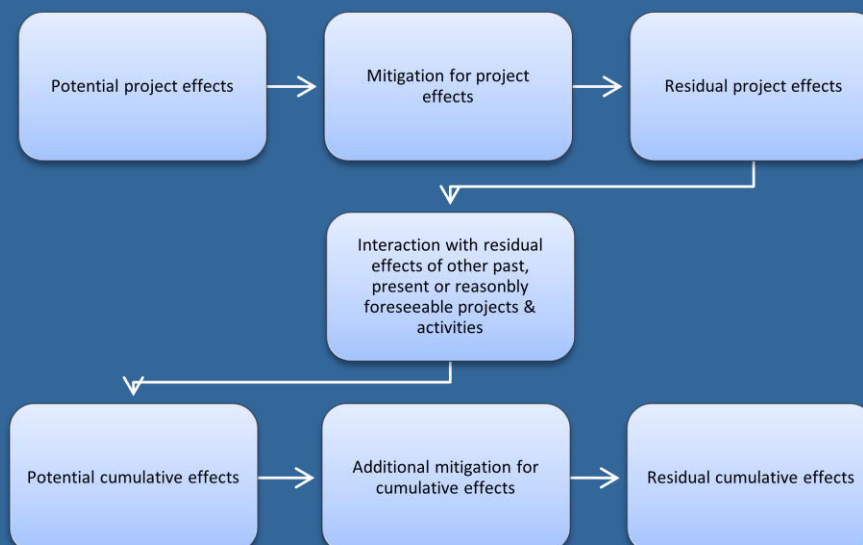
The Application will summarize the process and methodology used to determine if additional risk analysis is required. If additional risk analysis is required, the Application will summarize the process and methodology used for this analysis and the conclusions, including the range of likely, plausible and possible outcomes with respect to likelihood and significance.

### 3.10 Cumulative Effects Assessment

#### 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities

As identified in *EAO's Guideline for the Selection of Valued Components and Assessment of Potential Effects*, the Application must use the steps outlined in the figure below to determine residual project effects and the subsequent cumulative effects assessment:

**Figure 2: Steps to Determine Residual Project & Cumulative Effects**



The following development categories will be considered in the Application:

- Projects or activities that have already been built or conducted for which the environmental effects overlap with those of the proposed Project (i.e., certain).
- Projects that are either proposed (public disclosure) or have been approved to be built, but are not yet built, for which the environmental effects overlap the proposed Project (i.e., reasonably foreseeable).

The Application will include:

- A table of all past, present and certain/reasonably foreseeable developments that will be included in the cumulative effects assessment, should one be required for a particular VC or IC.
- A general description of the information sources used to identify reasonably foreseeable developments and activities.
- A map showing the location of the projects and activities.

The Application will describe the methodology for identifying potential interactions between residual project effects and the effects of other developments, including a description of the following:

- The spatial boundaries for the cumulative effects assessment for each VC/IC, including maps.
- The spatial and temporal boundaries of other developments.
- The potential for interaction (spatial and temporal) and linkages (overlap) of VCs/ICs with other developments.

A preliminary list of certain and reasonably foreseeable projects and activities that will be included in the cumulative effects assessment is provided in Table 3. This list will be refined further based on input from the Advisory Working Group, in consultation with EAO.

**Table 3: Preliminary List of Certain and Reasonably Foreseeable Projects and Activities for Cumulative Effects Assessment<sup>3</sup>**

| Project Name                                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WesPac Tilbury Marine Jetty Project                                         | A proposed project to construct and operate a marine jetty for loading LNG onto carriers and barges on Tilbury Island, along the South Arm of the Fraser River, in the City of Delta, approximately 12 km from the PBRep Project. The project is currently undergoing environmental assessment. According to the project website, construction is expected to start in 2018 and operations are expected to start in 2019/20.                                                                                         |
| Fraser Surrey Docks Direct Transfer Coal Facility                           | In November 2015, VFPA approved an amendment to the Fraser Surrey Docks Direct Transfer Coal Facility project permit. The amendment included changes to the approved loading infrastructure to allow coal to be loaded directly to ocean-going vessels. The Direct Transfer Coal Facility, located approximately 3.5 km downstream of the Project, is designed handle up to four million metric tonnes of coal per year.                                                                                             |
| Fortis BC Tilbury LNG Plant Expansion Project                               | The proposed expansion of the Tilbury LNG plant, located approximately 12 km downstream from the PBRep Project, will include an additional 1.1 million gigajoules of LNG storage and 34,000 gigajoules of liquefaction capacity per day. Construction of an additional storage tank commenced in October 2014. The expanded facility is expected to be fully functional in 2017.                                                                                                                                     |
| Vancouver Airport Fuel Facilities Corporation (VAFFC) Fuel Delivery Project | A project that includes construction of a marine terminal and fuel receiving facility on the north bank of the South Arm of the Fraser River and a 13 km underground pipeline to YVR, approximately 14 km downstream from the PBRep Project.<br><br>Pre-construction works for the fuel receiving facility started in 2015 and construction of the marine terminal and pipeline is expected in 2018. The project is expected to operational in 2019 at the time the PBRep Project construction is proposed to start. |
| Roberts Bank T2 Project                                                     | A proposed project for a new container port with a separate terminal to the existing Deltaport Container Terminal located at Roberts Bank, approximately 23 km downstream of the Project. The project is currently undergoing environmental assessment.                                                                                                                                                                                                                                                              |
| George Massey Tunnel Replacement Project                                    | The GMTR project, located 16 km downstream from the PBRep Project involves replacement of the existing tunnel on the Highway 99 corridor with a new 10-lane bridge along the existing tunnel alignment. The Project received an EA certificate, but is on hold pending a technical review of options for the George Massey Tunnel corridor by the province.                                                                                                                                                          |

<sup>3</sup> Influence of projects and activities that have already been/completed, including, but not limited to, the SkyTrain Bridge, the New Westminster Railway Bridge, the existing Fortis BC LNG Plant on Tilbury Island, and the Seaspan Tilbury Terminal, will be included in the assessment of existing conditions of each VC; these project, therefore, have not been included in the list of current projects and activities to be considered in the cumulative effects assessment.



| Project Name                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VFPA Habitat Enhancement Program                          | Point Grey Tidal Marsh Project (Point Grey), approximately 22 km downstream from the PBRep Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                           | South Arm Jetty Tidal Marsh Project (South Arm Jetty), approximately 26 km downstream from the PBRep Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                           | Steveston Island Tidal Marsh Project, approximately 22 km downstream from the PBRep Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                           | Tsawwassen Eelgrass Project (Tsawwassen), approximately 24 km downstream from the PBRep Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Bosa 660 Quayside Development                             | Proposed multiple residential buildings and tower construction at New West Quay, approximately 1.5 km from the Project, infill of existing wharf in the Fraser River and construction of a new pedestrian wharf.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Fraser Grain Terminal                                     | Fraser Grain Terminal Ltd. is proposing to develop a grain export facility at 11041 Elevator Road in the City of Surrey. This project is located about 4 km downstream from the PBRep Project. The proposed grain terminal would have an annual capacity of four million metric tonnes and would be used to trans-ship bulk grain products on the Fraser River via an existing berth at Fraser Surrey Docks. The proposed project includes the construction of 34 above-ground steel storage silos, a travelling ship-loader, semi-loop rail track, container loading facility and storage yard, rail and truck loading facility and other associated terminal infrastructure. |
| Seaspan Ferries Tilbury Expansion                         | Proposed expansion of the existing Tilbury Seaspan ferries jetty which is located 12 km downstream from the BPREP Project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Ladner Harbour Revitalization                             | The City of Delta is proposing to redevelop and revitalize the waterfront at Ladner Harbour. The proposed redevelopment will include new waterfront buildings and infrastructure. Conceptual drawings do not specify in-river construction activities. The project is at its conceptual pre-design phase and a schedule for project construction has not been identified yet. Delta has issued development variance permits for several lots. This project is located 19 km downstream from the PBRep Project.                                                                                                                                                                 |
| Annacis Island Wastewater Treatment Plant Outfall Project | Metro Vancouver is proposing a new outfall location and diffuser system to release treated effluent from the Annacis Island Wastewater Treatment Plant into the Fraser River, which will involve constructing a one-kilometre long tunnel (approximately) from the plant to the river. Construction on this project, located approximately 6.5 km downstream of the Project, is anticipated to start in 2019.                                                                                                                                                                                                                                                                  |
| BHP Billiton Canada Inc.   Potash Export Facility Project | BHP Billiton Canada Inc. (BHP) is proposing to develop a potash export facility at 11060 Elevator Road in Surrey (approximately 4km southwest of the Project site) on federal lands managed by VFPA. The proposed facility would utilize an existing berth and portion of the container yard at Fraser Surrey Docks terminal to load potash to deep sea vessels on the Fraser River. The project includes the construction of an above ground storage building, a travelling ship-loader, rail loop, rail unloading facility and transfer system and other associated terminal infrastructure.                                                                                 |
| Kinder Morgan – Trans Mountain Expansion Project          | Kinder Morgan is proposing an expansion of the existing Trans Mountain 1,150-kilometre pipeline between Strathcona County (near Edmonton),                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Project Name | Description                                                                                                                                                                               |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Alberta and Burnaby, BC. The Burnaby Terminal is the terminus of the project's mainline, and is located on the side of Burnaby Mountain, approximately 8 kilometres north of the Project. |

### 3.10.2 Conducting a Cumulative Effects Assessment

The Application will summarize the process and methodology used to conduct the cumulative effects assessment, including the identification of potential cumulative effects, identification of additional mitigation measures, and evaluation of any (residual) cumulative effects using the same methodology described above in sections 3.6 to 3.9 of this AIR document.

## 3.11 Follow-up Strategy

Where a residual adverse effect and/or cumulative effect has been identified for a specific VC, the Application will include a description of a follow-up strategy, where appropriate, that:

- Identifies the measures to evaluate the accuracy of the original effects prediction.
- Identifies the measures to evaluate the effectiveness of proposed mitigation measures.
- Proposes an appropriate strategy to apply in the event that original predictions of effects and mitigation effectiveness are not as expected. This includes reference to further mitigation, involvement of key stakeholders, Aboriginal Groups, government agencies and any other measures deemed necessary to manage the issue.

## 4.0 ENVIRONMENTAL EFFECTS ASSESSMENT

The Application will include an assessment of Environmental Effects on VCs identified in the AIR. The assessment will be conducted in accordance with the methodology specified in section [3.0 Assessment Methodology](#) of the AIR, using the organizational structure demonstrated in this section.

The Application will identify the VCs selected for assessment according to the methodology specified in section [3.1 Issues Scoping and Selection of Valued Components](#). The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

The following VCs have been identified for assessment under the environmental pillar:

- Fish and Fish Habitat;
- Vegetation; and
- Wildlife.

The following environmental components that are not the ultimate receptors of Project-related effects but are part of the effects pathways will be studied as ICs to support the assessment of the ultimate receptor VCs listed above:

- Fraser River Hydraulics and River Morphology;
- Surface Water and Sediment Quality;
- Soil and Groundwater;
- Noise and Vibration; and
- Air Quality.

### 4.1 Fraser River Hydraulics and Morphology

The proposed Project construction and decommissioning activities have the potential to change flow conditions (including flow velocity) in the Fraser River, and consequently change scour and sediment deposition patterns.

These river processes comprise one of the steps along the pathway of effects of the Project, with Fish and Fish Habitat and Marine Use being the ultimate receptors of those effects. Fraser River Hydraulics and Morphology will, therefore, be studied as an IC in the context of effects of the Project on the following VCs:

- Fish and Fish Habitat; and
- Marine Use.

The Fraser River Hydraulics and Morphology assessment will also inform the assessment of Project-related effects on the following:

- Surface Water and Sediment Quality; and
- Archaeological Resources subcomponent of Heritage Resources – specifically, in relation to potential Project-related effects on archaeological sites along the Fraser River shoreline.

Changes in Fraser River Hydraulics and Morphology could also have a measureable effect on the current use of lands and resources for traditional purposes (refer to Section 11) and Aboriginal Interests (refer to Section 12), and will inform the assessment of these factors.

Fraser River Hydraulics and Morphology will be assessed in terms of the following subcomponents:

- River hydraulics; and
- River morphology.

The assessment of existing baseline conditions and potential Project-related effects will focus on the following indicators:

- Changes to flow distribution and flow patterns;
- Velocity changes;
- Changes to river scour;
- Changes to sediment deposition patterns; and
- Changes to water levels and bathymetry.

#### 4.1.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable to river hydraulics and morphology, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for Fraser River Hydraulics and Morphology:

- Spatial boundaries:
  - Local Study Area (LSA): Section of the Fraser River extending from approximately the downstream end of Sapperton Bar to immediately downstream of the existing SkyTrain Bridge. This represents the section of the river where any potential substantial Project-related effects, including changes to flow distribution, scour, velocity flows, and sedimentation, could be expected. The LSA will encompass instream portions of the New Westminster Rail Bridge, existing Pattullo Bridge, existing SkyTrain Bridge, and proposed Pattullo Replacement Bridge, and will extend to the Higher High Water Level (HHWL) – large tide along the shoreline.

See Figure A1.4 Fraser River Hydraulics and River Morphology Assessment Area in Appendix 18.3 for LSA boundary.

- Regional Study Area (RSA): The upstream boundary of the RSA is 6 km from the existing Pattullo Bridge. Downstream of the existing bridge, the boundary is located 5.5 km downstream for each of the mainstem Annacis Channel and North Arm of the Fraser River, and 8 km downstream for the South Arm Fraser River. In terms of landmarks, this area extends from downstream of the Port Mann Bridge to downstream of Alex Fraser Bridge in Annieville Channel (mainstem). In Annacis Channel the area extends to upstream of the Annacis Channel Bridge. In the North Arm, it extends to downstream of the Queensborough Bridge. These boundaries have been selected to encompass key areas of interest identified in a meeting with Vancouver Fraser Port Authority (VFPA) in June 2016 such as:
  - The Sapperton V-Dyke;
  - The Phase III Trifurcation Training Wall (aka the Timberland Training Wall);
  - The entrance to Fraser Surrey Docks;
  - Wallenius Williamsen Logistics (WWL) Auto Terminal, Annacis Island; and
  - Amix Marine Services.

The boundary extends beyond the Higher High Water Level (HHWL) – large tide. Numerical modelling is proceeding based on the RSA boundary defined above.

See Figure A1.4 Fraser River Hydraulics and River Morphology Assessment Area in Appendix 18.3 for RSA boundary.

- Temporal boundaries:
  - Existing conditions
  - Project construction phase:
    - Site preparation and pre-construction activities
    - Construction of the new bridge
    - Decommissioning and removal of the existing bridge
  - Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints that could inhibit assessment of this IC were identified; therefore no administrative boundary is defined.

- Technical boundaries – no issues related to technical constraints (e.g. site access or data) that could inhibit assessment of this IC were identified; therefore no technical boundary is defined.

#### 4.1.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent is using the following approach to collect baseline information on river hydraulics and morphology:

- Review existing information on Fraser River hydraulics and morphology
- Review ATK, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies, and integrate relevant information provided with permission for use in the Application into the assessment of river hydraulics and morphology.
- Conduct field investigations to gather additional information on existing conditions (to calibrate and validate the models that will be used to assess potential Project effects)
- Use physical modelling to assess “near-field” (local) hydraulics and morphology effects (using a 1:80 scale physical model)
- Use numerical (i.e., computer) modelling to assess both “near-field” and “far-field” hydraulics and morphology effects

A scale model of the LSA has been constructed to assess the hydraulic and morphological baseline of the river, including around all existing piers. Two numerical models will also be used to: (a) provide preliminary indications of near-field effects on hydraulics; and (b) to assess potential far-field effects on hydraulics and morphology beyond the limits of the physical model.

The modeling results will be interpreted in order to assess the proposed Project’s potential hydraulic and morphologic effects on fish and fish habitat, marine use, surface water and sediment quality, and archaeological resources.

The Application will include a summary of the hydraulic assessment and an appendix containing detailed technical information related to river hydraulics and river morphology assessment.

#### 4.1.3 Potential Effects

The Application will identify potential adverse effects to the IC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

Fraser River Hydraulics and Morphology together comprise one of the ‘steps’ along the pathway of effects of the Project, with Fish and Fish Habitat, and Marine Use being the ultimate receptors of Project-related effects. The Fraser River Hydraulics and Morphology study will focus on water levels, velocities, and flow

patterns (river hydraulics) in the Fraser River and their influence on scour and sediment deposition (morphology).

Hydraulic modelling will be used to assess potential adverse hydraulic and morphological effects on navigation, environment, and infrastructure. The modelling will be based on:

- A spatial extent that encompasses, at a minimum, the area from the Alex Fraser Bridge in South Arm to the Port Mann Bridge in the Main Arm; downriver in the North Arm to Queensborough Highway Bridge; and downriver in Annacis Channel to Annacis Swing Bridge.
- A temporal extent that includes current conditions (for validation purposes), construction period when all piers of the new bridge are present, post construction (i.e. after demolition of the existing bridge).
- Predictions of potential changes in river hydraulics and morphology: this includes potential changes to currents and sedimentation at sites identified by VFPA in the document “PBRep – Hydraulic Model – Identification of VFPA Key Nodes – 2016 -10-20”.
- An assessment of potential effects on flow split between the Fraser River South Arm, Fraser River North Arm, and Annacis Channel as per function of a series of river training structures within the vicinity of the proposed works.

*The numerical modeling will be based on the Reference Concept.*

#### 4.1.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the IC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### 4.1.5 Residual Effects

Where an adverse residual effect is identified, the Application will describe the residual effect in terms of the context, magnitude, extent, duration, reversibility, and frequency as outlined in section [3.6 Characterization of Residual Effects](#) in this AIR, and in sufficient detail to support the assessment of relevant receptor VCs.

#### 4.1.6 Cumulative Effects

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Certain/Reasonably Foreseeable Projects and/or Activities](#) in this AIR.

- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, it will be described in sufficient detail to support the cumulative effects assessment of relevant receptor VCs.

#### 4.1.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

## 4.2 Surface Water and Sediment Quality

Project design and implementation may affect surface water and sediment quality in the Project area. Instream and near-stream construction/demolition activities have the potential to produce elevated suspended solids in surface water, and increase sediment deposition in sensitive habitats. Surface Water and Sediment Quality comprise 'steps' along the pathway of effects of the Project, with Fish and Fish Habitat, Vegetation, and Wildlife being the ultimate receptors of Project-related effects.

The Surface Water and Sediment Quality IC will be assessed in terms of the following subcomponents:

- Surface water quality; and
- Sediment quality.

Potential effects of the proposed Project on these two subcomponents will be assessed for both the construction and operation phases. The results of the effects assessment will be interpreted in a way that supports the assessment of potential Surface Water and Sediment Quality effects on the above ultimate receptor VCs.

The assessment will focus on the following indicators:

- Alteration of drainage patterns;
- Changes in surface water quality and sediment quality, focusing on potential contaminants of concern; and
- Changes in sediment deposition.

#### 4.2.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for Surface Water and Sediment Quality:



- Spatial boundaries:
  - Local Study Area (LSA):
    - In the Fraser River, the Surface Water and Sediment Quality LSA is defined as the section of the Fraser River extending from about 1 km upstream to 1 km downstream of the existing Pattullo Bridge. The upstream boundary corresponds to the downstream end of Sapperton Bar. The downstream boundary corresponds to Tannery Road on the Surrey Side and Fourth Street on the New Westminster side. These boundaries were selected to be consistent with the Fish and Fish Habitat LSA boundaries, and to encompass the River Hydraulics and River Morphology LSA;
    - On the Fraser River banks, the LSA extends to the Higher High Water Level (HHWL) – large tide along the reach of the Fraser River. This mirrors the river bank LSA definition for River Hydraulics and River Morphology;
    - The LSA also extends upland to include tributary surface water courses that discharge into the Fraser River and within an approximately 30 m buffer around the proposed Project Boundary on both the Surrey and New Westminster banks. This boundary ensures any Project-related effects on land are encompassed by the LSA, and roughly corresponds to the upland portion of the Fish and Fish Habitat LSA.

See Figure A1.6 Surface Water and Sediment Assessment Area in Appendix 18.3 for LSA boundary.

- Regional Study Area (RSA): The RSA extends from 6 km upstream to 5.5 km downstream of the existing Pattullo Bridge for the mainstem Annacis Channel and North Arm Fraser River, and 8 km downstream for the South Arm Fraser River. The RSA extends to the HHWL along the shoreline, and will cover an area extending from downstream of the Port Mann Bridge to downstream of Alex Fraser Bridge in Annacis Channel (mainstem). In Annacis Channel, the RSA extends to upstream of the Annacis Channel Bridge, and in the North Arm it extends to downstream of the Queensborough Bridge. These boundaries were selected to be consistent with the RSA boundaries for River Hydraulics and River Morphology.

See Figure A1.6 Surface Water and Sediment Assessment Area in Appendix 18.3 for RSA boundary.

- Temporal boundaries:
  - Existing conditions
  - Project construction phase:
    - Site preparation and pre-construction activities
    - Construction of the new bridge

- Decommissioning and removal of the existing bridge
  - Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints that could inhibit assessment of this IC were identified; therefore, no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g., site access or data) that could inhibit assessment of this IC were identified; therefore no technical boundary is defined.

#### 4.2.2 *Existing Conditions*

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent is using the following general approach to characterize surface water quality and sediment quality in the proposed Project area:

- Literature review, including review of background information on temporal trends in surface water quality and sediment quality in the Fraser River, and causal relationships with environmental variables; and
- Field assessments of surface water quality and sediment quality in watercourses within the LSA.

The Application will include technical information related to assessment of Surface Water and Sediment Quality.

#### 4.2.3 *Potential Effects*

The Application will identify potential adverse effects to the IC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

Construction and demolition activities may cause short-term adverse effects to water quality. For example, construction activities, specifically under inclement weather conditions such as larger than normal storm events, can potentially accelerate erosion in work site areas, produce construction-induced adverse water quality effects on streams and rivers (e.g., by increasing sediment load or contributing deleterious substances), increase suspended sediment concentrations and/or instream sediment deposition, cause changes in river hydraulics, morphology, and produce other potentially adverse effects on surface water quality. The results of the Contamination Risk Assessment undertaken as part of the assessment of the Soil and Groundwater IC will also inform the assessment of Surface Water and Sediment Quality.

#### 4.2.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to

the IC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### *4.2.5 Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will describe the residual effect in terms of the context, magnitude, extent, duration, reversibility, and frequency as outlined in section [3.6 Characterization of Residual Effects](#) in this AIR, and in sufficient detail to support the assessment of relevant receptor VCs.

#### *4.2.6 Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.

Where an adverse residual cumulative effect is identified, it will be described in sufficient detail to support the cumulative effects assessment of relevant receptor VCs.

#### *4.2.7 Follow-up Strategy*

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

### **4.3 Fish and Fish Habitat**

The Project has the potential to affect the Fraser River, and some upland tributaries of the Fraser River. Project implementation could have direct adverse effects on individual fish, and may result in permanent or temporary change in fish habitat form and function (e.g., the Project has the potential to cause changes in flow velocity in the Fraser River that could affect fish migration).

The Fish and Fish Habitat VC is divided into the following subcomponents:

- Key species;
- “Forage fish”; and
- Fish habitat form and function.

The assessment of fish will focus on the following fish species that are documented to be present or potentially present in the Project area that 1) form part of a commercial, recreational, or Aboriginal fishery (collectively termed “CRA” fisheries as defined in the federal *Fisheries Act*); 2) are classified as a species at risk (i.e., listed under schedules of the federal *Species at Risk Act* [SARA]) and/or provincially “red-listed” or “blue-listed”; or 3) have Aboriginal importance. They include:

- Salmonidae:
  - Pacific salmon – chinook, chum, coho, pink, and sockeye;
  - Trout – coastal cutthroat trout and rainbow/steelhead trout; and
  - Char – Dolly Varden and bull trout.
- Sturgeon – white sturgeon, green sturgeon;
- Eulachon; and
- Mountain sucker

Green sturgeon and mountain sucker are unlikely to be present in the Project area, but these species are included because they are each listed as a species of special concern under SARA. It is intended that the key species listed above collectively represent fish in general, including those that support a CRA fishery and those protected under Schedule 1 of SARA (where applicable). The assessment will also include consideration of a general category, termed “forage fish” (excluding Eulachon and Mountain Sucker that are already listed as individual species for assessment), which are prey for the key (i.e., CRA) species listed above. Forage fish are considered to include various species of minnows.

Fish habitat will be assessed from the perspectives of form and function, in particular relating to habitat use by the above-listed species. Regarding habitat function, initial study indicates that the Fraser River crossing area functions mainly as a migration corridor. Therefore, the assessment of habitat function in the Fraser River will interpret and build on the results of the hydraulic modelling and consider fish life-cycles (including timing of migrations by species).

The following indicators are proposed for the assessment of the Fish and Fish Habitat VC:

- Potential for physical injury/mortality to fish (in relation to the key species listed above); and
- Changes to fish habitat quantity, quality and function for life cycle components of key species listed above, including:
  - Changes to habitat suitability and availability;
  - Changes to water quality;
  - Changes to Fraser River hydraulics and river morphology.

Assessment of fish habitat quantity, quality, and function will include a consideration of the following issues identified by the Advisory Working Group during their initial review of the Valued Component Selection and Rationale Document for the Project:

- Potential for mobilization of contaminants into the aquatic environment through Project-related activities in areas of pre-existing soil/groundwater contamination, supported by assessment of Soil and Groundwater as outlined in Section 4.5 of this dAIR; and

- Project-related activities that limit the shade or cooling spaces for spawning salmon.

This section of the Application will assess environmental effects defined in subsection 5(1) of CEAA 2012 that are of relevance to Fish and Fish Habitat. If it is determined that the Project will not result in environmental effects defined in subsection 5(1) of CEAA 2012, rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives and ATK, where available publicly, or provided with permission for use in the Application during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies.

#### 4.3.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable to the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for the Fish and Fish Habitat VC:

- Spatial boundaries:
  - Local Study Area (LSA): Section of the Fraser River extending from 1 km upstream to 1 km downstream of the existing Pattullo Bridge, and 30 metres (m) either side of the Fraser River within the upstream and downstream boundaries plus the following upland areas. The boundaries of the physical hydraulic model for assessing Fraser River Hydraulics and Morphology (as influenced by scour and depositional processes) fall within these boundaries. In Surrey, the area bounded by Tannery Road from the Fraser River to 120 Street, then 120 Street/Scott Road to Old Yale Road, then Old Yale Road to Bridgeview Drive, north along 130 Street to the Fraser River. In New Westminster, the area bounded by Fourth Street from the Fraser River to Third Avenue, Third Avenue to First Street, First Street to Sixth Avenue, and Cumberland Street from Sixth Avenue to the Fraser River

See Figure A1.1 Fish and Fish Habitat Assessment Area in Appendix 18.3 for LSA boundary.

- Regional Study Area (RSA): Section of the Fraser River extending from 6 km upstream to 5.5 km downstream of the existing Pattullo Bridge for the Mainstem and North Arm, and 8 km downstream for the South Arm, plus upland areas covered by the LSA and a 100m buffer around it. These boundaries are consistent with the boundaries of the numerical hydraulic model that will be used to assess Fraser River Hydraulics and Morphology.

See Figure A1.1 Fish and Fish Habitat Assessment Area in Appendix 18.3 for RSA boundary.

- Temporal boundaries:
  - Existing conditions
  - Project construction phase:

- Site preparation and pre-construction activities
  - Construction of the new bridge
  - Decommissioning and removal of the existing bridge
- Project operations phase
- Administrative boundaries:
  - No issues related to political, economic or social constraints that could inhibit assessment of this VC were identified; therefore no administrative boundary is defined.
- Technical boundaries:
  - No issues related to technical constraints (e.g. site access or data) that could inhibit assessment of this VC were identified; therefore no technical boundary is defined.

#### 4.3.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The following general approach is being taken to generate information with respect to existing conditions of fish and fish habitat:

- A review of literature describing fish species occurrence and distribution, and fish habitat characteristics (i.e., riparian vegetation, streambed type, water quality) in the Fraser River and in potentially affected tributaries to the Fraser River.
- Characterization of habitat conditions of the lower Fraser River based on available and usable data from the Fraser River Hydraulic and Morphology models.
- Field surveys to characterize fish habitat and confirm the presence and distribution of fish in upland watercourses potentially affected by the proposed Project.
- Review of available ATK provided by Aboriginal Groups through consultation or Project-specific studies and integration of relevant information into the Fish and Fish Habitat existing conditions. Inclusion of ATK in the Application will be subject to the confidentiality provisions of relevant MOUs between TransLink and Aboriginal Groups and between MoTI and Aboriginal Groups.

Regulation and management of fish and fish habitat in B.C. occurs through the following provincial and federal legislation:

- B.C. *Fish Protection Act*;
- B.C. *Water Sustainability Act*, S.B.C. 2014, c.15;
- B.C. *Wildlife Act*, R.S.B.C. 1996, c.488;
- Federal *Fisheries Act*, R.S.C. 1985, C. F-14; and

- Federal *Species at Risk Act* (SARA), S.C. 2002, c.29.

The Proponent's proposed approach for assessing this VC includes the following steps:

- Review existing data on fish and fish habitat for key species identified for assessment based on literature and field surveys
- Review ATK, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies, and integrate relevant information provided with permission for use in the Application, into assessment of the Fish and Fish Habitat VC.
- Undertake acoustic modelling of underwater noise generated during Project-related in-river construction activities, specifically installation of in-river piers.
- Review results of assessments of relevant VCs and ICs, including:
  - Fraser River Hydraulics and River Morphology
  - Surface Water and Sediment Quality
  - Soil and Groundwater
  - Lighting and Shading

#### 4.3.3 *Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

The proposed Project has the potential to affect fish and fish habitat during construction. Fish may be directly affected by construction-related activities (e.g., through exposure to deleterious substances from accidental spills) or indirectly affected by Project-induced changes in habitat (e.g. increased levels of underwater noise, hydraulic changes). Permanent loss or alteration of fish habitat (aquatic and/or riparian) may result from displacement or alteration of existing habitat by Project infrastructure (e.g. bridge supports in the river).

The Proponent will:

- Assess Project interactions and related potential adverse effects on fish and fish habitat, with appropriate consideration of fish life cycles and seasonality/timing of fish species.

The Assessment will consider potential effects of Project construction-related noise and vibration transmitted through water (i.e. underwater noise) on the underwater acoustic environment, and associated effects on fish. A full-wave numerical sound propagation model will be used to simulate the transmission of sound generated during pile installation (i.e. the Project-related activity that is expected to have the maximum effect on underwater noise conditions) through water-saturated soils into water. Site-specific environmental data that describes the bathymetry, water sound speed, and seabed geoacoustics

in the Fraser River will be considered in the modelling. Four sites, one at each anticipated in-river pier location, will be used for modelling the sound field associated with pile installation. In addition, a composite scenario that represents the sound fields generated by pile installation operations occurring at multiple locations at the same time will be included in the modelling. A report on underwater acoustic modelling undertaken for the Project will be included as a technical appendix in the application.

#### 4.3.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

The Proponent will:

- Identify measures to mitigate potential adverse effects of the Project on fish and fish habitat as appropriate, for example:
  - Studies in advance of Project construction to identify eulachon presence and spawning activity within the Project Boundary
  - Identify and monitor select areas within the Project Boundary for white sturgeon presence prior to, and during, in-river construction activities that have the potential to interact with the species
- Propose a habitat offsetting strategy if habitat offsetting proves necessary.

#### 4.3.5 *Residual Effects and their Significance*

Where an adverse residual effect (post-mitigation) is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect (post-mitigation) is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 4.3.6 *Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by the EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.



- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 4.3.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

## 4.4 Vegetation

The Project area has historically been subject to extensive anthropogenic disturbance, and as a result, existing vegetation cover within the Project Boundary is severely fragmented and dominated by invasive species. However, some consolidated patches of riparian habitat and forest cover exist within the proposed Project Area (on the Surrey side of the Fraser River) that may offer suitable habitat for at-risk plant species or may in part comprise at-risk ecological communities.

The assessment of the VC will focus on the following subcomponents:

- Rare plants;
- At-risk plant communities; and
- Wetland ecosystems.

The following indicators are proposed for describing existing baseline conditions and assessing potential Project-related effects on vegetation:

- Presence/absence of federally and provincially listed plants and their locations and areal extent (if present);
- Presence/absence of plant communities (general) and their locations and aerial extent (if present);
- Presence/absence of federally and provincially listed plant communities and their locations and areal extent (if present); and
- Presence/absence of wetlands, and their location and aerial extent (if present).

The Application will assess environmental effects defined in subsection 5(1) of CEAA 2012 that are of relevance to vegetation. If it is determined that the Project will not result in environmental effects defined in subsection 5(1) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives and ATK, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through

Project-specific studies.

#### 4.4.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for vegetation:

- Spatial boundaries:
  - Local Study Area (LSA): The terrestrial area directly affected by the proposed Project footprint, plus a 250-m terrestrial area surrounding the proposed Project design footprint within which potential effects from the proposed Project may interact with vegetation.  
  
See Figure A1.2 Vegetation Assessment Area in Appendix 18.3 for LSA boundary.
  - Regional Study Area (RSA): Due to the disturbed nature of the site the proposed Project-related effects on vegetation are expected to be minimal and limited to the LSA. No RSA is defined for vegetation.
- Temporal boundaries:
  - Existing conditions
  - Project construction phase:
    - Site preparation and pre-construction activities
    - Construction of the new bridge
    - Decommissioning and removal of the existing bridge
  - Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints that could inhibit assessment of this VC were identified; therefore no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g., site access or data) that could inhibit assessment of this VC were identified; therefore no technical boundary is defined.

#### 4.4.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent is studying the type, amount, and distribution of vegetation in the proposed Project area through the following methods:

- Available databases and results of previous studies are being reviewed to develop a list of at-risk plant species and ecological communities that may be present.
- Terrestrial Ecosystem Mapping will be conducted to inform desktop assessment and direct field studies.
- Field surveys are being undertaken to confirm the presence or absence of at-risk species and communities.
- Review results of assessments of other relevant VCs and ICs, including:
  - Surface Water and Sediment Quality;
  - Soil and Groundwater;
  - Lighting;
  - Shading; and
  - Historical Heritage (i.e. landscape elements).
- Review ATK, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies, and integrate relevant information provided with permission for use in the Application into the assessment of the Vegetation VC.

Regulation and management of vegetation in B.C. occurs through the following legislation:

- *Forest and Range Practices Act (FRPA)*, S.B.C. 2002, c.69 and the *Forest and Range Practices Act, Forest Planning and Practices Regulation (BC Reg. 177/2014)*; and
- *Species at Risk Act (SARA)*, S.C. 2002, c. 29.

In addition to the above legislation, the following guidelines, standards, management tools also apply:

- *BC Conservation Data Centre, Conservation Status Ranks and Red and Blue Lists*
- *Classification and Management of Rare Ecosystems in British Columbia (McLennan and Ronalds 1999)*
- *Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia (MOE 2014b)*
- *Standard for Terrestrial Ecosystem Mapping in British Columbia (RIC 1998a)*

If appropriate, an appendix containing technical information relating to the vegetation assessment will be included in the Application.

#### 4.4.3 *Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

The proposed Project has the potential to affect rare plants and plant communities through the potential elimination of consolidated patches of riparian habitat and forest cover. These areas within the proposed Project area (on the Surrey side of the Fraser River) may be suitable habitat for plants and plant communities that are red- or blue-listed by the Provincial Conservation Data Centre (CDC). The proposed Project construction also has the potential to eliminate or degrade wetland ecosystems during construction.

The Application will include an assessment of existing vegetation habitat and potential Project-related effects, and description of measures proposed to mitigate adverse effects. For permanent habitat impacts, a description of offsets and/or replanting plans will be included.

The Application will include an assessment of Project-related effects on all federal and provincial listed species-at-risk and a description of proposed mitigation strategies.

The Proponent will use the baseline information to assess potential Project effects on vegetation, including habitat suitable for at-risk plants and plant communities (if present). Anticipated VC interactions with proposed Project components or activities include the following:

- Clearing activities, as well as construction and decommissioning works affecting vegetation cover; and
- The Proponent will use the baseline information to address concerns that construction of the proposed Project could induce or accelerate the spread of invasive species.

The Application will include an invasive species assessment that includes information on existing invasive species, a mitigation plan to prevent spread of invasive species during construction and demolition, and an invasive species monitoring and management plan. Invasive species management will also be addressed in a Vegetation Management Plan (see Part E – Vegetation Management Plans and Follow-Up Programs).

#### 4.4.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### 4.4.5 *Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's

significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 4.4.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 4.4.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR

## 4.5 Wildlife

The fragmented nature of the vegetation limits the quantity and quality of wildlife habitat and this in turn influences the type and abundance of wildlife inhabiting the proposed Project area. Wildlife present in the area is expected to consist primarily of common species of raptor, riverine birds, amphibians and small mammals.

The following wildlife subcomponents will be assessed to determine potential for proposed Project-related effects:

- Wildlife:
  - Migratory birds;
  - Birds (Heron, Peregrine falcons, ospreys, red-tailed hawks, eagles, common nighthawks, western screech owls, barn swallows, urban birds);

- Small mammals (Pacific water shrew); and
- Amphibians (Red-legged frog, Western toad).
- Wildlife habitat (focus on key species listed above).

The following indicators are proposed for describing existing baseline conditions and assessing potential Project-related effects on wildlife:

- Presence/absence of at-risk wildlife; and
- Amount, quality and function of habitat suitable for at-risk wildlife species.

The Application will assess environmental effects defined in subsection 5(1) of CEAA 2012 that are of relevance to wildlife. If it is determined that the Project will not result in environmental effects defined in subsection 5(1) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives and ATK, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies.

#### 4.5.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The Proponent is using the following assessment boundaries are defined for terrestrial wildlife:

- Spatial boundaries:
  - Local Study Area (LSA): The area directly affected by the proposed Project footprint, plus a 250-m area surrounding the proposed Project design footprint within which potential effects from the proposed Project may interact with wildlife.  
  
See Figure A1.3 Wildlife Assessment Area in Appendix 18.3 for LSA boundary.
  - Regional Study Area (RSA): The area lying within a 5 km radius from the outer edge of the LSA design footprint. The area includes Burnaby Lake Regional Park, the edge of Green Timbers Park, Invergarry Park, and forest patches near Burn Creek. These parks represent potential species pools for the Project area.  
  
See Figure A1.3 Wildlife Assessment Area in Appendix 18.3 for RSA boundary.
- Temporal boundaries:
  - Existing conditions
  - Project construction phase:

- Site preparation and pre-construction activities
- Construction of the new bridge
- Decommissioning and removal of the existing bridge
- Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this VC; therefore no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g. site access or data) were identified that could inhibit assessment of this VC; therefore no technical boundary is defined.

#### 4.5.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent is using the following general approach to collect baseline information on potentially affected wildlife and wildlife habitat, and to assess the presence of at-risk wildlife species:

- A review of literature to identify wildlife species with the potential to occur in the proposed Project area.
- Field studies to confirm the presence of wildlife and wildlife habitat, including migratory birds and their habitat, within the proposed Project area.
- Assessment of the suitability of identified wildlife habitat to accommodate at-risk wildlife species.
- Review results of assessments of other relevant VC/ICs, including:
  - Vegetation;
  - Surface Water and Sediment Quality;
  - Soil and Groundwater;
  - Noise and Vibration;
  - Lighting; and
  - Shading.
- Review ATK, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies, and integrate relevant information provided with permission for use in the Application into the assessment of the Wildlife VC.

Regulation and management of wildlife in B.C. occurs through the following legislation and guidance:

- B.C. *Wildlife Act*, R.S.B.C. 1996, c.488;
- Federal *Migratory Birds Convention Act*, S.C. 1994, C. 22; and
- Federal *Species at Risk Act* (SARA), S.C. 2002, c.29.
- Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia (MOE 2014b)
- Develop with Care: Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (MOE 2013)
- Management Plan for the Western Toad (*Anaxyrus boreas*) in British Columbia. Provincial Western Toad Working Group. Prepared for the BC Ministry of Environment, Victoria, BC. (MOE 2014)
- Guidelines for Amphibian and Reptile Conservation During Urban and Rural Land Development in British Columbia (FLNRO 2014)
- Management Plan for the Western Toad (*Anaxyrus boreas*) in Canada [Proposed]. Species at Risk Act Management Plan Series. (Environment and Climate Change Canada 2016)
- Best Management Practices for Pacific Water Shrew in Urban and Rural Areas. Prepared for the Pacific water shrew recovery team (Craig and Welstead 2010).

#### 4.5.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

The proposed Project has the potential to affect wildlife through loss of habitat (related to loss of vegetation) or through construction induced disturbance of, or injury or mortality to, wildlife caused by construction activities.

The Application will include an assessment of existing wildlife habitat and potential Project-related effects, and a description of measures proposed to mitigate adverse effects. For permanent habitat impacts, a description of offsets and/or replanting plans will be included. The assessment will include impacts and mitigation strategies for nesting birds (for more detail, see Part E – Management Plans and Follow-Up Programs).

The Application will include an assessment of potential Project-related effects on federal and provincial listed species-at-risk and a description of proposed mitigation strategies.

#### 4.5.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management



plans will be referenced. Linkages to other sections in the Application must be identified.

#### *4.5.5 Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### *4.5.6 Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### *4.5.7 Follow-up Strategy*

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR

## **4.6 Soil and Groundwater**

The proposed Project area is characterized by historical and ongoing industrial and commercial use and therefore Project construction could potentially encounter pre-existing soil and/or groundwater contamination. Construction and/or demolition activities will entail ground improvement, excavation of soils and local dewatering. These activities may disturb pre-existing contaminated soils and/or groundwater and potentially mobilize contaminants. In addition, groundwater disturbance may affect

existing groundwater wells. Soil and Groundwater is a pathway IC that could potentially affect the following ultimate receptor VCs:

- Fish and Fish Habitat;
- Vegetation;
- Wildlife; and
- Human Health (local residents).

Soil and Groundwater will be assessed in terms of the following subcomponents:

- Soil Quality; and
- Groundwater Quality.

The soil and groundwater assessment will focus on the following indicators:

- Presence/absence, character and extent of pre-existing contaminated soil; and
- Presence/absence, character and extent of pre-existing contaminated groundwater.

#### 4.6.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable to soil and groundwater, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for soil and groundwater quality:

- Spatial boundaries:
  - Local Study Area (LSA): 250 m from the extent of the proposed Project design footprint on land. This area is expected to encompass all proposed Project related soil excavation as well as potential Project-induced migration of possible groundwater contaminants.  
See Figure A1.5 Soils and Groundwater Assessment Area in Appendix 18.3 for LSA boundary.
  - Regional Study Area (RSA): An RSA is not applicable, as any potential impacts to soil and groundwater are anticipated to be highly localized and within the LSA.
- Temporal boundaries:
  - Existing conditions
  - Project construction phase:
    - Site preparation and pre-construction activities
    - Construction of the new bridge
    - Decommissioning and removal of the existing bridge

- Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints that could inhibit assessment of this IC were identified; therefore no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g. site access or data) that could inhibit assessment of this IC were identified; therefore no technical boundary is defined.

#### 4.6.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent will undertake a contamination risk assessment of the proposed Project area to better understand the possibility of encountering and disturbing contaminated media during the construction phase. This will include a review of:

- existing information on surficial geology and soils;
- results of geotechnical assessments;
- information on historical and current land use; and,
- the provincial contaminated sites registry.

The results of the risk assessment will be interpreted in the context of potential Project effects on fish and fish habitat, amphibians (if present), and vegetation. Depending on the findings of the risk assessment, intrusive sampling may be used to further characterize soil and groundwater quality in different areas of the proposed Project.

The Application will provide a summary of the assessment of soils and groundwater and include an appendix containing detailed technical information relating to the soils and groundwater assessment.

#### 4.6.3 Potential Effects

The Application will identify potential adverse effects to the IC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

Construction, including excavation, may directly disturb soils and groundwater. Given historical land use in the Project area, this may result in disturbance of pre-existing contaminated soils or groundwater. Proposed Project infrastructure may affect soil and groundwater quality in the longer term by altering surface topography, surface water runoff patterns and groundwater flows.

#### 4.6.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the IC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### 4.6.5 *Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will describe the residual effect in terms of the context, magnitude, extent, duration, reversibility, and frequency as outlined in section [3.6 Characterization of Residual Effects](#) in this AIR, and in sufficient detail to support the assessment of relevant receptor VCs.

#### 4.6.6 *Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.

Where an adverse residual cumulative effect is identified, it will be described in sufficient detail to support the cumulative effects assessment of relevant receptor VCs.

#### 4.6.7 *Follow-up Strategy*

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

### 4.7 **Noise and Vibration**

The noise environment in the Project area is strongly influenced by traffic on the existing Pattullo Bridge and on the main roads connecting to the bridge. Other noise sources include local traffic, trains, aircraft and marine related activities. Future operation of the new bridge has the potential to change existing noise conditions for noise sensitive receptors such as local residences. Construction also has the potential to temporarily change noise levels experienced by noise sensitive receptors.

Atmospheric noise acts as a pathway component (IC) that potentially affects the following ultimate receptor VCs:

- Wildlife;
- Economic Activity;
- Land Use; and

- Human Health – Physical Determinants

Vibration is also a pathway component, or IC, that potentially affects the following ultimate receptor VCs:

- Economic Activity;
- Land Use; and
- Human Health – Physical Determinants.

Changes in noise and vibration could also affect the current use of lands and resources for traditional purposes (refer to Section 11) and Aboriginal Interests (refer to Section 12).

The Noise and Vibration VC will be assessed in terms of the following subcomponents:

- Operational noise;
- Construction noise and vibration.

The assessment will focus on the following indicators:

- Incremental change in noise levels as a result of operating the Project, including the new bridge and connecting roads;
- Incremental change in noise levels attributable to constructing the new bridge and removing the existing bridge (excluding pile driving); and
- Incremental change in noise levels and vibration resulting specifically from pile driving.

The assessment approach will generally follow the BC Ministry of Transportation and Infrastructure (MOTI) 2014 Noise Policy. In addition, applicable sections of VFPA's PER guidance for noise assessment will be used to analyze and interpret noise assessment data in relation to noise sensitive receptors located within VFPA jurisdiction. The assessment will identify areas where noise mitigation will be considered.

#### 4.7.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the Noise and Vibration, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for atmospheric noise:

- Spatial boundaries:
  - Local Study Area (LSA): The LSA includes a 500 m buffer from the edge of the Reference Concept over land and a 1,500 m buffer over water. These boundaries are consistent with Health Canada (2011), World Health Organization guidelines (1995), the 2014 ~~MOTI~~ MOTI noise policy and VFPA's noise assessment guidelines.

See Figure A1.7 Noise and Vibration Assessment Area in Appendix 18.3 for LSA boundary.

- Regional Study Area (RSA): An RSA is not defined for noise and vibration i.e. it is deemed not applicable. Potential adverse noise and vibration effects are anticipated to be highly localized, as determined through initial review of traffic modeling data which show negligible increase in traffic volume from the LSA to a broader region. On that basis, the LSA has been defined to capture noise-sensitive receptors located within the acoustic zone of influence of the proposed Project.
- Temporal boundaries:
  - Existing conditions
  - Project construction phase:
    - Site preparation and pre-construction activities
    - Construction of the new bridge
    - Decommissioning and removal of the existing bridge
  - Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints that could inhibit assessment of this IC were identified; therefore no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g. site access or data) that could inhibit assessment of this IC were identified; therefore no technical boundary is defined.

#### 4.7.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent is undertaking baseline studies to assess the pre-Project noise environment, focusing on the identified residents' existing exposure to noise. Pre-Project ("baseline") noise monitoring undertaken as part of baseline studies will be used to:

- establish existing ambient noise levels in the Project area;
- estimate the contribution of existing Pattullo Bridge traffic to present ambient noise levels;
- calibrate the numerical model that will be used to estimate future noise effects resulting from Project operation; and
- establish a baseline for estimating temporary noise effects arising from construction and demolition

Noise monitoring stations will be located so as to represent noise sensitive receptors (both residential and

nonresidential), including receptors expected to have the highest exposure to Project noise.

#### *4.7.3 Potential Effects*

The Application will identify potential adverse effects to the IC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

Due to the realignment of the bridge, there may be some changes (increases or decreases) in operational noise exposures for some noise-sensitive receptors. Construction activities may be expected to produce some adverse noise effects, particularly if nighttime work proves necessary to avoid traffic conflicts, and during particularly noisy activities such as pile driving.

Based in part on the results of traffic modelling, noise modelling will be used to predict the residents' exposure to noise after the new bridge becomes operational. Operational noise will be predicted for the year 2033 (ten years after the new bridge opens).

In addition, The Proponent will use a generic model to assess the potential exposure of noise receptors to construction noise, excluding pile driving noise which will be assessed separately along with pile driving vibration.

The Application will provide a chapter summarizing the noise and vibration assessment. An appendix will explain the technical details of the assessment.

#### *4.7.4 Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### *4.7.5 Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will describe the residual effect in terms of the context, magnitude, extent, duration, reversibility, and frequency as outlined in section [3.6 Characterization of Residual Effects](#) in this AIR, and in sufficient detail to support the assessment of relevant receptor VCs.

#### *4.7.6 Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.

- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.

Where an adverse residual cumulative effect is identified, it will be described in sufficient detail to support the cumulative effects assessment of relevant receptor VCs.

#### 4.7.7 *Follow-up Strategy*

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

## 4.8 Air Quality

Project operations may change ambient air quality, both in the immediate Project area and beyond, as a result of Project-induced changes to traffic and corresponding changes to emission levels. Based on experience, concern focuses on sensitive receptors located close to major roads where traffic will increase substantially. Construction of the new bridge and demolition of the existing bridge also have the potential to change ambient air quality in the Project area, thereby temporarily affecting air quality experienced by sensitive receptors. Potential adverse effects relating to both operation and construction are likely to be highly localized.

Air Quality is an IC that may potentially affect the following ultimate receptor VCs:

- Economic Activity;
- Land Use; and
- Human Health – Physical Determinants.

Changes in air quality could also have a measureable effect on the current use of lands and resources for traditional purposes (refer to Section 11) and Aboriginal Interests (refer to Section 12).

The air quality assessment will assess the following potential adverse air quality effects:

- Project-induced changes in air quality during operational phase (estimated for the first year of operation); and
- Project-induced changes in air quality during construction/demolition phase (qualitative approach).

Air quality modelling will be used to assess the long-term air quality effects of operating the proposed Project. Methodology developed by the U.S. Environmental Protection Agency (EPA), which involves computer modelling (Model: MOVES), will be used to predict Project-induced air emission factors. A second model, CAL3QHCR, also developed by the EPA, will be used to simulate dispersion of airborne contaminants to select sensitive receptors (these will be chosen so as to enable a conservative assessment of potential adverse air quality effects).



The air quality assessment will consider potential Project-induced changes to airborne Criteria Air Contaminants (CACs). The following CACs will be modelled:

- Nitrogen oxides (NO<sub>x</sub>)
- Particulate matter (PM<sub>x</sub>) (total PM, PM<sub>10</sub> and PM<sub>2.5</sub>), including PM resulting from road dust and diesel emissions
- Carbon monoxide (CO)
- Volatile organic compounds (VOCs)

The air quality assessment will also consider potential Project-induced changes to Greenhouse Gas levels in the broader Metro Vancouver area and possibly beyond (depending on the geographic extent of effects).

The assessment will meet applicable air quality assessment guidelines of the VFPA.

The air quality assessment will focus on the following indicators:

- Project-induced changes to air quality during the operational phase (estimated for the first year of operation)
- Project-induced changes in air quality during the construction/demolition phase.

#### 4.8.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable to air quality, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for air quality:

- Spatial boundaries:
  - [Local Study Area \(LSA\)](#): Includes a 500 m buffer from the centerline extent of proposed Project design footprint. Air quality impacts are expected to be highly localized.  
  
See Figure A1.8 Air Quality Assessment Area in Appendix 18.3 for LSA boundary.
  - [Regional Study Area \(RSA\)](#): The RSA consists of the area covered by the regional traffic modelling undertaken for the study.

Initial modelling of traffic indicated that traffic speeds and volumes on the proposed Project, will be very similar to speeds and volumes that currently exist in the proposed Project design footprint. Potential proposed Project-induced changes to the regional network are expected to be small. Changes in traffic speed and volume beyond the LSA limits e.g., across alternative bridges and on main arteries leading to and from the proposed Project design footprint are also

expected to be small. The initial traffic modelling assumed that the new bridge would be tolled. Additional traffic modelling is now being conducted using a “no toll” scenario (no toll on the proposed Pattullo Replacement Bridge and existing tolls lifted from Port Mann Highway and Golden Ears Bridge. This alternative scenario may result in more pronounced changes to traffic that in turn could lead to greater air emissions.

- Temporal boundaries – includes the pre-Project baseline conditions, and construction and operations phases.
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this VC; therefore no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g. site access or data) were identified that could inhibit assessment of this VC; therefore no technical boundary is defined.

#### 4.8.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

Existing air quality conditions will be determined through a combination of historical air quality monitoring data review and computer modelling of roadway emissions in the LSA. This will be done for a selection of sensitive receptor locations (residences, schools, etc.) in proximity to the major roads affected by the Project.

In accordance with the *Air Quality Dispersion Modelling Guideline* (AQDMG) (BC MOE 2015), measured background concentrations will be used to represent the contribution from other natural and anthropogenic sources other than roadways in the area, and incorporated into the computer model. Monitoring data from six ambient air quality monitoring stations operated by Metro Vancouver in Burnaby, Port Moody, North Delta, and Coquitlam were obtained to characterize background air quality in the study area.

The modelling work will use US EPA’s Motor Vehicle Emission Simulator (MOVES 2014a) software to calculate tailpipe emissions, US EPA emission factors for road dust, and the CAL3QHCR dispersion model for predicting the dispersal of air pollutants as they drift away from the emission sources (US EPA 1995; 2011; 2014).

Existing annual GHG emissions will be estimated for the entire road network within the RSA using data from Metro Vancouver’s website and Government of Canada’s National Inventory Report.

Metro Vancouver operates a large network of air quality stations in the Lower Mainland, each of which monitors a specific set of pollutants focused on CACs. The National Air Pollution Surveillance network in turn collects data on non-CACs. The Proponent will analyze data from these sources to characterize existing air quality conditions in the proposed Project area.

The Application will include any technical information related to assessment of air quality for proposed Project.

#### *4.8.3 Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

Although local air quality in the proposed Project alignment is generally good, an increase in traffic congestion around the existing bridge has led to increased idling and slower traffic movements during peak periods. Idling and slower vehicle movements produce greater per-vehicle emissions of air contaminants such as fine particulate matter and nitrogen oxides (NOx) when compared to uncongested conditions.

The proposed Project is expected to improve local air quality somewhat in some locations, but potentially worsen it in others, due to shifting traffic patterns related to the implementation of user pricing. However, all of these changes will be on a backdrop of steadily declining tailpipe emissions, and corresponding reduction in levels of air pollutants of local concern, due to federal regulations dealing with emissions from on-road vehicles manufactured and sold in Canada.

An assessment of the contributions to air quality and climate change associated with the project will be conducted.

#### *4.8.4 Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### *4.8.5 Residual Effects*

Where an adverse residual effect is identified, the Application will describe the residual effect in terms of the context, magnitude, extent, duration, reversibility, and frequency as outlined in section [3.6 Characterization of Residual Effects](#) in this AIR, and in sufficient detail to support the assessment of relevant receptor VCs.

#### *4.8.6 Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.

- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.

Where an adverse residual cumulative effect is identified, it will be described in sufficient detail to support the cumulative effects assessment of relevant receptor VCs.

#### *4.8.7 Follow-up Strategy*

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

## 5.0 ECONOMIC EFFECTS ASSESSMENT

The Application will include an assessment of economic VCs identified in the AIR. The assessment will be conducted in accordance with the methodology specified in section [3.0 Assessment Methodology](#) in this AIR and reported using the organizational structure demonstrated in the section [4.0 Environmental Effects Assessment](#).

The following Economic Effects VCs have been identified for assessment under the economic pillar:

- Economic Activity.

### 5.1 Economic Activity

The Application will identify the VCs selected for assessment according to the methodology specified in section [3.1 Issues Scoping and Selection of Valued Components](#). The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final.

The proposed Project is located in an urban setting that already experiences a high level of economic activity, as reflected by the presence of a large number of industrial, commercial and retail businesses. The Project has the potential to further increase business opportunity within the study area as well as provide specific economic benefits such as increased employment, employment income, gross domestic product (GPD) and government revenues. The assessment of Economic Activity will confirm these benefits, which will be reported as part of the Project Description. Potential adverse economic effects relate mainly to temporary and/or permanent disruption of business activity and to temporary labour market crowding-out effects.

The assessment will focus on potential Project related impacts to the following subcomponents:

- Employment; and
- Business activity/existing businesses.

The following indicators are proposed for describing existing baseline conditions and assessing potential Project-related effects on Economic Activity:

- Employment required for Project construction (direct, indirect and induced);
- Total local and regional construction labour force (employed and unemployed, and proportion of the local and regional construction labour force required to construct the Project);
- Disruptions to industrial, commercial and retail businesses potentially adversely affected by the Project (e.g. changes in access, visibility of businesses, noise and vibration).

For clarity, this section of the Application will assess environmental effects defined in subsection 5(1) and 5(2) of CEAA 2012 that are of relevance to economic activity, including effects that may be specific to Aboriginal peoples. If it is determined that the Project will not result in environmental effects under subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the

Application. The effects assessment will consider Aboriginal perspectives regarding economic activity, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies.

#### 5.1.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for economic activity:

- Spatial boundaries:
  - [Local Study Area \(LSA\)](#):
    - Labour Market Sub-component: Metro Vancouver (with a focus on Cities of Surrey and New Westminster) to capture extent of labour market effects from Project construction capital expenditures on local demand for construction labour.
    - Disruption to Business Activity Sub-component: 500 m spatial buffer from the proposed Project design footprint to capture areas that may experience direct adverse economic effects from the proposed Project.

See Figure A1.8 Economic Activity Assessment Area in Appendix 18.3 for LSA boundary.
  - [Regional Study Area \(RSA\)](#):
    - Labour Market Sub-component- Province of British Columbia
    - Disruption to Business Activity Sub-component – Cities of New Westminster and Surrey to capture areas that may experience indirect adverse Project effects on business activity/existing businesses through broader changes in traffic patterns resulting from the Project.

See Figure A1.8 Economic Activity Assessment Area in Appendix 18.3 for RSA boundary.
- Temporal boundaries – includes the pre-Project baseline conditions, and construction and operations phases.
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this VC; therefore no administrative boundary is defined.

- Technical boundaries – no issues related to technical constraints (e.g. site access or data) were identified that could inhibit assessment of this VC; therefore no technical boundary is defined.

#### 5.1.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The following general approach is being taken to generate information with respect to Economic Activity existing conditions.

- A review of Statistics Canada and BC Stats labour force data including from:
  - 2016 Canada Census and 2011 National Household Survey (NHS)
  - Labour Market Statistics (BC Stats 2017)
- A custom run of the BC Stats Input-Output Model (I-O model)
- A review of relevant background information and literature describing business activity/ existing businesses that currently operate in the Project area and in the broader region (as applicable). Key data sources include:
  - 2012 Port Metro Vancouver Economic Impact Study (interVISTAS Consulting Inc. 2013)
  - Major Commercial Transportation System – Rail Capacity & Regional Planning Issues Overview (Greater Vancouver Gateway Council 2003)
  - City of Surrey publications providing information on business activity near the Project area (City of Surrey 2010 and 2014)
- Site visits and reviews of satellite images and streetscape images to help determine existing businesses operating in the vicinity of the Project
- Review of ATK, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies, and integration of relevant information provided with permission for use in the Application
- Characterization of the economic baseline:
  - size and employment status of the Metro Vancouver and BC construction labour force; and
  - location and type of industrial and commercial/retail businesses near the Project area.

The Application will include any technical information related to assessment of economic activity.

### 5.1.3 *Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

The baseline information will be used to assess the potential economic effects of the proposed Project (positive or negative). The results of that assessment will provide input to the human health assessment which will include consideration of broad determinants of health, including economic conditions and opportunities).

### 5.1.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

### 5.1.5 *Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

### 5.1.6 *Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.



#### 5.1.7 *Follow-up Strategy*

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

## 6.0 SOCIAL EFFECTS ASSESSMENT

The Application will include an assessment of social VCs identified in the AIR. The assessment will be conducted in accordance with the methodology specified in section [3.0 Assessment Methodology](#) in this AIR and reported using the organizational structure demonstrated in the section [4.0 Environmental Effects Assessment](#).

The Application will identify the VCs selected for assessment according to the methodology specified in section [3.1 Issues Scoping and Selection of Valued Components](#). The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

The following Social Effects VCs have been identified for assessment under the social pillar:

- Marine Use;
- Land Use;
- Community Cohesion; and
- Visual Quality.

The following social components that are not the ultimate receptors of proposed Project-related effects but are part of the effects pathways will be studied as ICs to support the assessment of associated ultimate receptor VCs listed above:

- Lighting; and
- Shading.

The results of these IC assessments will also support the assessment of the current use of lands and resources for traditional purposes (refer to Section 11) and Aboriginal Interests (refer to Section 12).

### 6.1 Marine Use

The section of the Fraser River located in the Project area is used for navigation, commercial, recreational and Aboriginal fishing as well as other marine uses. In-river piers may be necessary to support the new bridge and the location, number, size and shape of the piers will potentially have long-term implications for navigation and fishing in the Project area, as well as other marine use. The Project involves demolition of the existing bridge and corresponding removal of some or all of the existing bridge piers, so it is expected the Project will result in a net reduction in navigational encumbrance (i.e., the number of in-water piers for the new bridge will likely be fewer than the number of piers removed as a result of demolishing the existing bridge). Marine-based construction and decommissioning activities have the potential to temporarily affect navigation, fishing and other marine uses.

The assessment will focus on the following subcomponents:

- Navigation
- Commercial and recreational fisheries
- Other commercial marine use
- Other non-commercial marine use

For details on the assessment of potential effects on Aboriginal fisheries and other marine use for traditional purposes, including navigation associated with that use, see current use of lands and resources for traditional purposes and Aboriginal Interests, in Section 11 and Section 12, respectively.

Indicators for describing existing baseline conditions and assessing potential proposed Project-related effects on Marine Use are as follows:

- Navigation:
  - Navigation use
  - Navigability
- Commercial and Recreational Fisheries:
  - Commercial and recreational fishery activity
  - Harvest area use and access
  - Harvest levels and revenues (commercial)
  - Fishery resource availability
  - Environmental Setting (recreational fisheries)
- Other Commercial and Non-commercial Marine Use:
  - Types of commercial and non-commercial (e.g. recreational) marine use activity
  - Area use and access
  - Birds, wildlife, marine mammals resource availability as relevant (e.g. resources which support marine based tourism and recreation)
  - Environmental setting (e.g. pertaining to marine-based tourism and recreation)

The assessment will address applicable requirements of VFPA and other federal authorities for assessment of potential effects on Marine Use, including potential marine use effects on Aboriginal peoples, such as access to commercial and recreational activities, pursuant to subsection 5(1)(c)(i) of CEAA 2012, as well as potential effects on all peoples under subsection 5(2) of CEAA 2012 due to any changes linked to federal decisions. If it is determined that the Project will not result in environmental effects under subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives regarding non-traditional marine use.

### 6.1.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable to the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for marine use:

- Spatial boundaries:
  - [Local Study Area \(LSA\)](#): Includes the in-water construction and demolition areas of the Project Boundary (including staging areas), and extends 1 km upstream and 1 km downstream from the existing Pattullo Bridge (Fraser River waterway and foreshore area).  
See Figure A1.10 Marine Use Assessment Area in Appendix 18.3 for LSA boundary.
  - [Regional Study Area \(RSA\)](#): Includes the waterways and foreshore of the Lower Fraser River and extends 50 km upstream from the Project Boundary to the District of Mission, and downstream to the North Arm and South Arm/Mainstem, 26 km and 27 km, respectively, and provides appropriate regional context for the assessment.

See Figure A1.8 Economic Activity Assessment Area in Appendix 18.3 for RSA boundary.

- Temporal boundaries:
  - Existing conditions
  - Project construction phase:
    - Site preparation and pre-construction activities
    - Construction of the new bridge
    - Decommissioning and removal of the existing bridge
  - Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this VC; therefore no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g. site access or data) were identified that could inhibit assessment of this VC; therefore no technical boundary is defined.

### 6.1.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The following general approach is being taken to generate information with respect to existing conditions of Marine Use:

- A review of secondary information and literature to inform trends analysis on marine use activity, amenities, locations and use periods; vessel type, number and movements; fishing licenses, harvest levels and revenues; and other characteristics
- Engagement with VFPA, Transport Canada, marine users, other stakeholders and Aboriginal Groups to supplement, clarify and validate secondary data on existing and future marine use.
- Review of information provided by Aboriginal Groups through consultation or Project-specific studies and integration of relevant information provided with permission for use in the Application and into the assessment of Marine Use VC.

Regulation and management of marine use as it pertains to the Marine Use VC occurs through the following:

- *Navigation Protection Act (2012)*
- *Canada Marine Act (1998)*
- *Canada Shipping Act (2001)*
- *Marine Liability Act (2001)*

An appendix containing detailed technical information relating to the Marine Use VC will be included in the Application if appropriate.

#### *6.1.3 Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

Baseline information, combined with the Project related navigation assessment, relevant Project design features (e.g., navigational clearances, number and location of piers) and results from the fish and fish habitat, hydraulic modelling, noise and vibration and air quality assessment will be used to assess potential effects of the proposed Project on navigation and marine use.

#### *6.1.4 Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### *6.1.5 Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's

significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 6.1.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 6.1.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

## 6.2 Land Use

The Project is a major construction/demolition undertaking in a built-up area that may result in localized adverse effects on land use. Potential pathways for adverse effects include reduced access to local residential areas, community institutions, infrastructure and businesses, as well as other factors reducing the utility or viability of some local land uses. These factors include increased noise, vibration, dust levels and/or diminished visual quality.

Subcomponents chosen for assessment include the following:

- Transportation infrastructure including railways;
- Industrial and commercial/retail lands;
- Residential lands and dwellings;
- VFPA lands and leases;
- Community and regional infrastructure and services (e.g., education facilities, parks, health care, emergency and protection services); and

- Utilities, pipelines and other rights-of-way.

Indicators for describing existing baseline conditions and assessing potential proposed Project-related effects on Land Use are as follows:

- Consistency with land use and transportation plans, including relevant Aboriginal Group land use plans, where available publicly or as provided to the Proponent during consultation with Aboriginal Groups;
- Land acquisition and disposal for proposed Project infrastructure and rights-of-way;
- Disruptions to existing land uses through changes in:
  - nuisance effects which may reduce the utility of land and improvements ;
  - traffic patterns including traffic volumes for motorized and non-motorized traffic;
  - ease of motor vehicle access (including parking availability); and
  - ease of access for cycling and pedestrian traffic.

The assessment will address potential land use effects that are specific to Aboriginal peoples, such as access to commercial and recreational activities, pursuant to subsection 5(1)(c)(i) of CEAA 2012, as well as potential effects on all people under subsection 5(2) of CEAA 2012 due to any changes linked to federal decisions. If it is determined that the Project will not result in environmental effects under subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives regarding non-traditional land use, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies.

For an assessment of the current use of lands and resources for traditional purposes and Aboriginal Interests, refer to Section 11 and Section 12, respectively.

#### 6.2.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for land use:

- Spatial boundaries:
  - [Local Study Area \(LSA\)](#):
    - Includes the proposed Project design footprint and the surrounding neighbourhoods following Census Area boundaries: New Westminster – the eastern portion of Downtown New Westminster (Census Tract #207), part of the Queen’s Park neighbourhood and Glenbrooke North neighbourhood (Census Tract #208) and the

Glenbrooke South neighbourhood (Census Tract #209). Surrey – the Bridgeview neighbourhood and the South Westminster neighbourhood (Census Tract #192).

- LSA boundaries were selected to represent the spatial extent to which the Project is likely to interact with planned and existing land uses through direct effects from the Project (e.g. land acquisition and disposal for Project infrastructure and rights-of-way, changes in noise and other nuisance factors, changes in access for motor vehicles and pedestrian/ cycling traffic, and changes in traffic patterns resulting from individual structural components of the Project).

See Figure A1.11 Land Use Assessment Area in Appendix 18.3 for LSA boundary.

- [Regional Study Area \(RSA\):](#)

- The RSA includes the cities of Surrey and New Westminster.
- The RSA boundaries are intended to capture areas that may experience indirect adverse Project effects on land uses through broader changes in traffic patterns resulting from the Project.

See Figure A1.11 Land Use Assessment Area in Appendix 18.3 for RSA boundary.

- Temporal boundaries:
  - Existing conditions
  - Project construction phase:
    - Site preparation and pre-construction activities
    - Construction of the new bridge
    - Decommissioning and removal of the existing bridge
  - Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this VC; therefore no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g. site access or data) were identified that could inhibit assessment of this VC; therefore no technical boundary is defined.

## 6.2.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.



The following general approach is being taken to assemble baseline information for assessing effects on existing land uses and the extent to which the proposed Project is consistent with relevant land use plans:

- Review of land use and zoning in the proposed Project area by reviewing publicly available documentation such as the Metro Vancouver Regional Growth Strategy (RGS), Official Community Plans of the two affected cities, other relevant municipal and regional planning documents, and Aboriginal Group land use plans.
- The proposed Project will affect lands and waters that lie within VFPA jurisdiction and the assessment will consider VFPA's Land Use Plan, in particular VFPA's sub-plan for Planning Area 5 (Fraser River Central)<sup>4</sup>. Similar to a municipality's official community plan, the VFPA's Land Use Plan guides development of VFPA lands and waters over the next 15 to 20 years.
- Site visits and reviews of satellite images and streetscape images to help determine existing land uses in the vicinity of the Project.
- Summarize Statistics Canada 2016 Census data on number of dwellings and other demographic data for the LSA.
- Collect and review publicly available data on land uses by institutions and other community services.

### 6.2.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

The proposed Project has the potential to affect land use activities through changes in access, changes in traffic volumes (motorized and non-motorized), changes in traffic patterns, and changes in noise, air quality and visual landscape. Many of these effects are expected to be beneficial during Project operations, and will be discussed in Part A of the Application. Land uses potentially adversely affected (primarily during Project construction) include: commercial/retail, industrial, residential, community/regional infrastructure and services, road and railway infrastructure and utility rights-of-way.

Similarities in location and capacity between the existing Pattullo Bridge and the proposed Project suggest little potential for proposed Project induced changes in land uses, population growth or population distribution.

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<sup>4</sup> The *Canada Marine Act* sets a clear requirement for Canadian port authorities to adopt a comprehensive land use plan which includes its objectives and policies around development decisions. The VFPA's Land Use Plan articulates VFPA's commitment to responsible stewardship of port lands and waters, and demonstrates VFPA responsiveness to business needs, market trends and emerging issues that will impact the port and the broader community, while also contributing positively to local communities and Aboriginal groups.

#### 6.2.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### 6.2.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 6.2.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 6.2.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

### 6.3 Community Cohesion

Community cohesion, including neighbourhood connectivity, is an important contributor to a community's and an individual's wellbeing. The quality and frequency of personal interactions within and between

neighbourhoods can contribute to a common vision and an individual's sense of belonging or sense of place within a community. Changes in access and traffic patterns may have highly localized adverse effects on community cohesion. The proposed Project is also expected to provide many benefits to community cohesion which will be described in Part A of the Application.

The subcomponents identified to assess Project-related effects on community cohesion include the following:

- Neighborhood connectivity; and
- Social equity.

The Application will provide a description of the following indicators for describing existing baseline conditions and assessing potential Project-related effects.

- Physical connectivity within and between neighbourhoods and also between New Westminster and Surrey specifically:
  - Changes in transportation infrastructure;
  - Changes in traffic patterns (including traffic volumes for motorized, transit and non-motorized traffic);
  - Changes in motor vehicle access;
  - Changes in cycling and pedestrian access; and
  - Changes in physical barriers and safety related to transportation infrastructure (motorized and non-motorized).
- Social equity:
  - Vulnerable populations likely to incur equity effect.

This section of the Application will assess environmental effects defined in subsection 5(1) or 5(2) of CEAA 2012 that are of relevance to the community cohesion sub-components, including effects that may be specific to Aboriginal peoples. If it is determined that the Project will not result in environmental effects defined in subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives regarding community cohesion, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies.

With regard to potential cultural effects on Aboriginal Groups resulting from changes to community cohesion, refer to the assessment of current use of lands and resources for traditional purposes and Aboriginal Interests (Section 11 and Section 12, respectively).

## 6.3.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as

applicable of the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for Community Cohesion:

- **Spatial boundaries:**

## [Local Study Area \(LSA\):](#)

- Includes the proposed Project design footprint, plus the surrounding neighbourhoods following Census Area boundaries:
  - New Westminster – the eastern portion of Downtown New Westminster (Census Tract #207), part of the Queen’s Park neighbourhood and Glenbrooke North neighbourhood (Census Tract #208) and the Glenbrooke South neighbourhood (Census Tract #209).
  - Surrey – the Bridgeview neighbourhood and the South Westminster neighbourhood (Census Tract #192).
  - The LSA boundary was selected to represent the spatial extent to which the Project is likely to interact with community cohesion through direct effects on:
    - neighbourhood connectivity infrastructure such as roads, sidewalks, and paths from Project construction disturbance and through bridge access/exit ramps from Project operations affecting traffic patterns near the Project; and
    - social equity through Project effects that may be experienced predominantly or disproportionately in LSA neighbourhoods that are more vulnerable and less resilient to those effects (e.g. construction noise, vibration and access disturbance).

See Figure A1.12 Community Cohesion Activity Assessment Area in Appendix 18.3 for LSA boundary.

## [Regional Study Area \(RSA\):](#)

- The RSA includes the cities of Surrey and New Westminster. The RSA boundary is intended to capture areas that may be subject to indirect adverse Project effects on community cohesion through broader changes in traffic patterns.

See Figure A1.12 Community Cohesion Activity Assessment Area in Appendix 18.3 for RSA boundary.

- **Temporal boundaries:**

- Existing conditions
- Project construction phase:
  - Site preparation and pre-construction activities
  - Construction of the new bridge
  - Decommissioning and removal of the existing bridge
- Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this VC; therefore no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g. site access or data) were identified that could inhibit assessment of this VC; therefore no technical boundary is defined.

## 6.3.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The following general approach is being taken to assemble information with respect to Community Cohesion existing conditions.

- A review of relevant background information and literature; key data sources include:
  - Canada Census and National Household Survey (NHS) (Statistics Canada 2016) including data on Aboriginal and total population, number of dwellings, household income, commuting patterns, and other demographic data
  - TransLink results of the 2011 Metro Vancouver Regional Screenline Survey and Trip Diary Survey
  - TransLink, and Metro Vancouver regional transportation and growth plans
  - Transportation plans for New Westminister and Surrey
  - 2013/2014 My Health My Community (Vancouver Coastal Health 2015)
  - Social planning department websites and data for New Westminister and Surrey
- Site visits and review of satellite images and streetscape images to review current access and neighbourhood connectivity
- Review of ATK, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies, and integration of relevant information provided with permission for use in the Application into the assessment.

The Application will include technical information related to assessment of proposed Project-related effects on Community Cohesion.

#### 6.3.3 *Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

While the proposed Project is expected to provide many benefits to community cohesion, some specific neighbourhoods or population groups may be adversely affected through changes in access and traffic patterns.

Social benefits related to Project effects on Community Cohesion and Physical and Social Determinants of Human Health will be discussed in Part A of the Application (e.g., long term motor vehicle connection between New Westminster and Surrey, greater connectivity between neighbourhoods and between Surrey and New Westminster for pedestrian/ bicycle traffic, improvements to parks/ green spaces along waterfront, etc.).

#### 6.3.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### 6.3.5 *Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 6.3.6 *Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.

- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 6.3.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

### 6.4 Visual Quality

The Application will identify the VCs selected for assessment according to the methodology specified in section [3.1 Issues Scoping and Selection of Valued Components](#). The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Visual quality refers to the visual aesthetic aspects of a landscape which are related to public views and concern about the visual impact of a proposed development. The proposed Project has the potential to adversely affect visual quality related to the construction and operation of the new Pattullo Bridge and road interchanges. A visual effects assessment will be undertaken to characterize the existing level of visual quality and examine the potential for Project induced change to alter the existing level of visual quality. The assessment will focus on the new Pattullo Bridge and road interchanges in New Westminster and Surrey. The assessment approach will adapt technical methods from the U.S. Department of Transportation's *Guidelines for the Visual Impact Assessment of Highway Projects*.

The study will assess the following VC subcomponents:

- Daytime viewing; and
- Nighttime viewing.

Indicators for assessing potential proposed Project-related effects on the visual quality of existing baseline conditions are as follows:

- Level of change in visual quality from current daytime viewing conditions
  - Visibility of the Project from key viewpoints to determine the visual prominence of Project features;
  - Level of visual contrast created by the Project from key viewpoints to determine the level of change to visual character during daytime viewing.
- Level of change in visual quality from current nighttime viewing conditions

- Visibility of the Project from key viewpoints to determine the visual prominence of Project lighting;
- Visual contrast from a change in perceived lighting created by the Project to determine the level of change to visual character during nighttime viewing.

Regulation of visual impacts related to a portion of the proposed Project site occurs through the Project and Environmental Review (PER) Guidelines process (2015) which is applicable to federal lands and waters partially or wholly within the Vancouver Fraser Port Authority's (VFPA) jurisdiction. The VFPA has established guidelines related to view, shade, and lighting, as part of the PER Guidelines process. These guidelines to assist applicants in addressing potential view, shade and lighting effects where developments are proposed in close proximity to residential or public areas. The assessment will address applicable view, shade and lighting assessment guidelines of the VFPA.

The assessment will also assess environmental effects defined in subsection 5(1) or 5(2) of CEAA 2012 that are of relevance to visual quality, including effects that may be specific to Aboriginal peoples. If it is determined that the Project will not result in an environmental effect defined in subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives regarding visual quality, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies.

With regard to potential cultural effects on Aboriginal Groups resulting from changes to visual quality, refer to the assessment of current use of lands and resources for traditional purposes and Aboriginal Interests (Section 11 and Section 12, respectively).

#### 6.4.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for visual quality:

- Spatial boundaries:
  - [Local Study Area \(LSA\)](#): The proposed LSA for the Visual Quality VC encompasses the Project Boundary, plus a 5 km buffer zone. The LSA includes potential viewing locations within New Westminster and Surrey that represent residential, transportation, and recreational land-use settings and locations of interest to Aboriginal Groups. These locations are within viewing distances which generally allow for a discernible level of visual detail to be perceived by viewers.  
  
See Figure A1.13 Community Cohesion Activity Assessment Area in Appendix 18.3 for LSA boundary.
  - [Regional Study Area \(RSA\)](#): The proposed RSA for the Visual Quality VC encompasses the



Project Boundary , plus a 10 km buffer zone. The RSA provides a regional landscape context within Metro Vancouver. The outer extent of the RSA was selected based on the farthest reasonable distance at which some proposed Project features may be visible and represents viewing distances where the perception of visual detail is less discernible by viewers and more frequently affected by atmospheric conditions (e.g., fog, haze).

See Figure A1.12 Community Cohesion Activity Assessment Area in Appendix 18.3 for RSA boundary.

- Temporal boundaries – includes the pre-Project baseline conditions, construction and operations phases.
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this VC; therefore no administrative boundary is defined.
- Technical boundaries – modelling of the Project’s visual effects are based on a Reference Concept design which has an inherent level of uncertainty regarding the accurate representation of visual effects.

#### 6.4.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent will use baseline information related to environmental conditions and land use, photographic inventories, viewshed analysis, and visual analysis to assess the level of existing visual quality for views in the LSA. Results of the Lighting and Shading IC assessments (Section 6.5 and Section 6.6, respectively) will also inform the assessment of existing visual quality. The following general approach is proposed:

- Review results of assessments of other relevant VCs/ICs:
  - Lighting IC
  - Shading IC
  - Land Use VC
- Identify key public viewpoints intended to collectively represent a range of viewer groups and viewing locations (identification will be based on land use information, input from consultation with Aboriginal Groups and stakeholders, and initial visibility analysis)
- Conduct photographic field surveys to record panoramic images of the Project area and prominent Project components, as seen from the viewpoints, and use the images to describe the existing viewing conditions and visual character of the Project area

#### 6.4.3 *Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR. The Application will also include technical information related to assessment of visual effects.

The proposed Project is expected to result in changes to views from various locations surrounding the Project. The Proponent will use visual simulations and qualitative visual analysis to assess the potential effects of the proposed Project on existing views in the LSA. Potential effects will be assessed for the level of change in visual quality from current daytime and nighttime viewing conditions based on visibility of the proposed Project from key viewpoints to determine the visual prominence of proposed Project features, and the level of visual contrast created by the proposed Project from key viewpoints to determine the level of change to the existing visual character. Results of the Lighting and Shading IC assessments (Section 6.5 and Section 6.6, respectively) will also inform the visual quality effects assessment.

#### 6.4.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### 6.4.5 *Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 6.4.6 *Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in

this AIR.

- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 6.4.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

### 6.5 Lighting

Project lighting is important for the safety and security of drivers, cyclists, pedestrians and for safe navigation. The EA will address lighting design and potential adverse lighting effects relevant to both construction and operation of the Project (as well as demolition of the existing Pattullo Bridge). For example, the Project may generate changes in light levels as a result of implementing Project requirements for additional street lighting and navigational lighting, and possibly adding aesthetic lighting.

The following indicator is proposed for the assessment of the Lighting IC:

- Change in light levels from current night-time viewing conditions.

Lighting acts as a pathway IC that may potentially affect ultimate receptor VCs. Assessment of the Lighting IC will inform the assessment of following ultimate receptor VCs:

- Visual Quality;
- Fish and Fish Habitat;
- Wildlife;
- Marine Use;
- Land Use; and
- Physical Determinants of Human Health

For clarity, the lighting assessment will also inform assessment of current use of land and resources for traditional purposes (refer to Section 11) and Aboriginal Interests (refer to Section 12).

The Application will provide a description of a proposed exterior lighting design based on the Reference Concept as understood at the time of the Application. The qualitative lighting assessment will consider applicable lighting guidelines and other standards identified by VFPA available at: <http://www.portvancouver.com/development-and-permits/project-and-environmental-reviews/technical-guidelines/>. The description of a proposed exterior lighting design is not intended as a Lighting Plan, which will be prepared by a qualified lighting professional during detailed design.

### 6.5.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable to lighting, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for lighting:

- Spatial boundaries:
  - [Local Study Area \(LSA\)](#): The proposed LSA for the Lighting IC encompasses the Project Boundary, plus a 5 km buffer zone. The LSA includes potential viewing locations within New Westminster and Surrey. These locations are within viewing distances which generally allow for a discernible level of visual detail to be perceived by viewers at night.  
  
See Figure A1.14 Community Cohesion Activity Assessment Area in Appendix 18.3 for LSA boundary.
  - [Regional Study Area \(RSA\)](#): The RSA is not applicable because of the existing level of lighting within Metro Vancouver; any potential impacts of lighting are expected to be limited to the LSA.
- Temporal boundaries – includes the pre-Project baseline conditions, and construction and operations phases.
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this IC; therefore no administrative boundary is defined.
- Technical boundaries – a detailed lighting design is not available for the Project at the time of the assessment. A proposed lighting design will be provided based on operational requirements and lighting guidelines to support the assessment. The light assessment is focused on changes to perceived environmental lighting levels and subsequently, the effect of glare from traffic is not included.

### 6.5.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent will use the baseline information from photographic inventories and qualitative visual analysis to assess the existing lighting conditions for views in the LSA. Spatial data describing the PBRP Project Boundary, physical characteristics of the landscape, and cultural use areas will be used to conduct spatial analysis to determine the location of potential viewpoints. The following key sources of information will be used:

- Available mapping data and digital imagery describing transportation networks, parks and protected areas, recreation areas and amenities, community locations and services, cultural heritage sites, and administrative boundaries to determine land use activity patterns and potential night-time viewing opportunities;
- Regional and local government land use plans and related regulations and bylaws to determine existing management objectives for exterior lighting;
- Aboriginal Traditional Knowledge (ATK) and Traditional Use (TU) information provided during ongoing consultation between TransLink and Aboriginal Groups and between MoTI and Aboriginal Groups to identify Aboriginal perspectives related to effects of exterior lighting; and,
- Previous environmental assessments for projects in the same area (i.e., Port Mann/Highway 1 EA Application, South Fraser Perimeter Road Project EA Application)

#### 6.5.3 *Potential Effects*

The Application will identify potential adverse effects to the IC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

There is potential for an increase in light levels in the vicinity of the proposed Project from navigational, and operational street lighting that may alter existing night-time viewing from nearby areas. The Proponent will use information from visual simulation and qualitative visual analysis to assess the potential effects of the proposed Project on existing light conditions in the LSA. Potential effects will be assessed for the change in perceived lighting levels from current nighttime viewing conditions.

#### 6.5.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the IC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### 6.5.5 *Residual Effects*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) of this AIR template.

If any residual effect is identified, it will be described in sufficient detail to support the assessment of relevant receptor VCs.

#### 6.5.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.

Where an adverse residual cumulative effect is identified, it will be described in sufficient detail to support the cumulative assessment of relevant receptor VCs.

#### 6.5.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

### 6.6 Shading

The new Pattullo Bridge and roadway approaches, combined with removal of the existing Pattullo Bridge, have the potential to change structure-related shade patterns in the Project area.

Shading acts as a pathway IC that may potentially affect the following ultimate receptor VCs:

- Visual Quality;
- Fish and Fish Habitat;
- Vegetation;
- Wildlife;
- Marine Use; and
- Land Use.

For clarity, the shading assessment will also inform assessment of current use of land and resources for traditional purposes (refer to Section 11) and Aboriginal Interests (refer to Section 12).

The following indicator is proposed for the assessment of the Shading IC:

- Change in pattern of shadow from current daytime conditions.

The shading assessment will meet applicable assessment guidelines provided by VFPA at:

<http://www.portvancouver.com/development-and-permits/project-and-environmental-reviews/technical-guidelines/>.

#### 6.6.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the IC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for shading:

- Spatial boundaries:
  - [Local Study Area \(LSA\)](#): The proposed LSA for the Shading IC encompasses the Project Boundary, plus a 1 km buffer zone. The LSA includes an area adequate to evaluate the length of the shadows during key periods throughout the year with the longest shadow.  
  
See Figure A1.15 Shading Assessment Area in Appendix 18.3 for LSA boundary.
  - [Regional Study Area \(RSA\)](#): The RSA is not applicable because any potential impacts to shading beyond the LSA distance is expected to be minimal; shadows are expected to dissipate before reaching residential or public areas beyond the LSA.
- Temporal boundaries – includes the pre-Project baseline conditions, construction, and operations phases.
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this IC; therefore no administrative boundary is defined.
- Technical boundaries – the modelling of shade patterns of existing and proposed structures will be based on available data detailing the dimensions and characteristics of these structures.

#### 6.6.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent will use the baseline information of existing built structures in combination with 3D modelling results to assess the existing shade patterns in the LSA. Spatial data describing the Project Boundary, the physical characteristics of the terrain and built structures, and the location of public spaces and community institutions such as parks, greenways, community/recreation centres, and schools will be used to produce figures and conduct spatial analysis to determine the extent and potential effect of shadow patterns within the Shade IC LSA. The following key sources of information will be used in this regard:

- Available mapping data describing parks and protected areas, recreation areas and amenities, and community locations and services to determine land use activity patterns and areas where activities of the communities where use and enjoyment could be affected by shading
- 3D terrain data, 3D building models, and/or 2D two-dimensional building footprints and height information to develop an integrated digital surface model (DSM) to support shadow modelling
- Available Aboriginal Traditional Knowledge (ATK) and Traditional Use (TU) information provided during ongoing consultation between TransLink and Aboriginal Groups and between MoTI and Aboriginal Groups to identify areas used by Aboriginal Groups and perspectives related to the effects of shade
- Review of relevant environmental assessments and shadow analyses for projects in the Metro Vancouver region

#### 6.6.3 *Potential Effects*

The Application will identify potential adverse effects to the IC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

There is potential for a change in the pattern of shade related to the new bridge and associated roadway approaches and ramps that may alter existing daytime viewing condition for nearby areas. The Proponent will use the 3D modelling results to assess the potential effects of the Project on existing shade patterns in the LSA.

#### 6.6.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the IC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### 6.6.5 *Residual Effects*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) of this AIR template.

If any residual effect is identified, it will be described in sufficient detail to support the assessment of relevant receptor VCs.

#### 6.6.6 *Cumulative Effects*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed



Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.

- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.

Where an adverse residual cumulative effect is identified, it will be described in sufficient detail to support the cumulative effects assessment of relevant receptor VCs.

#### 6.6.7 *Follow-up Strategy*

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

## 7.0 HERITAGE EFFECTS ASSESSMENT

The Application will include an assessment of heritage VCs identified in the AIR. The assessment will be conducted in accordance with the methodology specified in section [3.0 Assessment Methodology](#) in this AIR and reported using the organizational structure demonstrated in section [4.0 Environmental Effects Assessment](#).

The Application will identify the VCs selected for assessment according to the methodology specified in section [3.1 Issues Scoping and Selection of Valued Components](#). The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final.

The following single VC was identified for the purpose of assessing Heritage Effects of the proposed Project under the heritage pillar:

- Heritage Resources.

### 7.1 Heritage Resources

The Project area, though substantially altered by development over many decades has high heritage sensitivity. Heritage Resource VC subcomponents that are known to occur in the Project area and are currently protected under the provincial *Heritage Conservation Act* include the following:

- Archaeological resources, defined for the purpose of assessment as artifacts, features, materials, or other physical evidence of human habitation or use prior to AD 1846 (these resources are automatically protected under the *Heritage Conservation Act*); and
- Historical heritage resources, defined for the purpose of assessment as artifacts, features, materials, or other physical evidence of human habitation or use that originated after AD 1846 and are protected, or in process of being protected, under the *Heritage Conservation Act* and/or by municipal heritage protection mechanisms.

The Project is not located in an area of BC that has been identified by Heritage Branch of FLNRO as having known fossil resource site concentrations (i.e. Vancouver Island, Haida Gwaii, the Princeton-Merritt-Kamloops area, southeastern and northeastern British Columbia, and the Central Interior Plateau). As such paleontological resources has not been identified as a subcomponent in the assessment of Heritage Resources. The Proponent will confirm the potential for presence of paleontological resources in the Project area in consultation with FLNRORD. If the potential for presence of such resources in the Project area is identified, a chance-find procedure will be developed to address adverse effects.

Indicators used to assess the potential Project-related effects on Heritage Resources are based on the provincial guidelines for archaeological overview assessments (AOAs) and archaeological impact assessments (AIAs), and municipal heritage assessment guidelines. The assessment identifies the following indicators for describing existing baseline conditions and assessing potential Project-related effects on Heritage Resources:

- Extent of disturbance to known heritage values and related change to heritage value; and
- Change in the level of accessibility to known heritage values.

This section of the Application will assess environmental effects defined in subsection 5(1) and 5(2) of CEAA 2012 that are of relevance to heritage resources, including effects to physical heritage or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. If it is determined that the Project will not result in an environmental effect defined in subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives regarding physical heritage, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies.

With regard to potential effects on non-physical Aboriginal cultural heritage, refer to the assessment of current use of lands and resources for traditional purposes and Aboriginal Interests (Section 11 and Section 12, respectively).

#### 7.1.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for archaeological resources:

- Spatial boundaries:
  - HCA Permit Area: The boundaries in which ground disturbing fieldwork may be undertaken under permit 2016-0390.
  - [Local Study Area \(LSA\)](#): Project Boundary with a 50 m wide buffer.

See Figure A1.16 Shading Assessment Area in Appendix 18.3 for LSA boundary.

- [Regional Study Area \(RSA\)](#): 1 km wide zone around the outside of the LSA boundary. The RSA is intended to include the larger regional area in which archaeological and historical heritage values are entrenched as part of ancient and modern networks. For the archaeology sub-component, the RSA extends along the banks of the Fraser River from Annacis Island to Port Mann to model potential effects on riverside archaeological resources.

See Figure A1.16 Shading Assessment Area in Appendix 18.3 for RSA boundary.

- Temporal boundaries:
  - Existing conditions

- Project construction phase:
  - Site preparation and pre-construction activities
  - Construction of the new bridge
  - Decommissioning and removal of the existing bridge
- Project operations phase
- Administrative boundaries – the administrative boundaries of the assessment are defined by the specific geographic area associated with permits issued by the Archaeology Branch, the Port of Vancouver, and First Nations.
- Technical boundaries – technical boundaries to heritage assessments relate to access for in-field assessment.

## 7.1.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent is undertaking archaeological and historical heritage literature resources studies to confirm and delineate the presence of known and/or listed sites and to identify areas that have potential to contain heritage deposits. Under the B.C. *Environmental Assessment Act* policy and the B.C. *Heritage Conservation Act*, heritage resources are defined by the historical, cultural, aesthetic, scientific, or educational worth or usefulness of a site or object.

Sites within the proposed Project alignment that are identified as having high heritage potential will be evaluated further through desktop and field investigations.

The Application will include the following additional studies:

- An AOA that identifies and assesses archaeological resource potential or sensitivity within a proposed Project area, and provides recommendations concerning the appropriate methodology and scope of work for subsequent inventory and/or archaeological impact assessment studies.
- An AIA, if recommended based on the results of the AOA, that identifies archaeological sites, evaluates their significance, assesses potential impacts by the project on archaeological sites, and provides recommendations concerning the appropriate impact management measures that may be required.
- [A historical heritage assessment will be conducted.](#)

The Application will include supplemental baseline archaeology/historical heritage information provided through consultation with the EAO working group and Aboriginal groups. Refer to Section 11 for information on consultation.

The Application will include technical information related to the Heritage Resources VC.

#### *7.1.3 Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

The proposed Project has the potential to affect heritage resources during construction of the new bridge and removal of the existing bridge.

The results of literature review, field investigations, and consultation with Aboriginal Groups will be used to assess potential Project effects on existing archaeological resources as well as to determine design and construction constraints relating to the protection of such resources.

#### *7.1.4 Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### *7.1.5 Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### *7.1.6 Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.

- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

#### 7.1.7 *Follow-up Strategy*

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

## 8.0 HEALTH EFFECTS ASSESSMENT

The Application will include an assessment of two health VCs under the health pillar. The assessment will be conducted in accordance with the methodology specified in section [3.0 Assessment Methodology](#) in this AIR and reported using the organizational structure demonstrated in section [4.0 Environmental Effects Assessment](#).

The Application will identify the VCs selected for assessment according to the methodology specified in section [3.1 Issues Scoping and Selection of Valued Components](#). The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final Application.

The dAIR document differs from the Project Description in the following ways:

- Human Health VC is now partitioned into two distinct VCs.

Human health considerations for the proposed Project are associated primarily with changes in air quality, atmospheric noise and vibration levels (the results of the air quality and noise assessments will be inputs to the human health assessment), and social determinants.

The following Health Effects VCs have been identified for assessment:

- Physical Determinants of Human Health (PDHH) VC; and
- Social Determinants of Human Health (SDOH) VC.

### 8.1 Physical Determinants of Human Health

Physical determinants of health comprise environmental conditions that have the potential to affect human health through physical media. As with other road-related projects, the development and operation of the Project has the potential to alter existing (baseline) conditions for several important attributes of the physical environment, including air quality, noise, and vibration. Consultation undertaken on the Project also identified a potential concern expressed in relation to Project-related disturbances to sediment that may result in the biomagnification of contaminants, and resultant human exposure.

Project-related impacts will be assessed based on the following approach. The PDHH VC uses the results of the assessment of air quality, noise and vibration, and sediment quality (**Section 4.8, Section 4.7, and Section 4.2**, respectively) to estimate how human health may be affected during both the construction period and on-going operations.

The following three subcomponents have been identified for the PDHH VC:

- Human health effects stemming from changes in air quality
- Human health effects stemming from changes in noise and vibration
- Human health effects stemming from exposure to aquatic contaminants

These potential impacts will be studied through a Human Health Risk Assessment, which is presented as a technical appendix in the Application. HHRA is a standardized modelling approach that estimates how

human health may be affected from exposure to physical or chemical hazards. Its use is endorsed by the Province of BC, Health Canada, and others as the most suitable way to quantitatively assess physical health impacts in the context of an environmental assessment.

The following indicators are proposed for the assessment of the PDHH VC sub-components:

- Human health effects stemming from changes in air quality
  - Acute health effects following short-term inhalation exposures
  - Chronic health effects following long-term inhalation exposures
- Human health effects stemming from noise and vibration
  - Annoyance associated with highway noise
  - Sleep disturbance
  - Speech comprehension
  - Annoyance associated with vibration
- Human health effects stemming from exposure to aquatic contaminants
  - Health effects from exposure to contaminants via seafood

In addition to the three subcomponents listed above, the potential for human health effects stemming from exposure to night-time light during the operation phase was also be considered. Operation of the Project would introduce new light sources, including navigational lighting of bridge towers and operational street lighting of the bridge deck. Results of the assessment of the Project's contribution to light levels (**Section 6.5 Lighting**) will be reviewed to determine the need for further assessment of health effects resulting from light exposure. This information, and, if applicable based on results of the Lighting IC assessment, assessment of health effects resulting from Project-related change in light exposure, will be included in the Application.

This section of the Application will assess any environmental effect defined in subsection 5(1) or 5(2) of CEAA 2012 that is of relevance to human health, including effects under 5(1)(c)(i) that are specific to Aboriginal peoples. If it is determined that the Project will not result in environmental effects defined in subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives regarding human health, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies.

#### *8.1.1 Context and Boundaries*

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) in this AIR.



The following assessment boundaries are defined for physical determinants of human health:

- Spatial boundaries:
  - [Local Study Area \(LSA\)](#): 500 m buffer from the edge of the Reference Concept over land and 1,500 m buffer over water (Corresponds to the larger LSA boundary of the Air Quality and Atmospheric Noise ICs).  
  
See Figure A1.17 Physical Determinants of Human Health Assessment Area in Appendix 18.3 for LSA boundary.
  - [Regional Study Area \(RSA\)](#): No Regional Study Area (RSA) has been defined because potential effects of the Project on PDHH are expected to be highly localized and not to extend beyond the LSA (see Air Quality (Section 4.8.1) and Atmospheric Noise (Section 4.7.1) spatial boundaries and rationale).
- Temporal boundaries:
  - Existing conditions
  - Project construction phase:
    - Site preparation and pre-construction activities
    - Construction of the new bridge
    - Decommissioning and removal of the existing bridge
  - Project operations phase
- Administrative boundaries – no issues related to political, economic or social constraints were identified that could inhibit assessment of this VC; therefore no administrative boundary is defined.
- Technical boundaries – no issues related to technical constraints (e.g. site access or data) were identified that could inhibit assessment of this VC; therefore no technical boundary is defined.

### 8.1.2 Existing Conditions

The Proponent is studying ambient air quality and existing noise conditions as they relate to physical determinants of human health conditions in and around the proposed Project area, to understand existing human health conditions in local and regional populations. The Application will summarize existing conditions for air and noise in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

In addition, the Application will include relevant baseline information on rates of human health conditions (such as chronic lower respiratory disease and stress) that have the potential to be affected by the Project.

The Application will include any technical information related to assessment of human health.

### 8.1.3 *Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

Where residual adverse effects are identified, potential mitigation measures will be proposed to avoid, eliminate, or limit the extent and impact of potential adverse effects.

### 8.1.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

### 8.1.5 *Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

### 8.1.6 *Cumulative Effects and their Significance*

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

### 8.1.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.

## 8.2 Social Determinants of Human Health

The societal conditions in which people are born, live, and work directly affect the quality of their health (Mikkonen and Raphael 2010)Mikkonen and Raphael 2010).

The urban environment, including the design of transportation systems and infrastructure, can shape individual and public health by affecting various SDOH components. Walkways, cycling lanes, and roads that are perceived as safe and low risk will encourage use of and ease access<sup>5</sup> to services, employment centres, shops and restaurants, and recreations areas. The use of public spaces (places where people naturally interact such as sidewalks, local parks, plaza, and public transportation) facilitates development of healthy community dynamics and cohesion.<sup>6</sup>

The assessment of effects on the SDOH VC will interpret, build upon and otherwise elaborate on the findings of other assessment chapters including economic activity, marine use, land use, community cohesion and visual quality, from a social determinants of health perspective.

The assessment of the SDOH VC followed the general methodology that is applied to all VCs described in the BC EAO AIR Template (2015) Section 3.0. The selection was also informed by Metro Vancouver's Health Impact Assessment (HIA) of Transportation and Land Use Planning Activities Guidebook (EcoPlan, n.d.) and the Public Health Agency of Canada's determinants of health (Public Health Agency of Canada 2015).

The health assessment will address the following subcomponents:

- Services;
- Social Interactions;
- Livelihood factors; and
- Active living.

In order to assess potential Project-related effects on SDOH the subcomponents will be assessed by studying the following indicators:

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<sup>5</sup> We acknowledge that access has multiple dimensions but there lacks a formal definition and accepted conceptions of the encompassing factors. This assessment will adopt a definition of access that includes three dimensions: availability, affordability and acceptability. Availability refers to the actual presence of the service within a reasonable distance, with convenient operating hours, and a user-friendly system. Affordability includes the direct and indirect cost of using the services relative to the person's ability to pay. Acceptability constitutes the subjective, social, and cultural factors that may prevent or hinder someone's use of a service(s).

<sup>6</sup> Community cohesion refers to the quantity and quality of social interactions among people in the community, as indicated by the degree residents know and care about their neighbours and participate in community activities (Litman 2017).

- Services
  - Physical connectivity within and between neighbourhoods as well as between Surrey and New Westminster.
  - Perception of safety, risk, and ease of travel within and between neighbourhoods as well as between Surrey and New Westminster
- Social Interactions
  - Physical connectivity within and between neighbourhoods as well as between Surrey and New Westminster
  - Perception of safety, risk, and ease of travel within and between neighbourhoods as well as between Surrey and New Westminster
- Livelihood factors
  - Business activity and income and/or in opportunities for gainful employment
- Active living
  - Physical connectivity within and between neighbourhoods as well as between Surrey and New Westminster
  - Perceptions of safety, risk, and ease of travel within and between neighbourhoods as well as between Surrey and New Westminster

This section of the Application will assess environmental effects defined in subsection 5(1) or 5(2) of CEAA 2012 that are of relevance to social determinants of health, including effects under 5(1)I(i) that are specific to Aboriginal peoples. If it is determined that the Project will not result in environmental effects defined in subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The effects assessment will consider Aboriginal perspectives regarding social determinants of health, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies.

#### *8.2.1 Context and Boundaries*

The Application will identify the spatial, temporal, administrative and technical study area boundaries applicable to assessment of the potential effects of the Project the SDOH, including maps, in a manner consistent with [3.2 Assessment Boundaries](#) of the AIR Template.

The following assessment boundaries are defined for SDOH:

- Spatial boundaries:
  - Local Study Area (LSA): Corresponds to the larger LSA boundary of the Community Cohesion VC encompassing the proposed Project design footprint, plus the surrounding neighbourhoods following Census Area boundaries:
    - New Westminster – the eastern portion of Downtown New Westminster (Census Tract #207), part of the Queen’s Park neighbourhood and Glenbrooke North neighbourhood (Census Tract #208) and the Glenbrooke South neighbourhood (Census Tract #209).
    - Surrey – the Bridgeview neighbourhood and the South Westminster neighbourhood (Census Tract #192).

See Figure A1.18 Social Determinants of Human Health Assessment Area in Appendix 18.3 for LSA boundary.
  - Regional Study Area (RSA): The proposed RSA includes the cities of Surrey and New Westminster.

See Figure A1.18 Social Determinants of Human Health Assessment Area in Appendix 18.3 for LSA boundary.
- Temporal boundaries:
  - Existing conditions
  - Project construction phase:
    - Site preparation and pre-construction activities
    - Construction of the new bridge
    - Decommissioning and removal of the existing bridge
  - Project operations phase – the assessment will primarily consider the new alignment and its implications from an SDOH perspective on the LSA. That is it will be a static assessment of the new bridge and approaches once completed and will not, indeed cannot, pretend to anticipate how SDOH issues in relation to the new bridge might change over its anticipated lifespan.
- Administrative boundaries – no issues related to political, economic or social constraints that could inhibit assessment of this VC were identified; therefore no administrative boundary is defined.
- Technical boundaries – The proposed LSA is based on census tract boundaries to enable the use

of statistical data to appropriately describe existing social conditions over a reasonable and representative area in and around the Project footprint. The assessment of effects will acknowledge that these boundaries are almost certainly porous due to the fluid nature of social phenomena (i.e. people move around). The assessment will consider the possibility that certain interactions involving SDOH and relevant subcomponents will not necessarily be contained exclusively within these boundaries but may carryover to other adjacent areas.

### 8.2.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section [3.3 Existing Conditions](#) in this AIR.

The Proponent is studying key health indicators, available from existing regional and community health studies, to understand existing human health conditions in local and regional populations. Social and economic studies (see Section 6.0) and a health assessment guided by the principles of Metro Vancouver (2016) will assist The Proponent in considering how broader determinants of human health (e.g., changes in social and economic conditions) would potentially be influenced by the proposed Project.

The following general approach is being taken to assemble information with respect to SDOH existing conditions.

- A review of relevant background information and literature, including:
  - Canada Census and National Household Survey (NHS) (Statistics Canada 2016), including population, number of dwellings, household income, commuting patterns, and other demographics
  - 2013/2014 My Health My Community (Vancouver Coastal Health 2015), which provides selected health, lifestyle, and socio-economic statistics based on an extensive survey of Metro Vancouver residents; survey results are available for the RSA (i.e., New Westminster and Surrey) and for several neighbourhoods overlapping the LSA, including Downtown New Westminster, Queen's Park, Whalley, and Surrey City Centre
  - Provincial, TransLink, and regional transportation and regional growth plans, including the TransLink Regional Transportation Strategy (2013); the 2011 TransLink cycling strategy (A Regional Cycling Strategy for Everyone); and the Metro Vancouver Regional Growth Strategy, first completed in 2011 and updated in 2014
  - Transportation plans for New Westminster and Surrey (2014 New Westminster Master Transportation Plan by Urban Systems, and the 2008 Surrey Transportation Strategic Plan)
  - Social Planning for New Westminster and Surrey (both Surrey and New Westminster have Social Planning departments with extensive websites detailing action plans and progress reports directed toward vulnerable populations in their communities)
- A review of the results of Project-related effects on the following VCs:

- Economic Activity (Section 5.1): Analysis of Project effects on business activity relevant to the assessment of Livelihood factors.
  - Marine Use (Section 6.1): Analysis of Project effects on business activity and social interaction relevant to Livelihood factors and Social interaction, in the context of consideration of Aboriginal-specific effects under CEAA 2012 Section 5(1).
  - Land Use (Section 6.2): Analysis of Project effects relevant to the assessment of Active living.
  - Community Cohesion (Section 6.3): Analysis of Project effects relevant to the assessment of the subcomponent of SDOH, Social interaction.
- A review of ATK, where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups or through Project-specific studies, and integration of relevant information provided with permission for use in the Application into the assessment.

#### 8.2.3 *Potential Effects*

The Application will identify potential adverse effects to the VC in a manner consistent with section [3.4 Potential Effects](#) in this AIR.

The proposed Project is anticipated to result in improvements in human health in consideration of broader determinants of human health (e.g., improved access to leisure activity, reduced stress for bridge users, improved public safety, and by fostering opportunities to increase economic activity through improved transportation infrastructure with requisite benefits for employment and economic development.

Where residual adverse effects are identified, potential mitigation measures will be proposed to avoid, eliminate, or limit the extent and impact of potential adverse effects.

#### 8.2.4 *Mitigation Measures*

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section [3.5 Mitigation Measures](#) in this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.

#### 8.2.5 *Residual Effects and their Significance*

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section [3.6 Characterization of Residual Effects](#) in this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

### 8.2.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section [3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities](#) in this AIR.
- Conduct a cumulative effects assessment consistent with section [3.10.2 Conducting a Cumulative Effects Assessment](#) in this AIR.
- Identify any additional mitigation measures, consistent with section [3.5 Mitigation Measures](#) in this AIR.
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections [3.7 Likelihood](#), [3.8 Proponent's Determination of Significance](#) and [3.9 Confidence and Risk](#) in this AIR.

### 8.2.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section [3.11 Follow-up Strategy](#) in this AIR.



## 9.0 ACCIDENTS AND MALFUNCTIONS

The Application will include the following:

- Identification of potential accidents and malfunctions:
  - Spill incidents related to marine-based and/or land-based construction activity;
  - Structural failures of water management infrastructure (e.g., existing dykes) during construction;
  - Damage to municipal utilities during construction;
  - Impediments to marine navigation or vehicle access caused by construction malfunctions;
  - Malfunction of final infrastructure components during the operational phase;
  - Vessel collision with new bridge piers. A Collision Risk and Pier Impact Assessment will be conducted, based on the Reference Concept. The assessment will provide information on:
    - Design Vessel – Length Overall (LOA)
    - Design Vessel – Beam
    - Design Vessel – Draught
    - Design Vessel – Displacement
    - Design Vessel – Speed
    - Design Vessel – Frequency
    - Distance between Piers
    - Channel Alignment
    - Pier Accessibility to Vessels
    - Proximity to and nature of channel edges
    - Vessel Traffic Congestion
    - Risk of Collision (Deep-sea and Domestic) (During Construction and Post Construction)
    - Pier Protection Options (During Construction and Post Construction)
    - Superstructure Protection Options (Visual and Electronic).
- The overall methodology for assessing the potential risk of an event (likelihood and consequence);
- Definitions of each category of likelihood;
- Definitions for each category of consequence;
- An assessment of the likelihood of the event occurring, based on historical trends and predictive models;
- Identification of proposed measures to reduce the likelihood of the event;
- Assessment of consequence of the event, in a manner consistent with the direct effects assessment;

- Identification of measures to mitigate the consequences to valued components; and
- Conclusions on the potential risk (likelihood multiplied by consequence) of the accident or malfunction.

## 10.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The Application will include:

- The environmental factors deemed to have possible consequences on the proposed project, including, but not necessarily limited to, consideration of natural hazards such as:
  - Potential impacts of climate change (e.g., temperature rise, trend of increasing precipitation, and sea-level rise);
  - Extreme weather and weather-related events (e.g., heavy precipitation, extreme temperatures, and high wind);
  - Flood events;
  - Seismic activities/events; and
  - Fire.
- A description of any changes or effects on the proposed Project that may be caused by the above-mentioned environmental factors;
- The likelihood and consequence of the changes or effects to relevant VCs and ICs;
- Practical mitigation measures, including design strategies and environmental contingency plans, to avoid or minimize the likelihood and consequence of the effects of the environment on the proposed Project; and
- A conclusion about the potential risk of an effect of the environment on the proposed Project and to relevant VCs and ICs.

## 11.0 SUMMARY OF STATUTORY REQUIREMENTS UNDER CEAA 2012

The Application will identify CEAA 2012 subsection 5(1) and 5(2) requirements as they relate to obligations of federal authorities under section 67 of CEAA 2012, and will summarize how these requirements have been met by the assessment of environmental, social, economic, health and heritage VCs presented in preceding sections. The Application will also identify CEAA 2012 provisions that were not considered in the assessment pursuant to section 67.

The summary in this section will be specific to environmental effects resulting from the physical activities and physical works conducted on federal lands, and will be presented in a table format similar to that shown below. If environmental effects as defined in subsections 5(1) and 5(2) of CEAA 2012 are identified for a VC, the summary of assessment included in the table will describe any such residual adverse effects in a manner that allows federal authorities to draw conclusions on the significance of those effects. A summary of assessment of section 5(1)(c) factors for each Aboriginal Group listed in Schedule B and C of the Section 11 order will be included in the table.

**Table 4: Summary Table of CEAA 2012 5(1) and 5(2) Effects and Applicable Part B Results**

| CEAA 2012 5(1) or 5(2) Effect <sup>7</sup>                                                                                                   | Applicable VC/IC(s) and EA Section/Subsection | Summary of VC/IC Assessment Results Applicable to CEAA 2012 5(1) or 5(2) |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------|
| 5(1)(a) re change that may be caused to the following components of the environment that are within the legislative authority of parliament: |                                               |                                                                          |
| 5(1)(a)(i) – Fish and Fish Habitat                                                                                                           |                                               |                                                                          |
| 5(1)(a)(ii) – Aquatic Species                                                                                                                |                                               |                                                                          |
| 5(1)(a)(iii) – Migratory Birds                                                                                                               |                                               |                                                                          |
| 5(1)(b)(i) re change that may be caused to the environment on federal lands                                                                  |                                               |                                                                          |
| 5(1)(c) – with respect to Aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on:          |                                               |                                                                          |
| 5(1)(c)(i) – health and socioeconomic conditions <sup>8</sup>                                                                                |                                               |                                                                          |
| 5(1)(c)(ii) – physical and cultural heritage                                                                                                 |                                               |                                                                          |
| 5(1)(c)(iii) – the current use of lands and resources for traditional purposes                                                               |                                               |                                                                          |
| 5(1)(c)(iv) – any structure, site or thing that is of historical, archaeological, paleontological or architectural significance              |                                               |                                                                          |
| 5(2)(a) re a change, other than those referred to in 1(a) and 1(b) that may be caused to the environment and that is                         |                                               |                                                                          |

<sup>7</sup> Specific to physical activities and physical works conducted on federal lands and waters

<sup>8</sup> Navigation is considered a health and socio-economic condition and will be included in this summary

| CEAA 2012 5(1) or 5(2) Effect <sup>7</sup>                                                                                                                                                                                                           | Applicable VC/IC(s) and EA Section/Subsection | Summary of VC/IC Assessment Results Applicable to CEAA 2012 5(1) or 5(2) |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------|
| directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part. Of the physical activity, the designated project or the project |                                               |                                                                          |
| 5(2)(b) and effect, other than those referred to in paragraph (1)(c), of any change referred to in paragraph (a) on:                                                                                                                                 |                                               |                                                                          |
| 5(2)(b)(i) – health and socio-economic conditions <sup>9</sup>                                                                                                                                                                                       |                                               |                                                                          |
| 5(2)(b)(ii) – physical and cultural heritage                                                                                                                                                                                                         |                                               |                                                                          |
| 5(2)(b)(iii) – any structure, site or thing that is of historical, archaeological, paleontological or architectural significance                                                                                                                     |                                               |                                                                          |

This section of the Application will also include the following additional information with regard to effects on Aboriginal peoples pursuant to 5(1)(c), and in relation to each Aboriginal Group identified in Schedule B and C of the Section 11 Order:

- For each subsection 5(1)(c) factor, a summary of linked VC effects, the specific potential effect mechanism on the Aboriginal Group (as informed by the applicable VC assessments), applicable mitigation measures (including any additional measures beyond those identified for the linked VC), and any identified residual effects;
- An assessment of Section 5(1)(c) factors that have not been assessed elsewhere in the Application (i.e., the current use of lands and resources for traditional purposes), in a manner consistent with Section 3.0 Assessment Methodology of this dAIR; and
- A report on the views of Aboriginal Groups with respect to subsection 5(1)(c) effects as provided to the Proponent during consultation on the Project or through Project-specific studies.

For clarity, the information provided in Section 11 will be presented in a manner that facilitates the VFPA's determination on whether any identified residual effects on 5(1)(c) factors are likely to be significant.

<sup>9</sup> Navigation is considered a health and socio-economic condition and will be included in this summary

# Application Information Requirements

## *Part C – Aboriginal Consultation*

## **PART C - ABORIGINAL CONSULTATION**

## 12.0 ABORIGINAL CONSULTATION

### 12.1 Aboriginal Interests

Aboriginal Interests are defined according to the EAO's definition outlined through the B.C. *Environmental Assessment Act* section 11 Order directly<sup>10</sup> The Indigenous Groups named in the EAO's Section 11 Order and discussed in this Section will include:

- Cowichan Tribes;
- Halalt First Nation;
- Katzie First Nation;
- Kwantlen First Nation;
- Kwikwetlem First Nation;
- Lake Cowichan First Nation;
- Lyackson First Nation;
- Musqueam Nation;
- Penelakut Tribe;
- Semiahmoo First Nation;
- Squamish Nation;
- Stz'uminus First Nation;
- Tsawwassen First Nation; and
- Tseil-Waututh Nation.

For each Indigenous Group, the Application will include:

- A summary of past and planned consultation activities.
- A summary of proposed changes to the Aboriginal Consultation Plan resulting from the Aboriginal Groups' feedback, or experience from consultation to date, including any such changes which have been implemented.
- A summary of the key issues and concerns raised by Indigenous Groups relevant to the environmental assessment, the Proponent's responses to those issues and concerns, and the status of resolution.

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<sup>10</sup> "Aboriginal Interest" as defined by British Columbia's Environmental Assessment Office – means asserted or determined aboriginal rights, including title, and treaty rights.



- A map that identifies Indian Reserves and Aboriginal communities, for the Indigenous Groups and the project location.
- Traditional use information and related ATK, as available, with a description of how traditional use information and ATK was gathered and incorporated into the assessment of impacts of the proposed Project on Aboriginal Interests.
- A description of the Aboriginal Interests of each group identified through secondary research techniques or provided directly through consultation activities. The description will include background information on ethnography, language, governance, economy and reserves.
- A description of potential adverse effects of the proposed Project on Aboriginal Interests.
- A description or summary of mitigation measures to avoid or reduce potential adverse effects on Aboriginal Interests consistent with section [3.5 Mitigation Measures](#) in this AIR.
- A characterization of the residual adverse effects on Aboriginal Interests after mitigation using the methodology described in sections [3.6 Characterization of Residual Effects](#), [3.7 Likelihood](#), and [3.9 Confidence and Risk](#) in this AIR and incorporation of findings of the VC chapters in the Application that are relevant to Aboriginal interests.
- A summary of any outstanding Aboriginal Interests issues identified by Aboriginal groups.
- A summary of publically available arrangements or agreements reached between the proponent and Aboriginal Groups.

## **12.2 Other Matters of Concern to Indigenous Groups**

The Application will include:

- A list of other matters of concern raised by Aboriginal Groups with respect to potential environmental, economic, social, heritage and health effects of the proposed Project, which have not already been considered in the discussion about Aboriginal Interests (in Section 12.1) or in the statutory requirements under CEAA 2012 (Section 11) where applicable.
- A description (or summary if described elsewhere in the Application) of the mitigation measures to address potential effects on other matters of concern to Aboriginal Groups.
- A characterization of the residual adverse effects after mitigation, in a manner consistent with assessment methodology in this dAIR.
- A description of how these matters of concern have been addressed from the perspective of the Aboriginal Groups and the Proponent.

### 12.3 Issue Summary Table

The Application will include:

- A Summary Table (see example below) that identifies Aboriginal Interests or other matters of concern to Aboriginal Groups that may be impacted by the proposed Project, and the measures to avoid, mitigate or otherwise manage the effects; and
- An Appendix, the Aboriginal Consultation Report, which contains comments received from Aboriginal Groups regarding this section of the Application.

**Table 5: Summary Table of the Results of Aboriginal Consultation related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups**

| Indigenous Group | Consultation Stage/<br>Information Source | Issue – Aboriginal Interest | Issue – Other Matters of Concern | Analysis of Potential Effect | Proposed Measures to Avoid, Mitigate or Otherwise Manage Effects | Status of Issue<br>(e.g. resolved, ongoing resolution, referred to agency, etc.) |
|------------------|-------------------------------------------|-----------------------------|----------------------------------|------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------|
|                  |                                           |                             |                                  |                              |                                                                  |                                                                                  |
|                  |                                           |                             |                                  |                              |                                                                  |                                                                                  |
|                  |                                           |                             |                                  |                              |                                                                  |                                                                                  |

# Application Information Requirements

## *Part D – Public Consultation*

## **PART D - PUBLIC CONSULTATION**

## 13.0 PUBLIC CONSULTATION

The Application will include a report on the results of implementation of the approved Public Consultation Plan including:

- Background information:
  - Identification of local governments, residents, property owners, and other rights holders who are potentially impacted by the proposed Project.
  - Maps of local government boundaries, private land, tenures/authorizations, or residences with respect to the proposed Project.
  - Background information about each potentially affected municipality and/or stakeholder group.
- Public Consultation:
  - A summary of the past and planned consultation activities.
  - A summary of any proposed changes to the approved Public Consultation Plan as a result of feedback from local governments, stakeholders or individuals, or experience from consultation to date.
  - A description of the key issues raised by the public that are relevant to the EA, the responses to those issues, and the status of their resolution.
- Summary Table:
  - Identification of concerns raised by the public and the measures to avoid, reduce or mitigate those impacts. This information will be provided in the form of a table.



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# Application Information Requirements

## *Part E – Management Plans and Follow-Up Programs*



## **PART E - MANAGEMENT PLANS AND FOLLOW-UP PROGRAMS**

## 14.0 MANAGEMENT PLANS

The Application will include:

- A list of Management Plans with a summary of the contents for all phases of the proposed Project, including but not limited to:
  - Air Quality Management Plan;
  - Archaeological and Historical Heritage Resources Management Plan;
  - Construction Environmental Management Plan;
  - Contaminated Sites Management Plan;
  - Construction Staging Plan;
  - Demolition Staging Plan;
  - Emergency Response and Spill Prevention Plan;
  - Energy Efficiency Study (Preliminary Lighting Plan and Criteria);
  - Environmental Monitoring Plan;
  - Erosion and Sediment Control Plan;
  - Fish and Fish Habitat Management Plan;
  - Hazardous Materials Management Plan (including Report for Demolitions);
  - Health and Safety Plan;
  - Landscape Plan;
  - Lighting Plan;
  - Marine Communications Plan;
  - Noise Management Plan;
  - Soil and Groundwater Management Plan;
  - Stormwater Management and Pollution Prevention Plan;
  - Traffic Impact Study and Construction Traffic Management Plan;



- Vegetation Management Plan; and
- Wildlife Management Plan (Components will include for example, pre-clearing bird nesting activity surveys, pre-construction surveys for species at risk and sensitive habitats, the management of invasive species, and the protection of incidentally observed wildlife e.g. harbour seals).
- A comprehensive description of the contents of each Management Plan, including the identification of any mitigation measures described in previous sections that will be included within the plans.

## 15.0 MONITORING & FOLLOW-UP PROGRAMS

The Application will include:

- A description of the monitoring and follow-up programs the Proponent will implement, including their activities, objectives and reporting.
- Reporting structure as identified within the environmental management plans, monitoring plans and EA Certificate Conditions.

# Application Information Requirements

## *Part F – Conclusions*

## **PART F - CONCLUSIONS**

## 16.0 CONCLUSIONS

The Application will:

- Provide the Proponent's conclusions regarding the potential for significant adverse effects on VCs from the proposed Project.
- Request an EA Certificate for the proposed Project.
- Acknowledge the need, if applicable, to successfully complete a federal EA and subsequent permitting/authorization processes prior to proceeding with Project construction, operation and decommissioning.

### 16.1 Summary of Residual Effects

The Application will summarize all potential residual effects, including cumulative residual effects, in a table format that depicts the potential effect, project phases, project activity or physical work linked to the effect, proposed mitigation and significance of effect on VCs.

### 16.2 Summary of Mitigation Measures

The Application will include a table that identifies the proposed measures to mitigate potential impacts to VCs as shown in Table 6. This information provides the foundation for the development of a Table of Conditions for the proposed Project, which would be appended to an EA Certificate, should one be issued.

**Table 6: Summary of Proposed Mitigation Measures**

| No.                  | VC and Effect | Proposed Mitigation Measure | Timing | Legal Requirement? | Responsible Agency |
|----------------------|---------------|-----------------------------|--------|--------------------|--------------------|
| <b>Environmental</b> |               |                             |        |                    |                    |
| 1.1                  |               |                             |        |                    |                    |
| 1.2                  |               |                             |        |                    |                    |
| <b>Social</b>        |               |                             |        |                    |                    |
| 2.1                  |               |                             |        |                    |                    |

## 17.0 REFERENCE MATERIAL

The Proponent will provide a list of reference material used in developing the Application. Reference material includes the following:

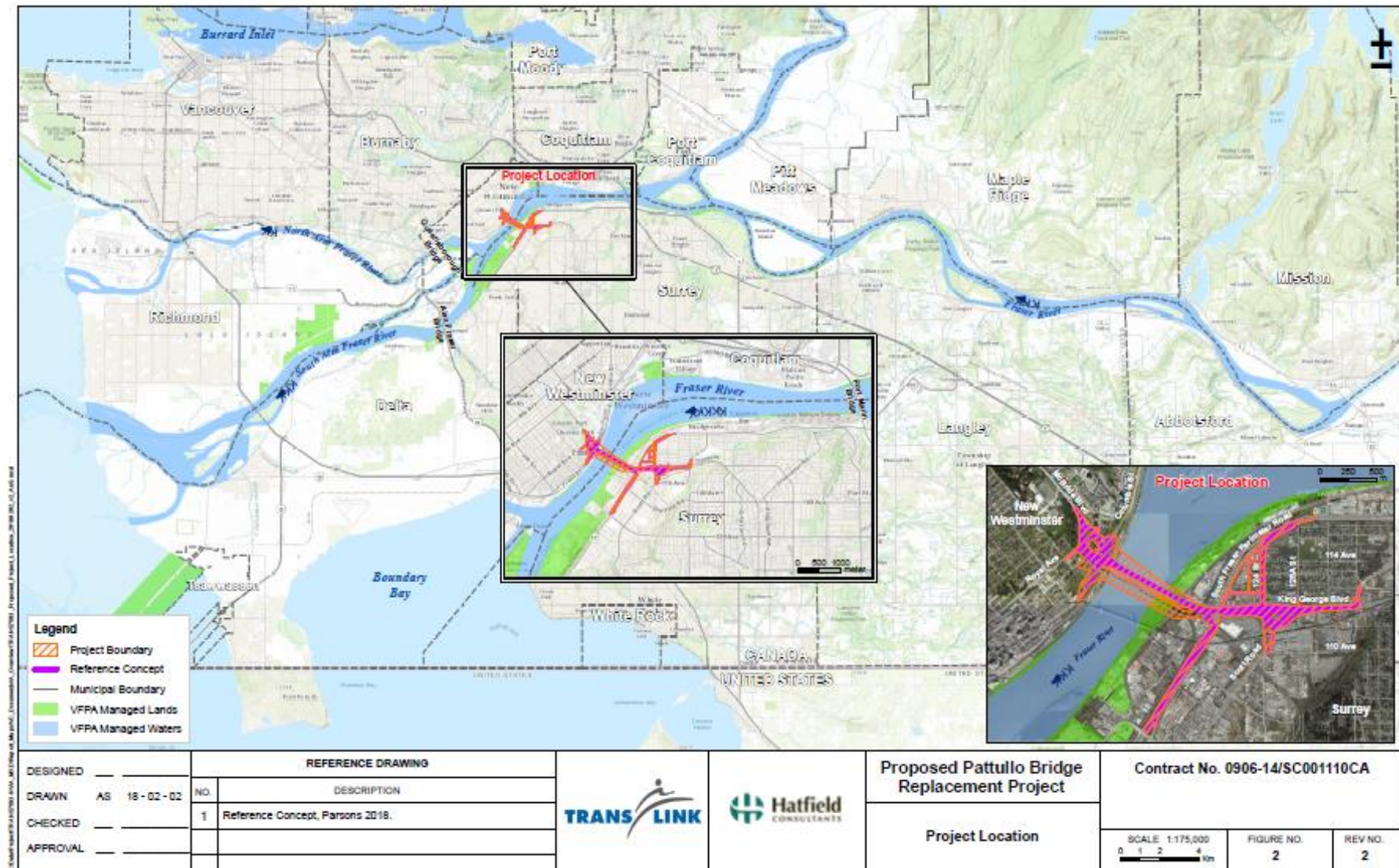
- British Columbia. British Columbia Environmental Assessment Office. 2013a. “Guideline for the Selection of Valued Components and Assessment of Potential Effects.” Available: [http://www.eao.gov.bc.ca/pdf/EAO\\_Valued\\_Components\\_Guideline\\_2013\\_09\\_09.pdf](http://www.eao.gov.bc.ca/pdf/EAO_Valued_Components_Guideline_2013_09_09.pdf). [Accessed October 20, 2016].
- British Columbia. British Columbia Environmental Assessment Office. 2013b. “Guide to Involving Proponents when Consulting First Nations in the Environmental Assessment Process.” Available: [http://www.eao.gov.bc.ca/pdf/EAO\\_Proponent\\_Guide\\_Dec2013.pdf](http://www.eao.gov.bc.ca/pdf/EAO_Proponent_Guide_Dec2013.pdf). [Accessed November 2, 2016].
- British Columbia, Ministry of Transportation and Infrastructure (MOTI). 2014. “Policy of Assessing and Mitigating Noise Impacts from New and Upgraded Numbered Highways.”
- Canada. Health Canada (HC). 2011. “Guidance for Evaluating Human Health Impacts in Environmental Assessment.” DRAFT.
- Metro Vancouver. 2016. “Human Health Impact Assessment of Transportation and Land Use Planning Activities.” Accessed November 9, 2016: <http://www.metrovancouver.org/services/regional-planning/PlanningPublications/HIA-Guidebook.pdf>.
- Vancouver Fraser Port Authority (VFPA). 2015. Project and Environmental Review Guidelines – Lighting. Available: <http://www.portvancouver.com/wp-content/uploads/2015/05/PER-Lighting-Guidelines-Final-2015-07-08.pdf>. [November 28, 2016]
- Vancouver Fraser Port Authority (VFPA). 2015. Project and Environmental Review Guidelines – View and Shade Impact. Available: <http://www.portvancouver.com/wp-content/uploads/2015/05/PER-View-and-Shade-Impact-Guidelines-FINAL-2015-07-13.pdf>. [November 28, 2016].
- Vancouver Fraser Port Authority (VFPA). 2015. “Project and Environmental Review Guidelines – Environmental Noise Assessment.” Accessed May 18, 2017: <http://www.portvancouver.com/wp-content/uploads/2015/05/PER-Noise-Assessment-Guidelines-FINAL-2015-07-09.pdf>
- World Health Organization (WHO). 1995. “Community Noise”. Edited by Birgitta Berglund & Thomas Lindvall Stockholm, Sweden.

## 18.0 APPENDICES

This section will include the appendices referenced in the Application.

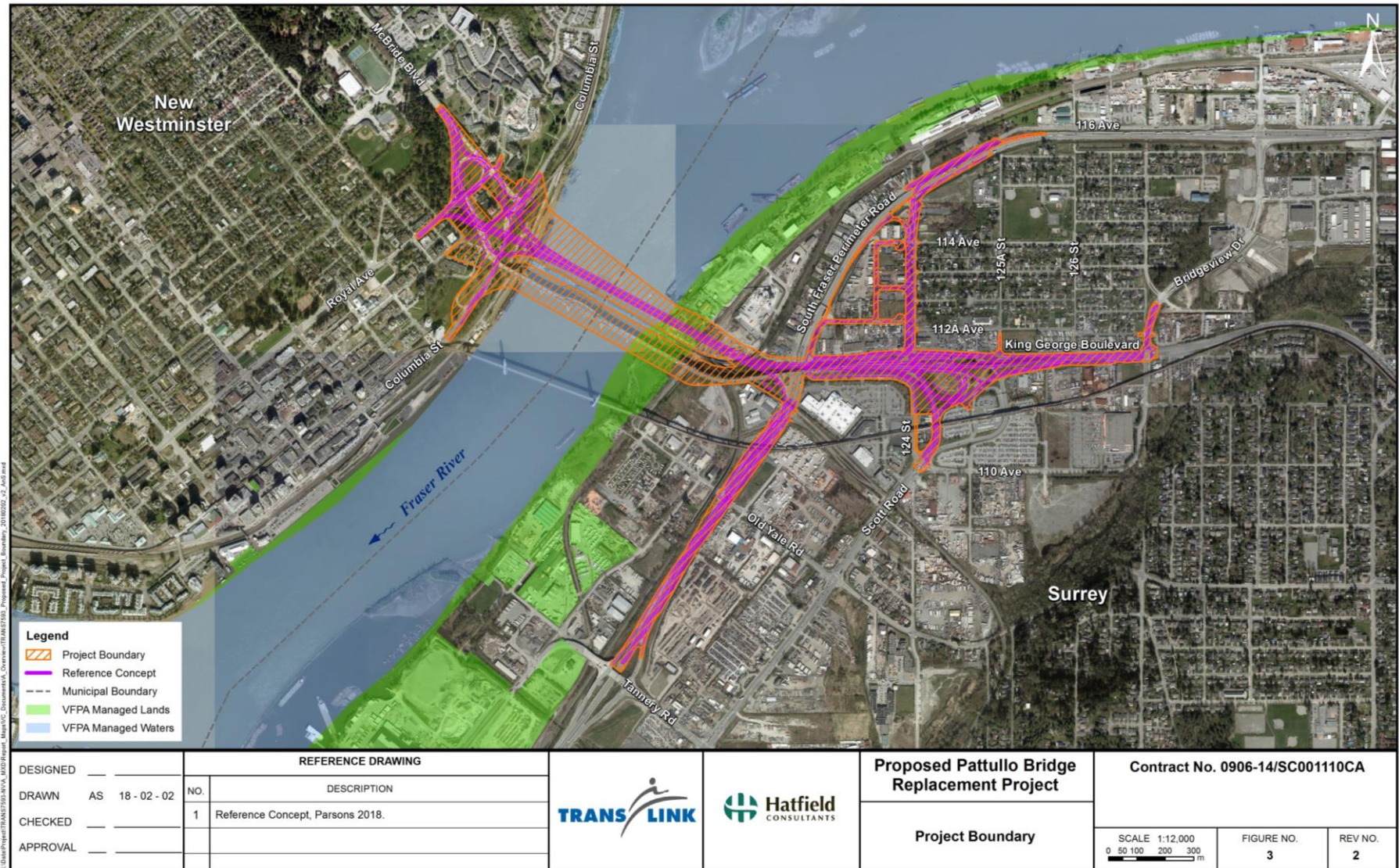
Information prepared by professionals and provided under their professional seal will be identified in the Application and the related sealed studies will be included in an Appendix.

## 18.1 Proposed Project Location





## 18.2 Proposed Project Design Footprint



### **18.3 VC and IC Spatial Study Area Boundaries**



Figure A1.1 Fish and Fish Habitat Assessment Area

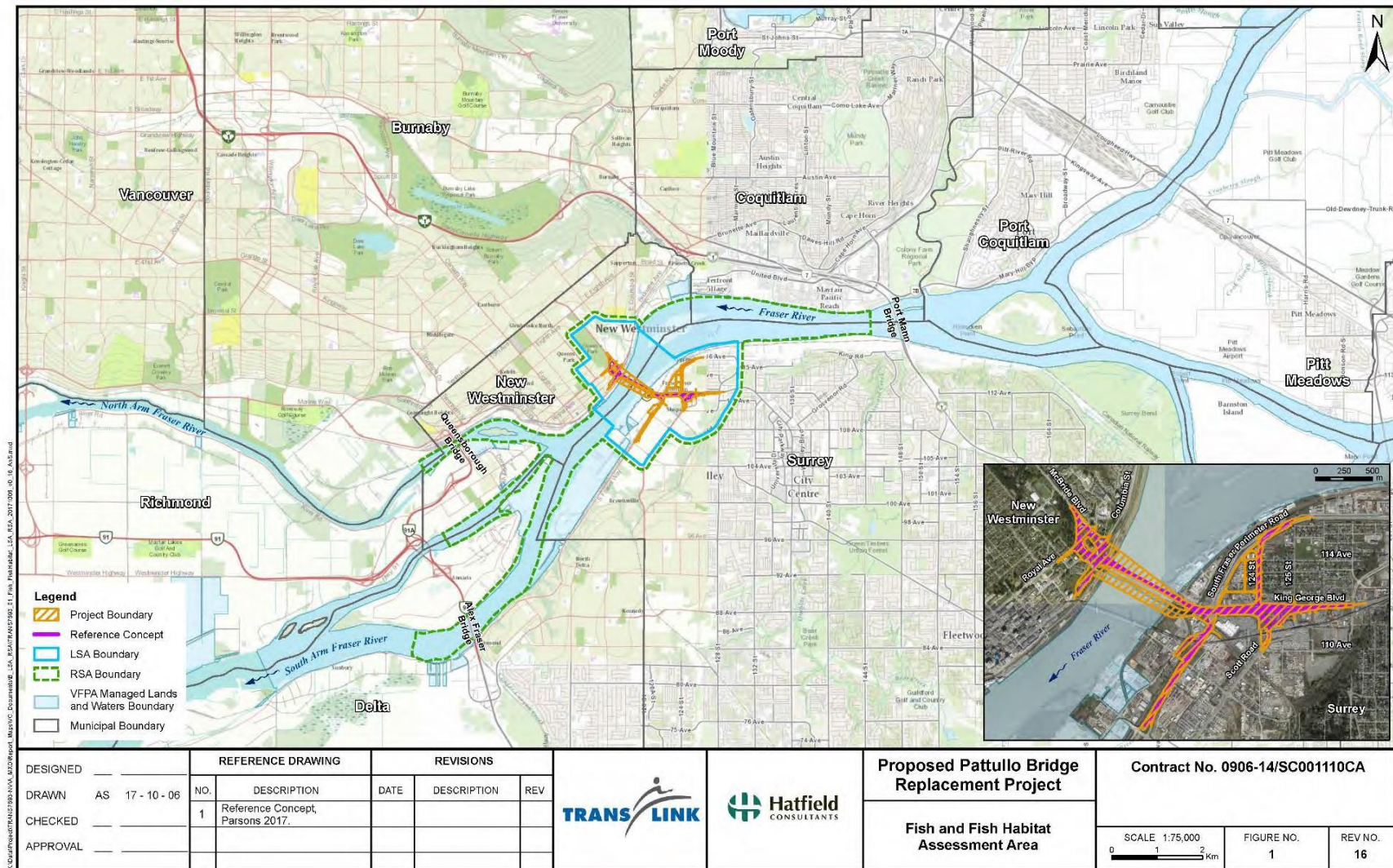




Figure A1.2 Vegetation Assessment Area

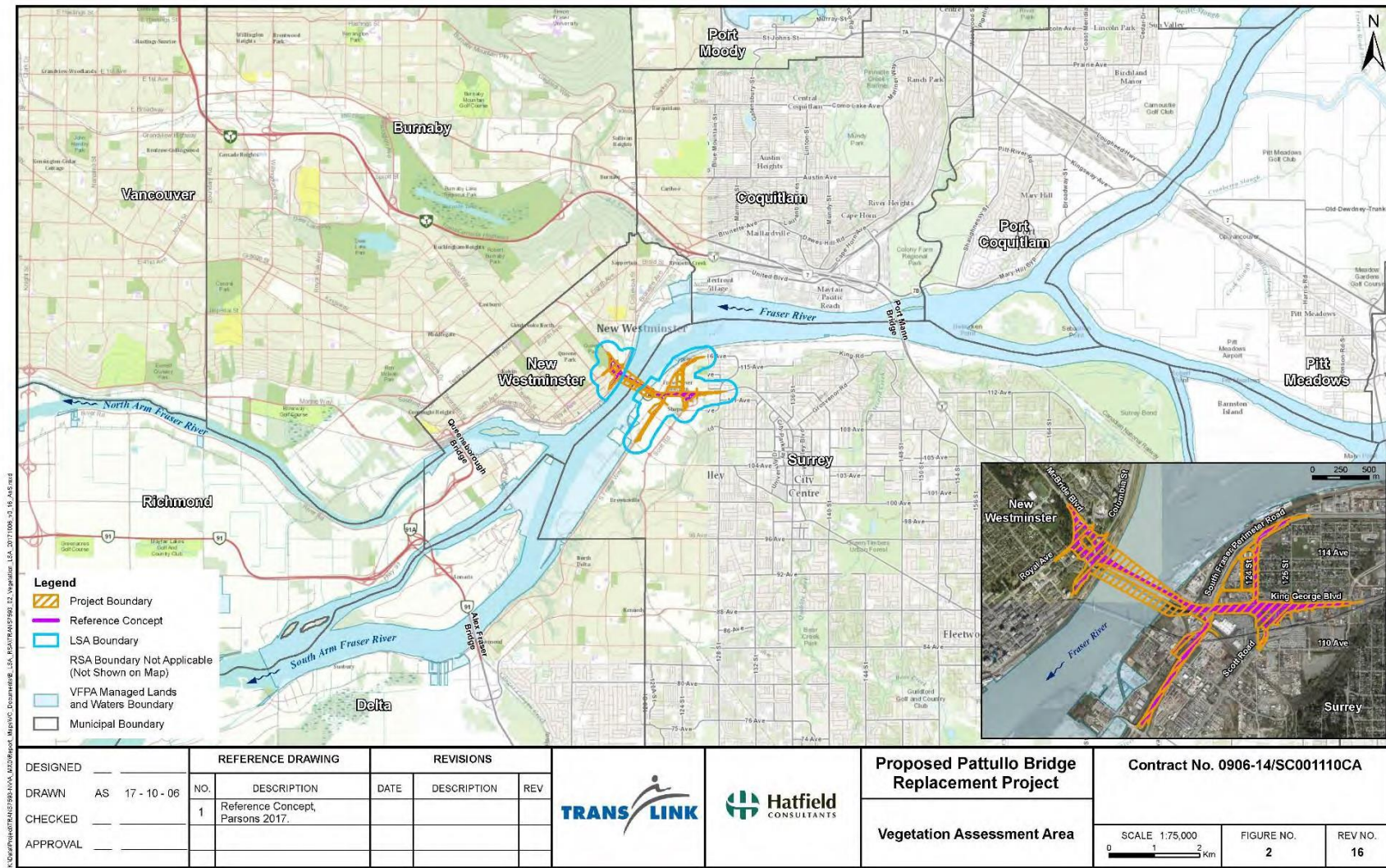




Figure A1.3 Wildlife Assessment Area

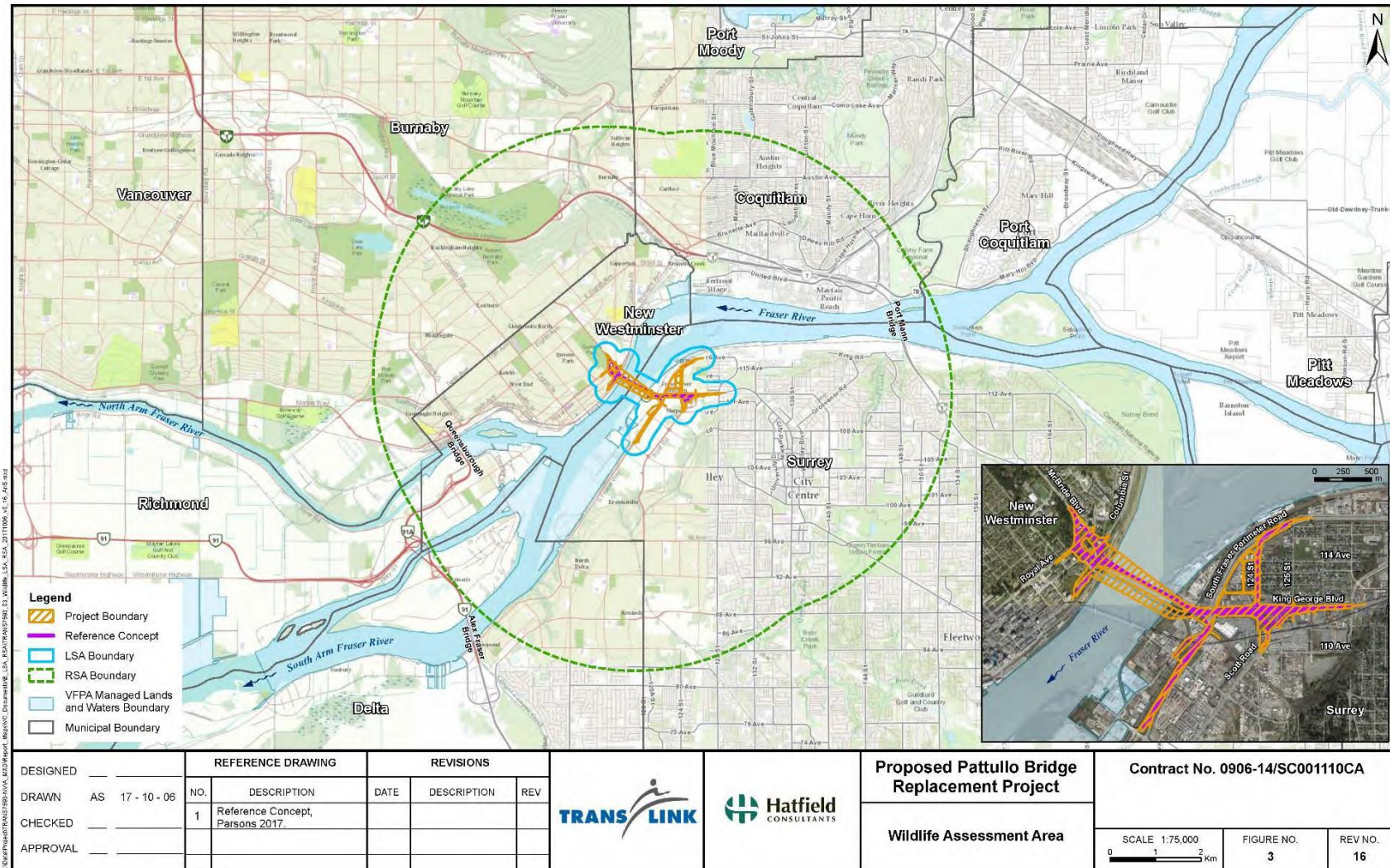




Figure A1.4 Fraser River Hydraulics and River Morphology Assessment Area

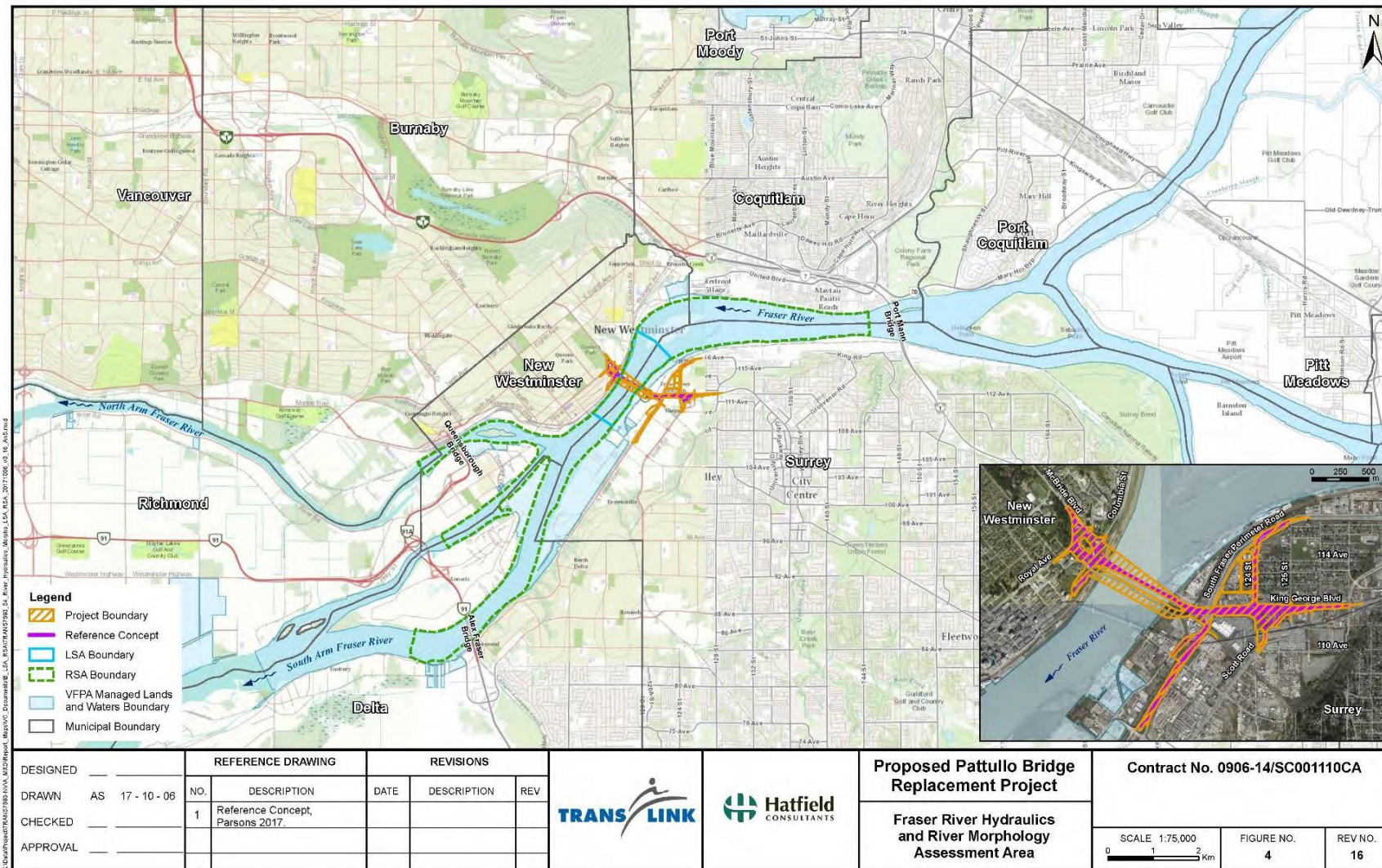




Figure A1.5 Soil and Groundwater Assessment Area

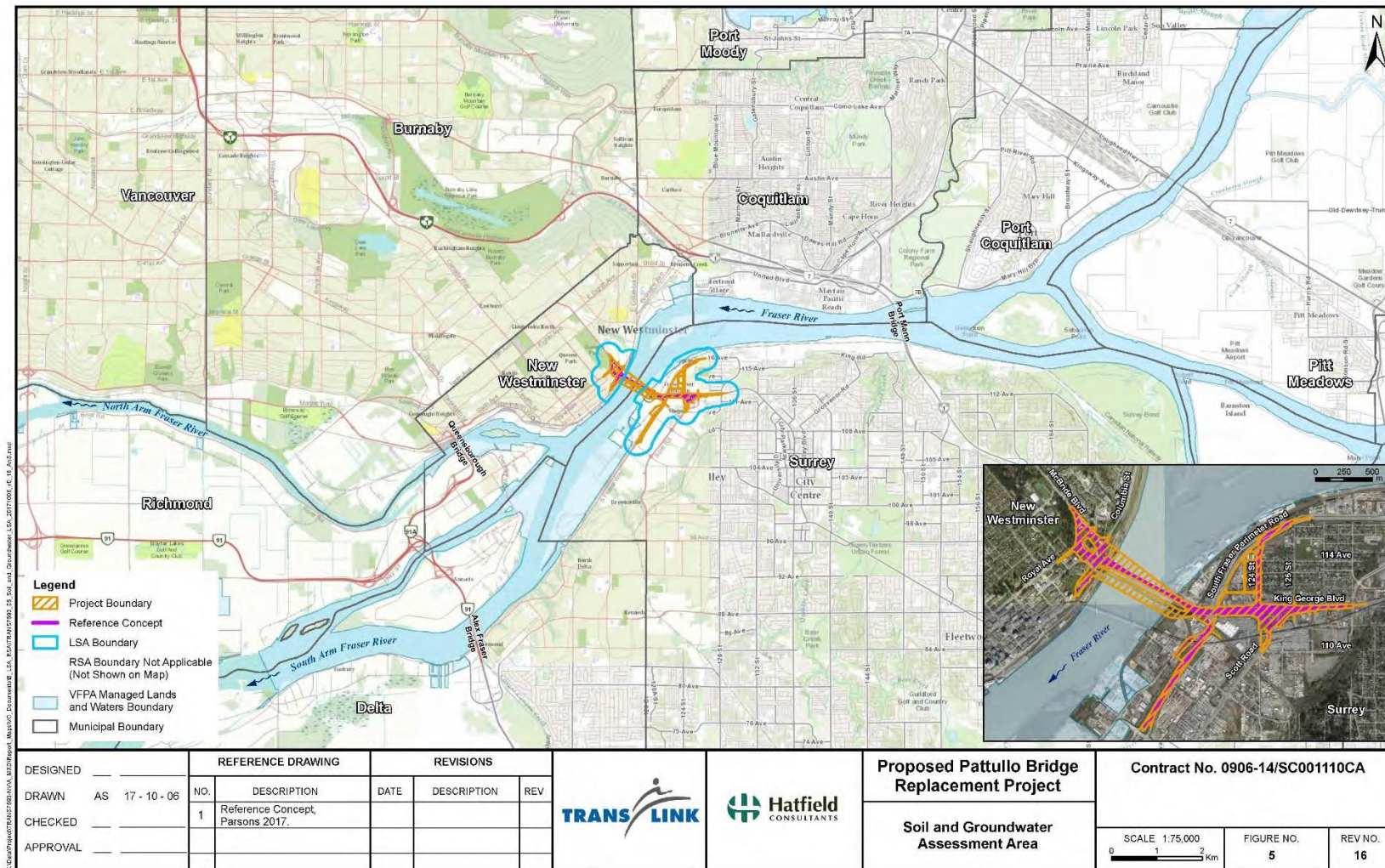




Figure A1.6 Surface Water and Sediment Assessment Area

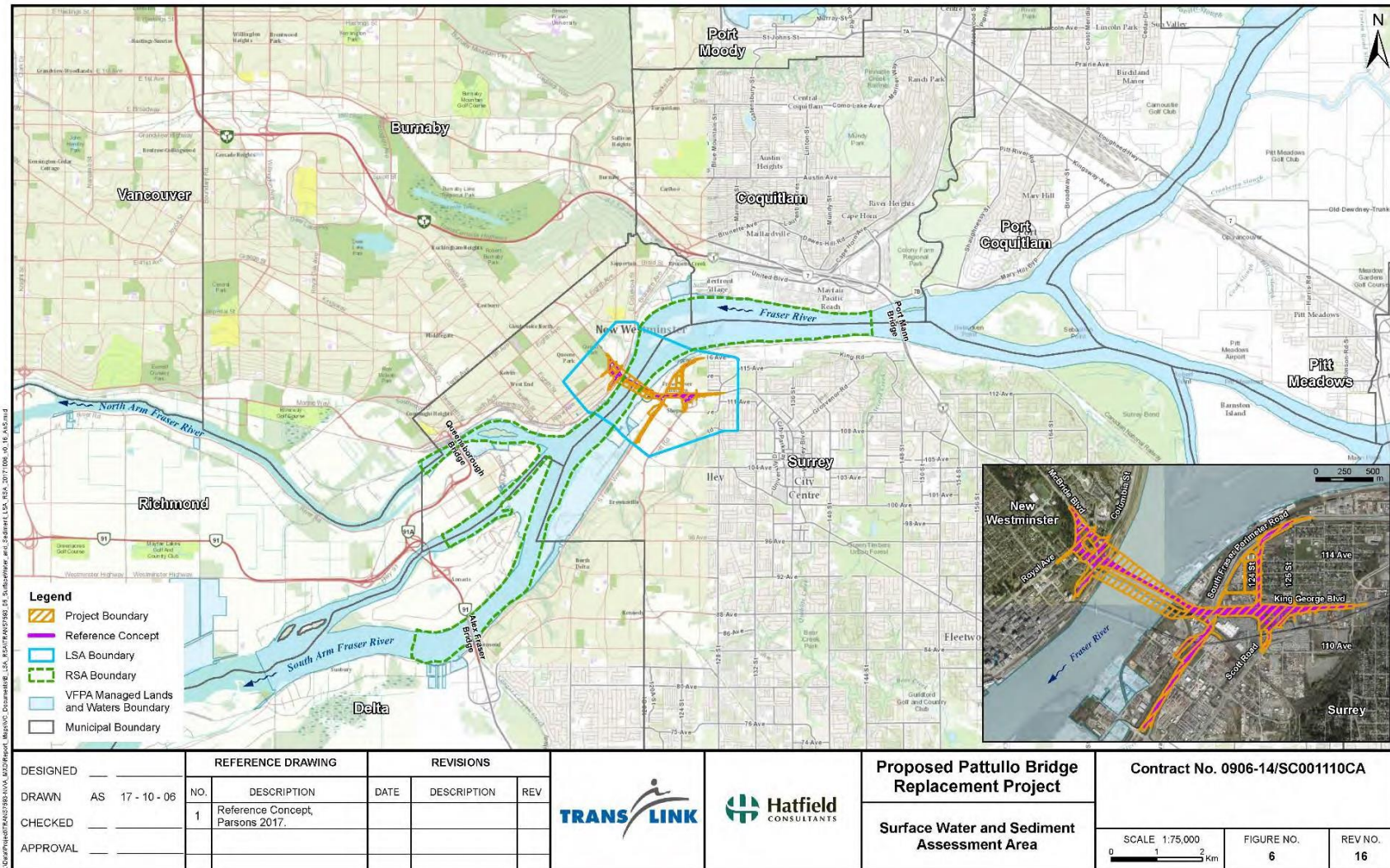




Figure A1.7 Noise and Vibration Assessment Area

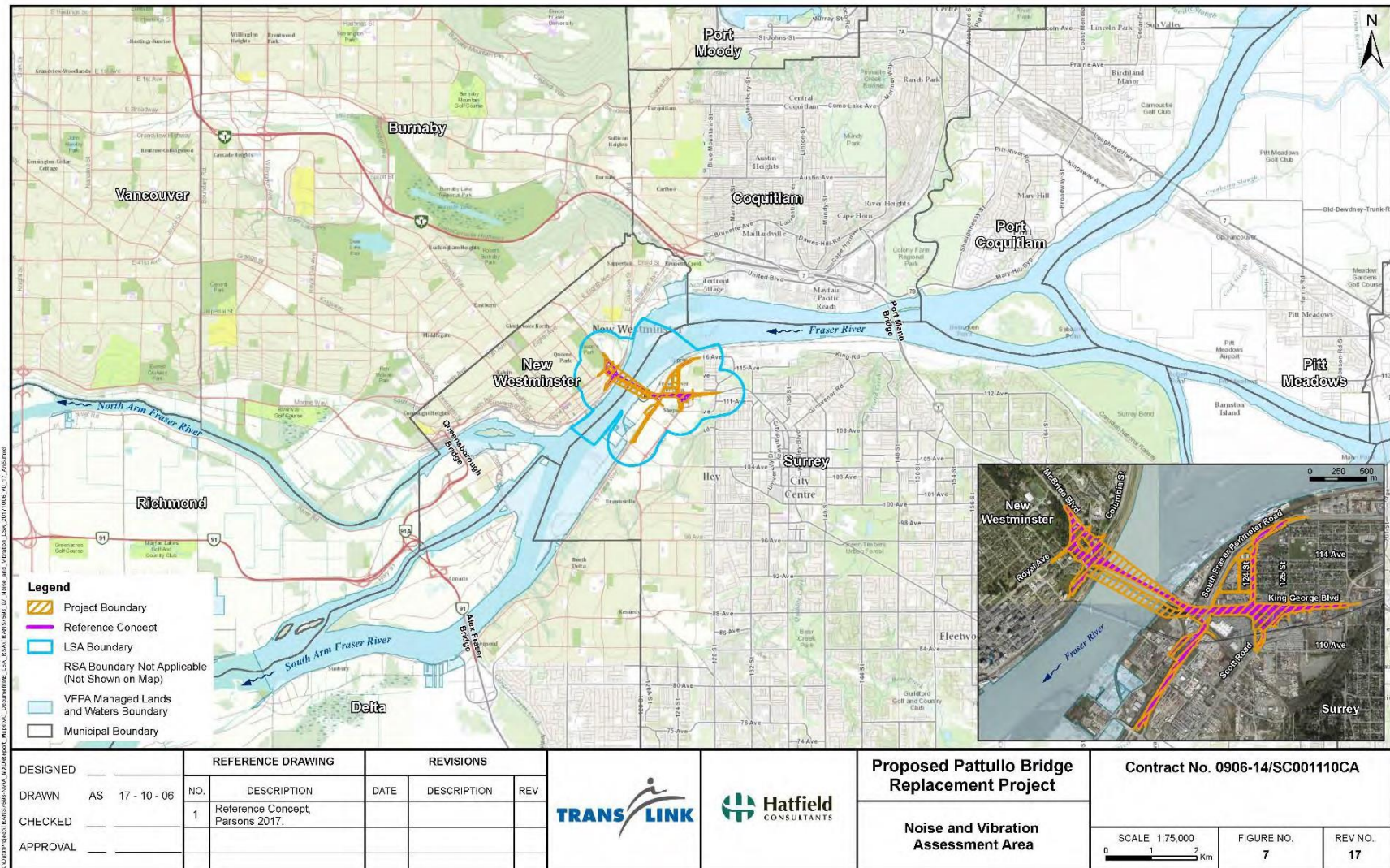




Figure A1.8 Air Quality Assessment Area

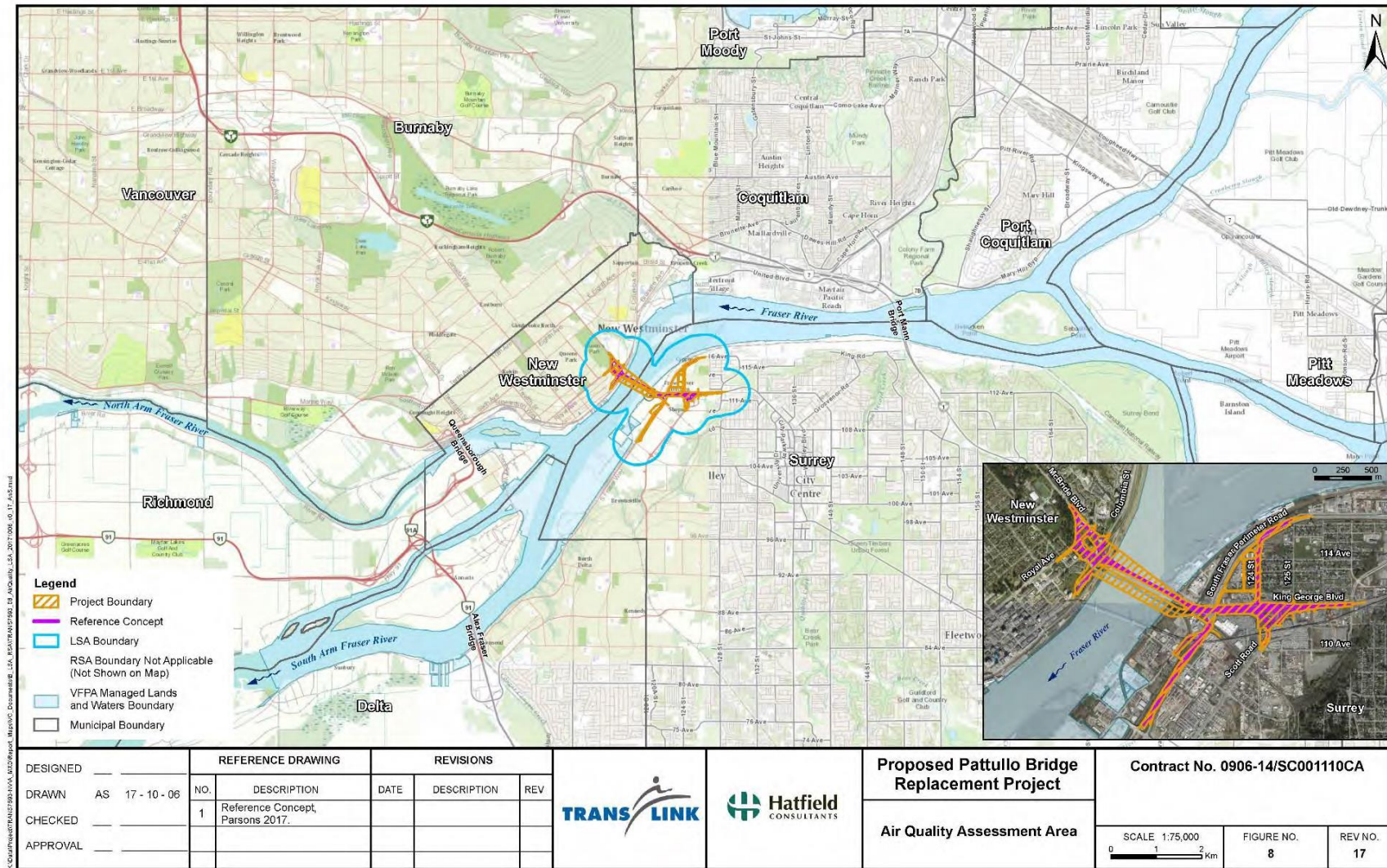




Figure A1.9 Economic Activity Assessment Area

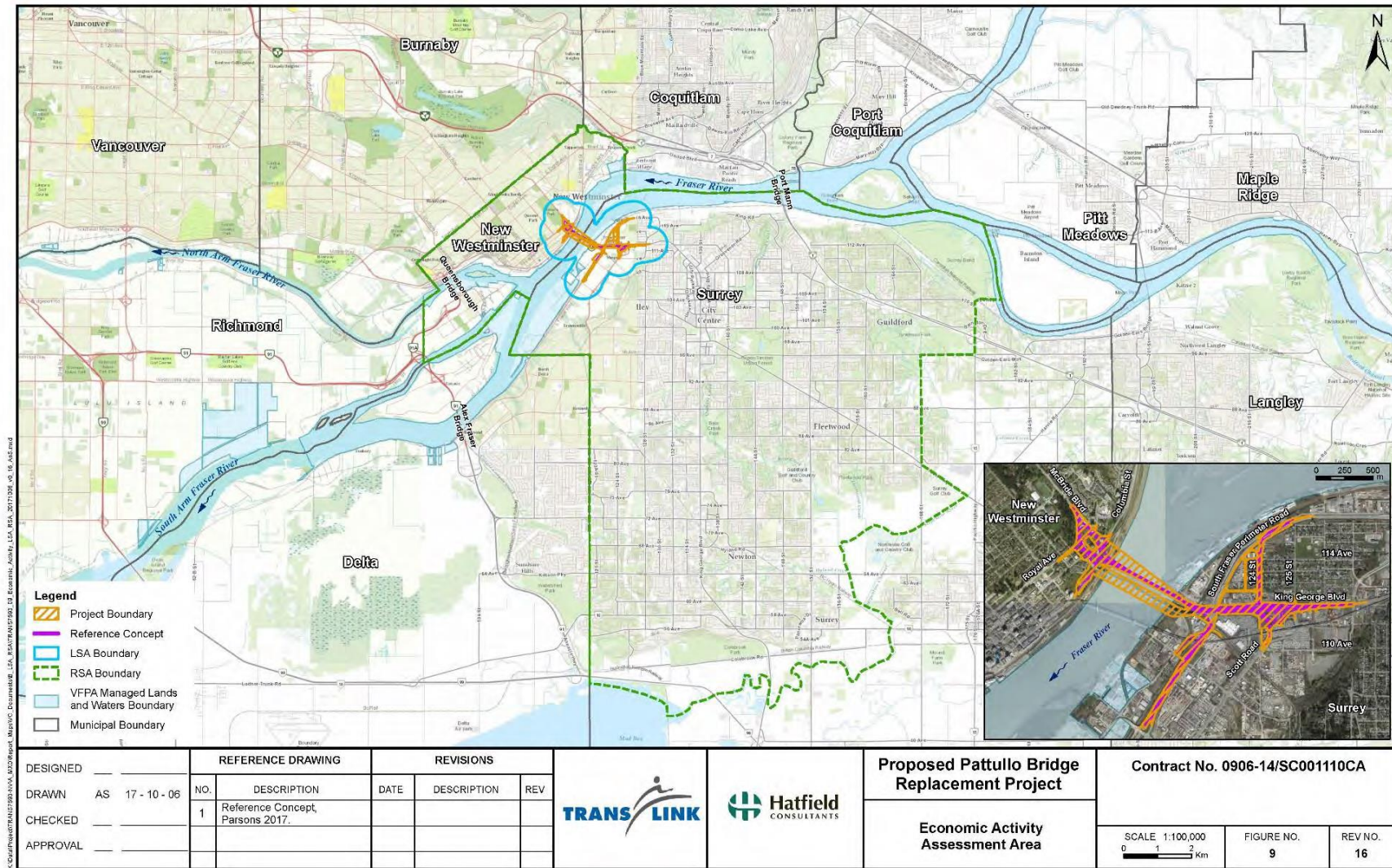




Figure A1.10 Marine Use Assessment Area

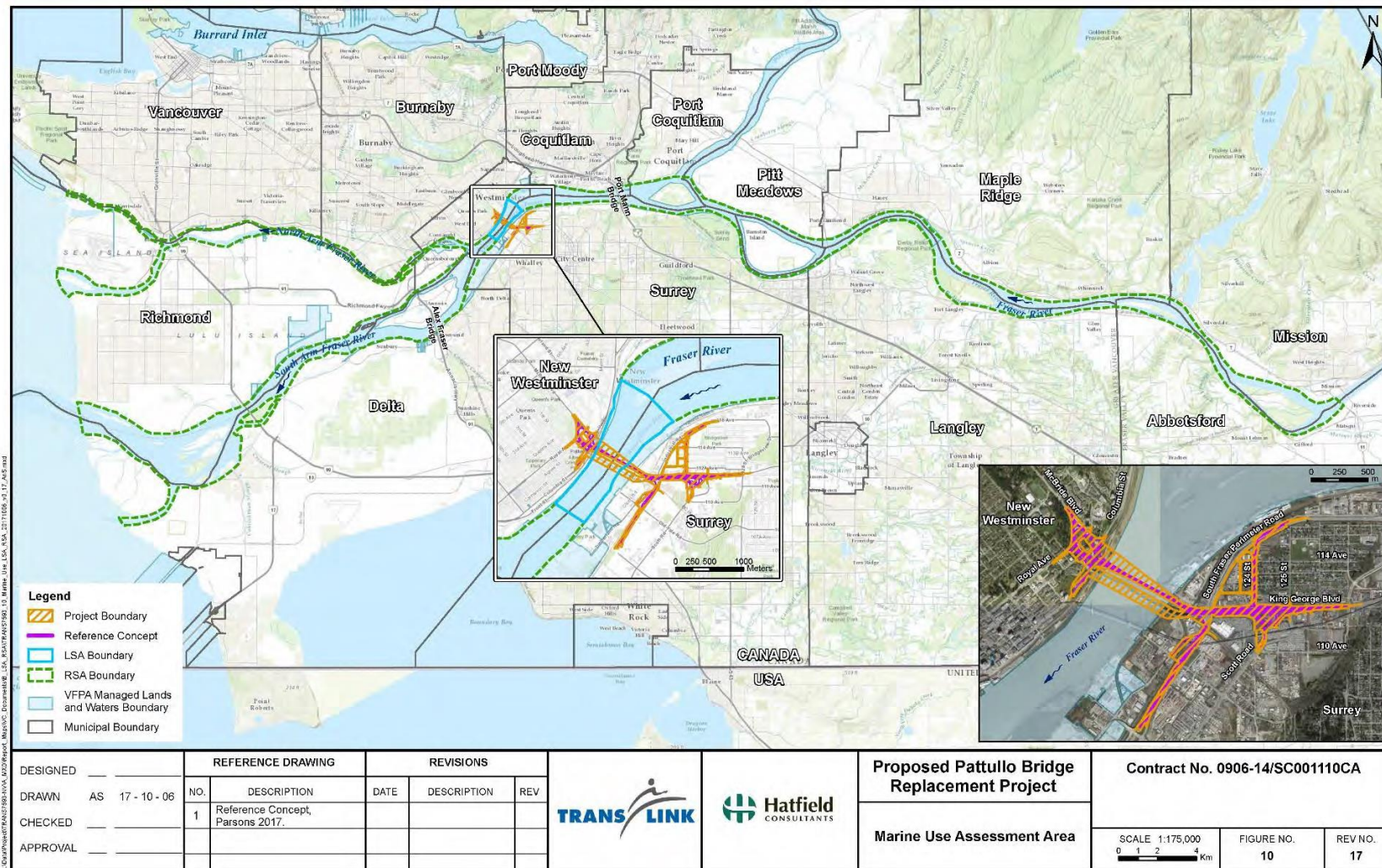




Figure A1.11 Land Use Assessment Area

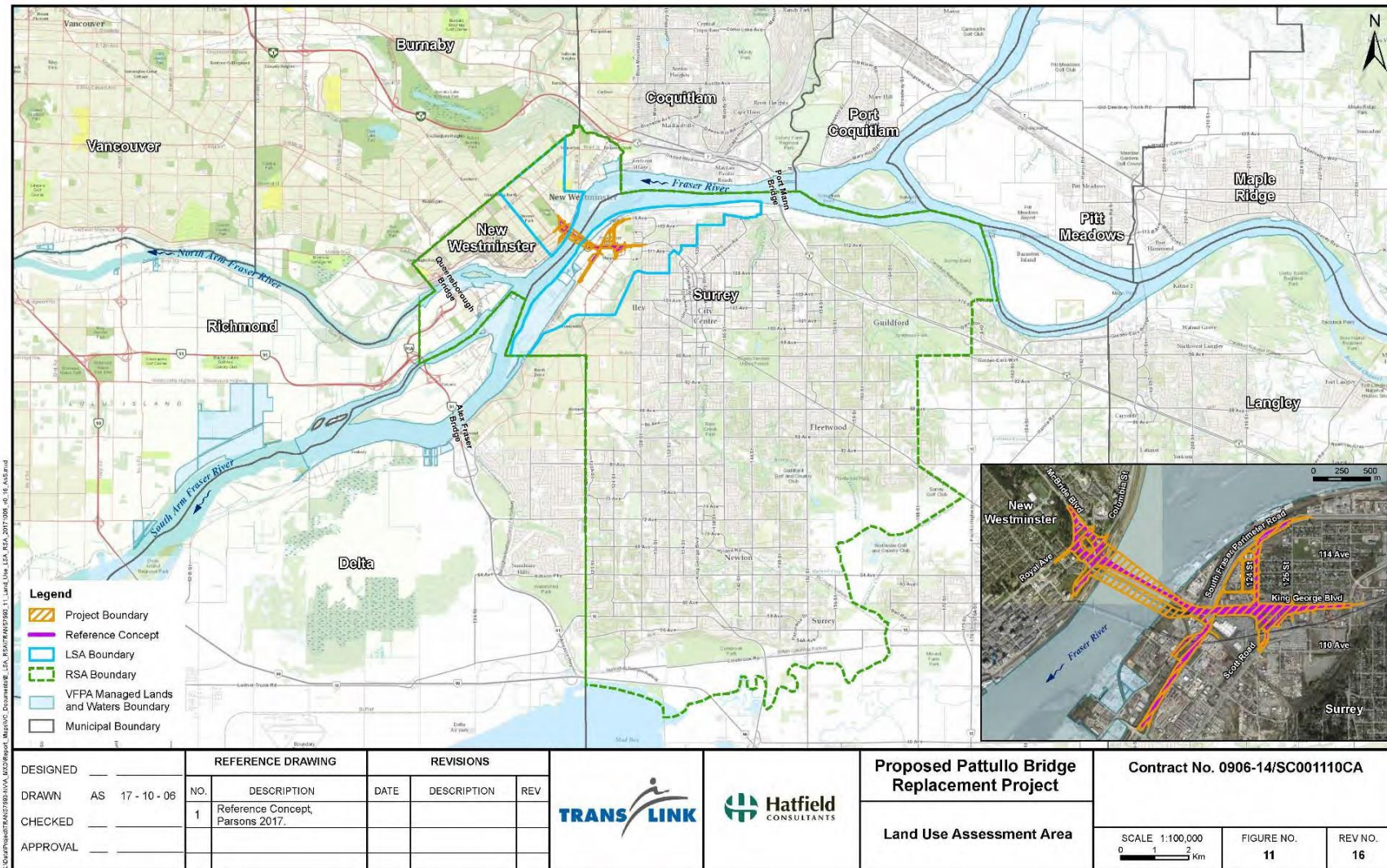




Figure A1.12 Community Cohesion Assessment Area

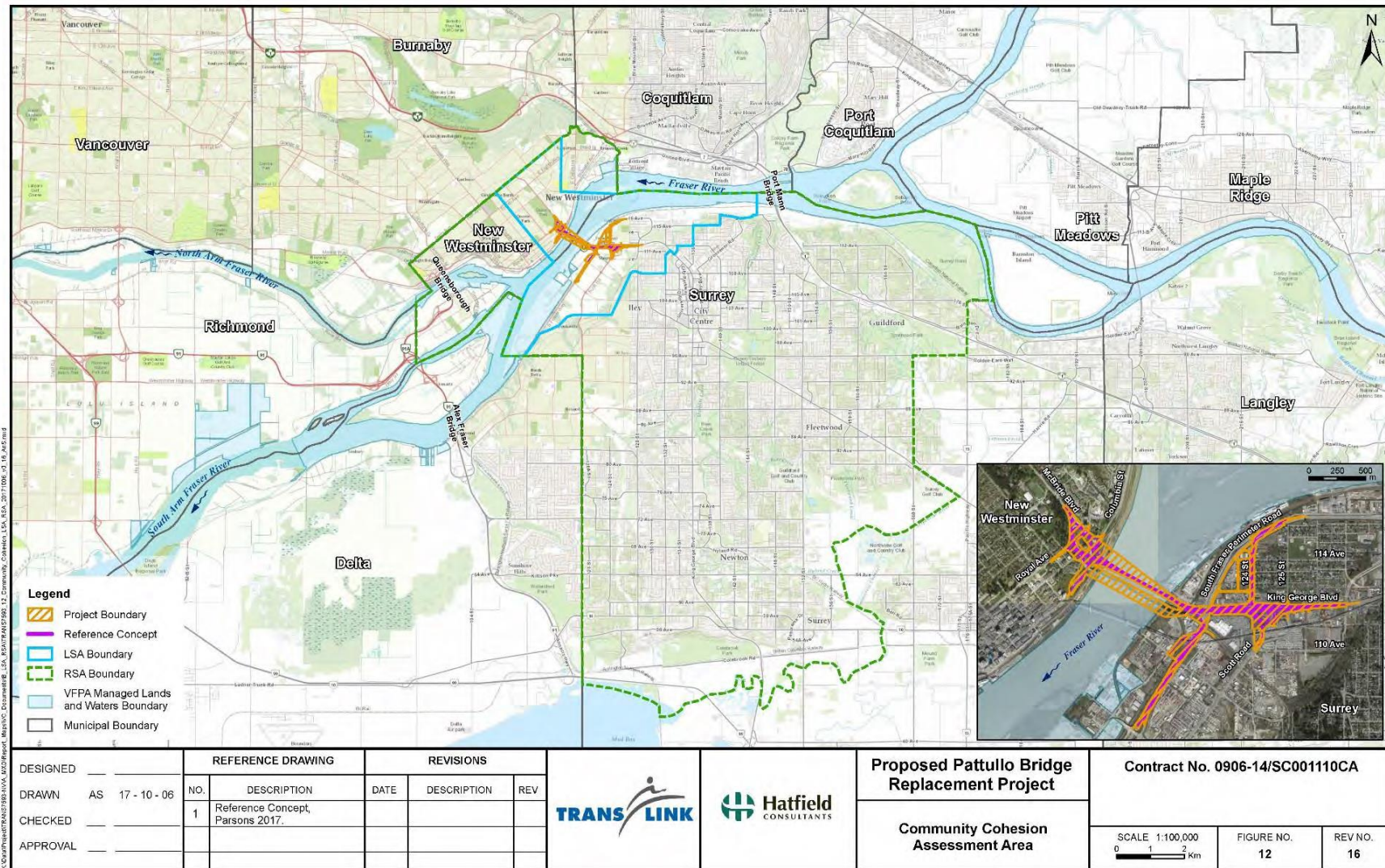




Figure A1.13 Visual Quality Assessment Area

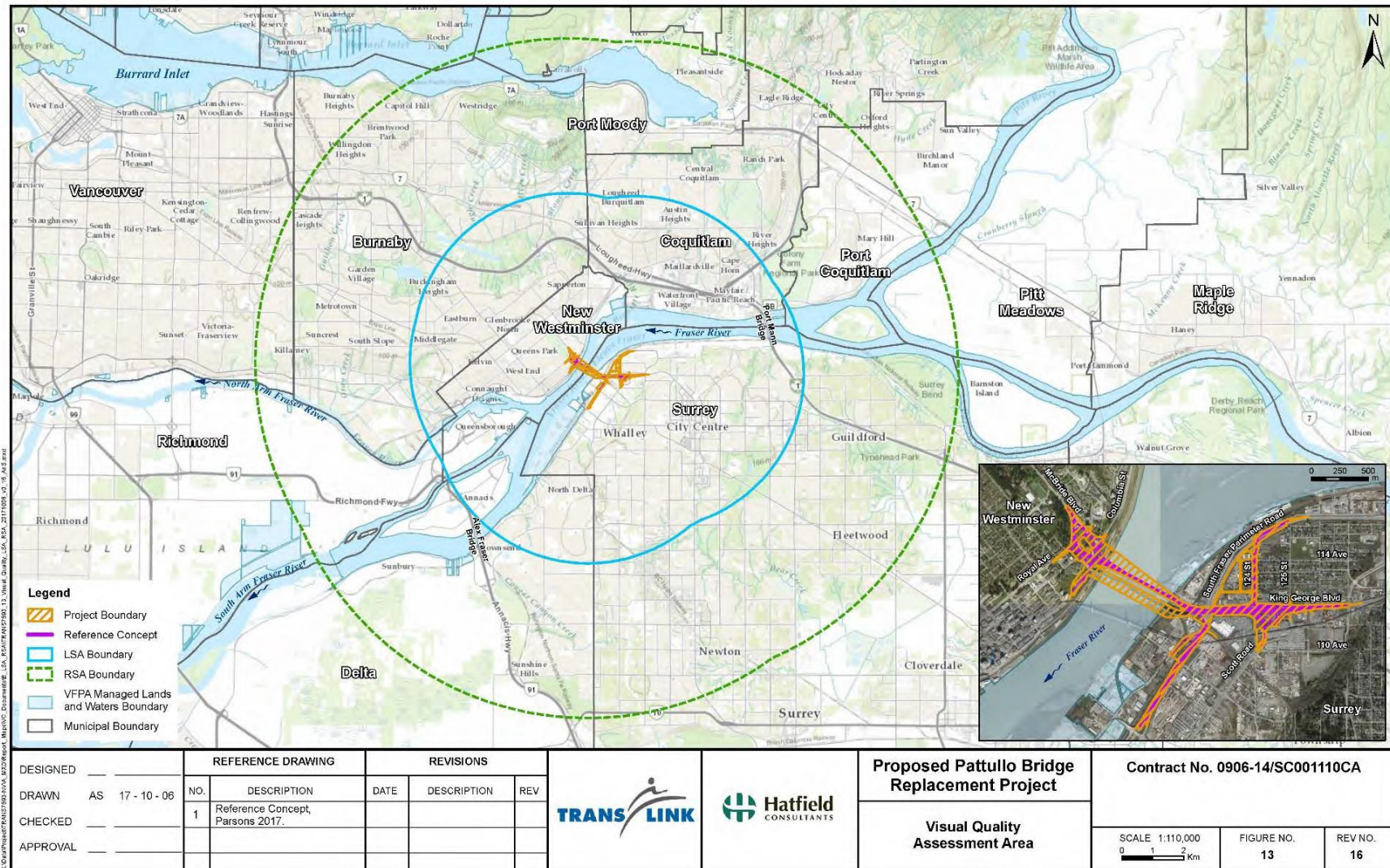




Figure A1.14 Lighting Assessment Area

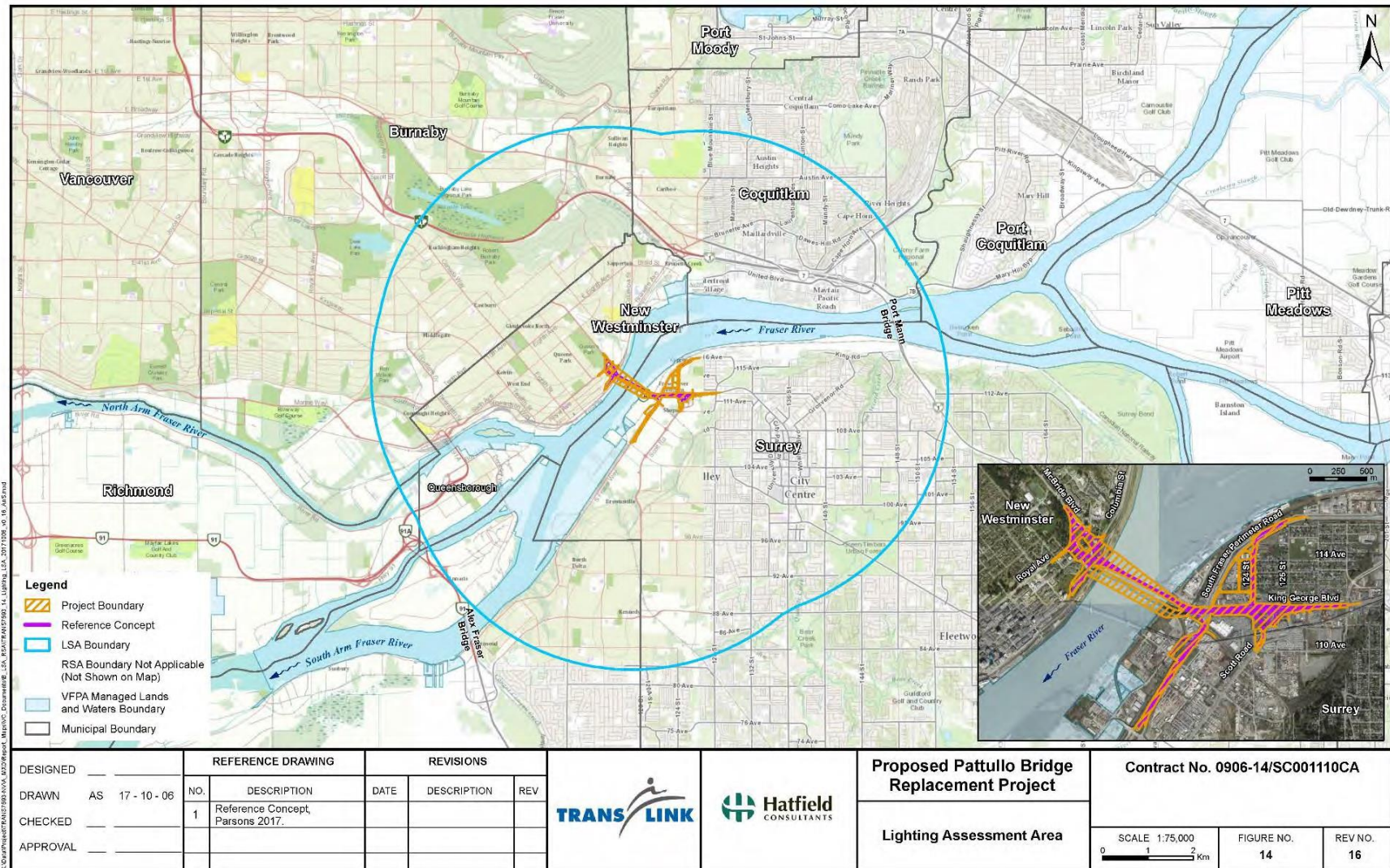




Figure A1.15 Shading Assessment Area

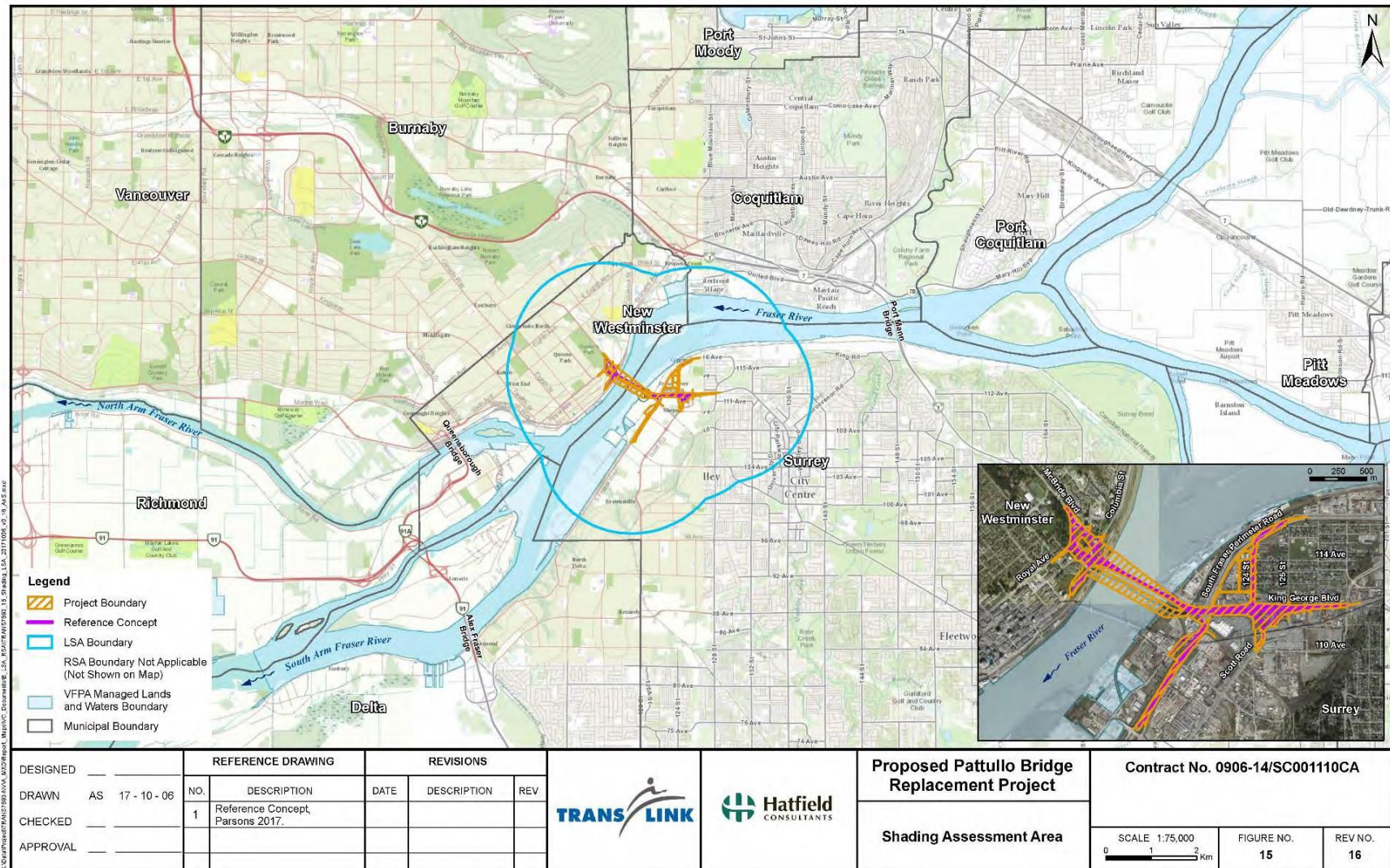




Figure A1.16 Heritage Resources Assessment Area

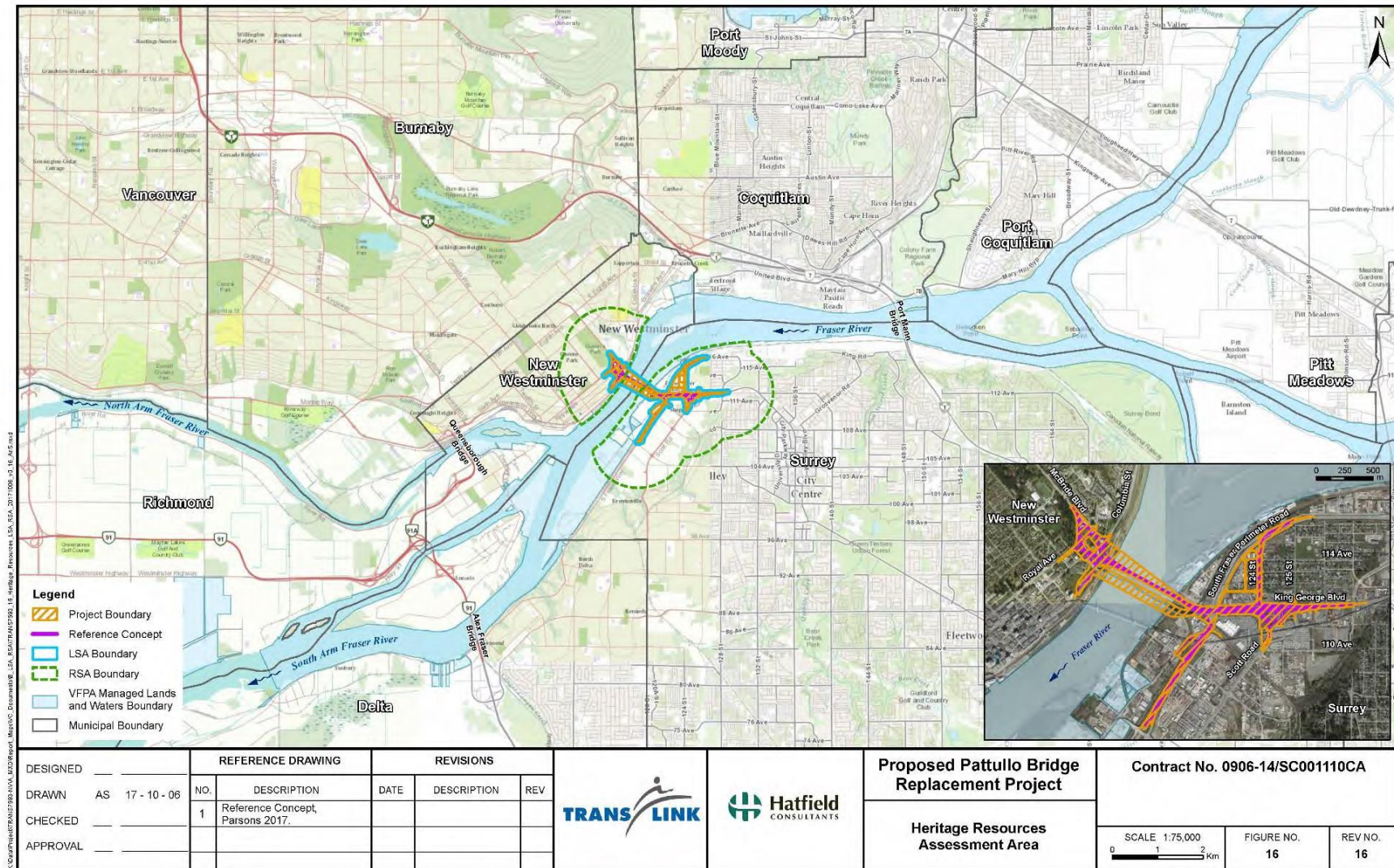




Figure A1.17 Physical Determinants of Human Health Assessment Area

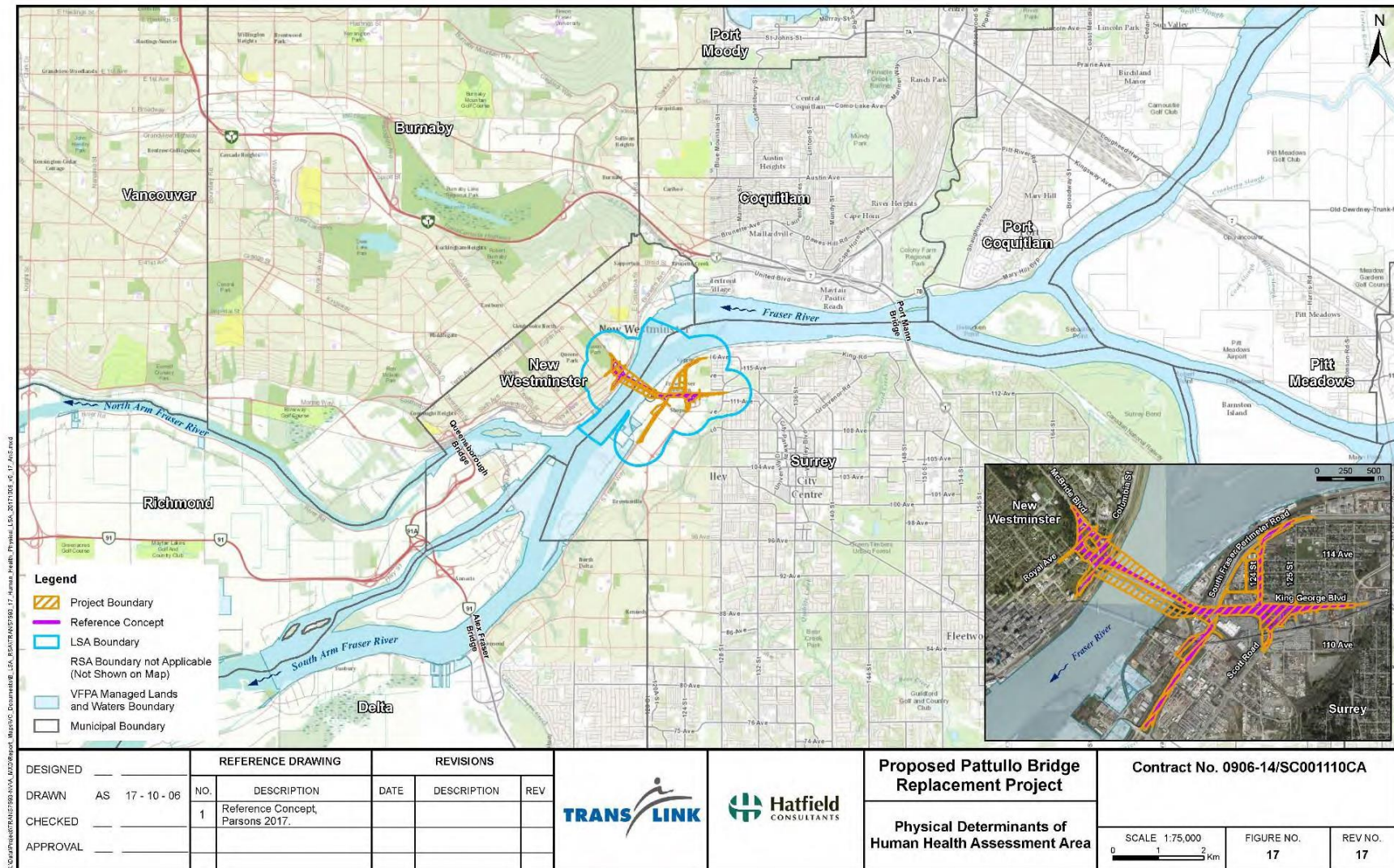
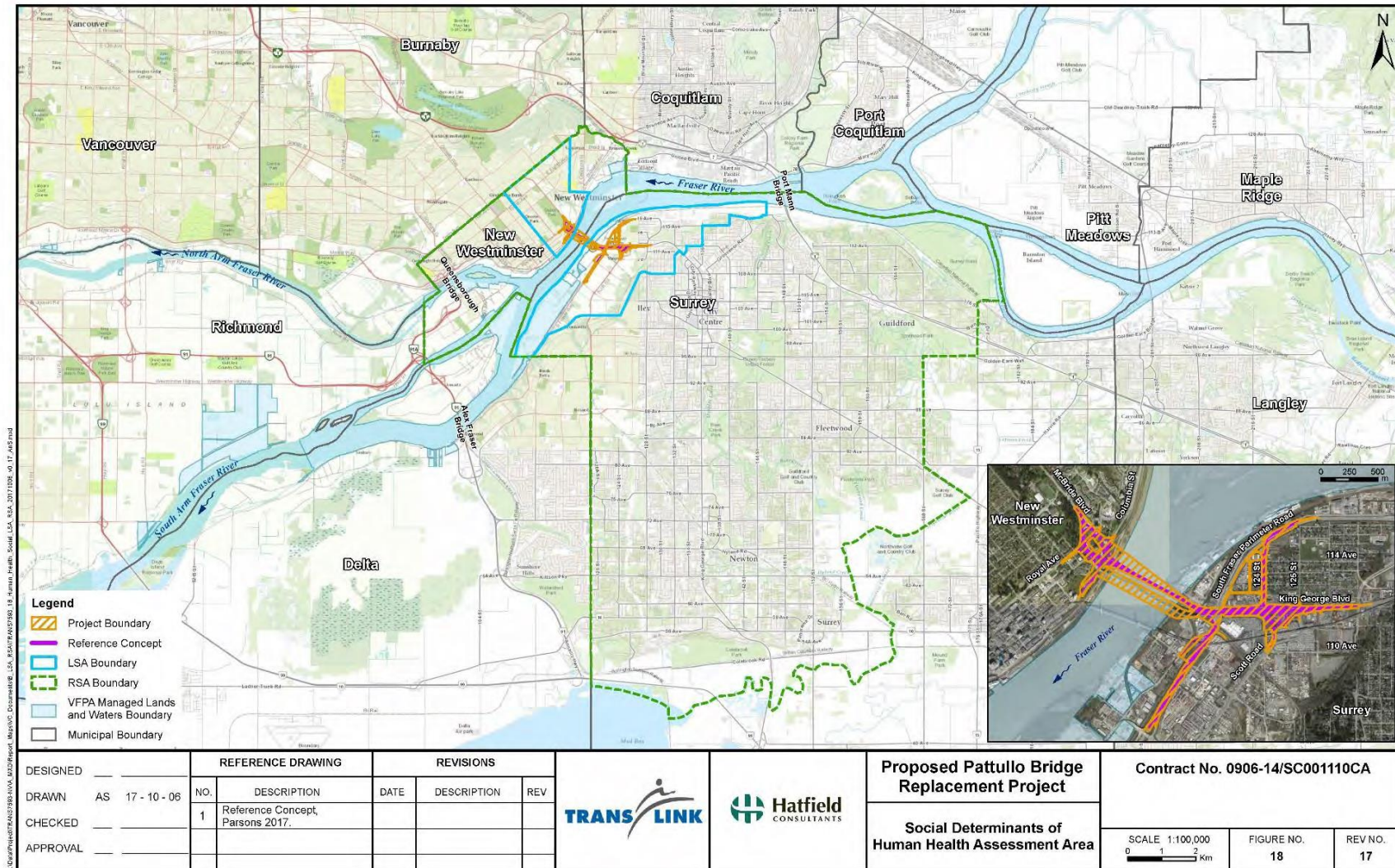




Figure A1.18 Social Determinants of Human Health Assessment Area



## 18.4 Valued Components Selection and Rationale Document



# Pattullo Bridge Replacement Project

## VALUED COMPONENTS SELECTION AND RATIONALE DOCUMENT

March 2018

Ministry of Transportation and Infrastructure

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# ABBREVIATIONS AND ACRONYMS

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>AIA</b>         | Archaeological Impact Assessment                                                                        |
| <b>AIR</b>         | Application Information Requirements                                                                    |
| <b>AOA</b>         | Archaeological Overview Assessment                                                                      |
| <b>Application</b> | Ministry of Transportation and Infrastructure's Application for an Environmental Assessment Certificate |
| <b>ATK</b>         | Aboriginal Traditional Knowledge                                                                        |
| <b>BC</b>          | Province of British Columbia                                                                            |
| <b>BCAA</b>        | British Columbia Automobile Association                                                                 |
| <b>BCBC</b>        | Business Council of British Columbia                                                                    |
| <b>BCEAA</b>       | British Columbia <i>Environmental Assessment Act</i>                                                    |
| <b>BIA</b>         | Business Improvement Association                                                                        |
| <b>CACs</b>        | Criteria Air Contaminants                                                                               |
| <b>CDC</b>         | British Columbia Conservation Data Centre                                                               |
| <b>CEAA 2012</b>   | <i>Canadian Environmental Assessment Act 2012</i>                                                       |
| <b>CL</b>          | Canada Line                                                                                             |
| <b>CO</b>          | Carbon Monoxide                                                                                         |
| <b>COSEWIC</b>     | Committee on the Status of Endangered Wildlife in Canada                                                |
| <b>DEM</b>         | Digital Elevation Models                                                                                |
| <b>DSM</b>         | Digital Surface Models                                                                                  |
| <b>EA</b>          | Environmental Assessment                                                                                |
| <b>EAC</b>         | Environmental Assessment Certificate                                                                    |
| <b>EAO</b>         | [British Columbia] Environmental Assessment Office                                                      |
| <b>FLNRORD</b>     | Ministry of Forests, Lands, Natural Resource Operations and Rural Development                           |
| <b>GDP</b>         | Gross Domestic Product                                                                                  |

|                        |                                                                          |
|------------------------|--------------------------------------------------------------------------|
| <b>GEB</b>             | Golden Ears Bridge                                                       |
| <b>GHGs</b>            | Greenhouse Gases                                                         |
| <b>GIS</b>             | Geographic Information Systems                                           |
| <b>GMTR</b>            | George Massey Tunnel Replacement Project                                 |
| <b>HA (%)</b>          | Highly Annoyed                                                           |
| <b>HHWL</b>            | Higher High Water Level                                                  |
| <b>ICBC</b>            | Insurance Corporation of British Columbia                                |
| <b>IC</b>              | Intermediate Component                                                   |
| <b>km</b>              | Kilometre                                                                |
| <b>LSA</b>             | Local Study Area                                                         |
| <b>m</b>               | Metre                                                                    |
| <b>Mayors' Council</b> | Mayors' Council on Regional Transportation                               |
| <b>MoTI</b>            | Ministry of Transportation and Infrastructure                            |
| <b>MOVES</b>           | Motor Vehicle Emission Simulator                                         |
| <b>New bridge</b>      | Proposed new 4-lane bridge under the Pattullo Bridge Replacement Project |
| <b>New Westminster</b> | City of New Westminster                                                  |
| <b>NWRB</b>            | New Westminster Railway Bridge                                           |
| <b>NH<sub>3</sub></b>  | Ammonia                                                                  |
| <b>NO<sub>x</sub></b>  | Nitrogen oxides                                                          |
| <b>PBRep</b>           | Pattullo Bridge Replacement Project (also referred to as "Project")      |
| <b>PER</b>             | Project Environmental Review Process (a VFPA process)                    |
| <b>PB</b>              | Project Boundary                                                         |
| <b>Permits</b>         | Term used collectively for all legal instruments                         |
| <b>PM<sub>x</sub></b>  | Particulate Matter (X denotes size in microns)                           |
| <b>PMH1</b>            | Port Mann / Highway 1 Improvement Project                                |

|                       |                                                       |
|-----------------------|-------------------------------------------------------|
| <b>Proponent</b>      | Ministry of Transportation and Infrastructure         |
| <b>RC</b>             | Reference Concept                                     |
| <b>RSA</b>            | Regional Study Area                                   |
| <b>SDOH</b>           | Social determinants of health                         |
| <b>SFPR</b>           | South Fraser Perimeter Road Project                   |
| <b>SO<sub>x</sub></b> | Sulfur dioxides                                       |
| <b>Surrey</b>         | City of Surrey                                        |
| <b>MOTI</b>           | Ministry of Transportation and Infrastructure         |
| <b>TransLink</b>      | South Coast British Columbia Transportation Authority |
| <b>UTM</b>            | Universal Transverse Mercator                         |
| <b>VAFDP</b>          | Vancouver Airport Fuel Delivery Project               |
| <b>VC</b>             | Valued Component                                      |
| <b>VFPA</b>           | Vancouver Fraser Port Authority                       |
| <b>VOC</b>            | Volatile Organic Compounds                            |



# KEY TERMS AND DEFINITIONS

As detailed in EAO Guidance (British Columbia 2013a), the following key terms are used in this document:

- **Valued Component (VC)** – A component of the natural or human environment that is considered to have scientific, Aboriginal, regulatory, economic, social, or cultural importance. In this document, a VC is distinguishable from an Intermediate Component (IC) in that the former is used mostly to refer to an ultimate receptor of potential Project-related effects, whereas an IC is a VC that lies within the pathway of effects.
- **Effect Pathway** – Cause and effect linkage between the proposed Project and a VC or IC.
- **Intermediate Component (IC)** – A VC within the Effect Pathway that has the potential to affect an end-of-pathway VC. An IC is not the ultimate receptor of proposed Project-related effects, but is part of the effects pathways, and is studied to support the assessment of the end-of-pathway VCs.
- **Subcomponent** – A broadly defined VC may contain detailed, representative subcomponents as necessary to frame the effects assessment (e.g. amphibians are a subcomponent of the Wildlife VC).
- **Indicator** – A measurable condition/parameter that evaluates the potential effects of the proposed Project on a VC or IC. Indicators must be responsive enough to the VC/IC that useful, practical data are generated within the potential temporal effects of the proposed Project, reflecting incremental changes in the VC/IC that are attributable to the proposed Project.
- **Reference Concept** – The Project is expected to be delivered as a design-build project. The Proponent has developed a “Reference Project” for Project procurement purposes. The Reference Concept is a conceptual design solution that meets the identified design guidelines and is constructible and economically feasible. The EA will occur before a Contractor is selected and before the final design is developed. The EA will be environmentally conservative in that it will assume implementation of the Reference Project but will also consider reasonably likely design variants and a realistic range of construction methods that, together, would entail greater and more extensive adverse environmental effects than those anticipated merely as a result of implementing the Reference Concept.
- **Project Boundary (PB)** – Includes the Reference Concept plus additional area intended to capture a reasonable spectrum of possible design refinements and anticipated direct disturbance<sup>11</sup> from construction.

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<sup>11</sup> “Direct disturbance” area means the plan view area that encompasses the Reference Concept (including reasonably expected design refinement, as well as an area allowance that would reasonably be expected to be subject to ground disturbance from temporary construction support activities). The direct disturbance area is

- **Local Study Area (LSA)** – The area within which potential Project-related interactions and adverse effects are expected to occur; the LSA is intended to capture sensitive receptors that could reasonably be expected to be directly affected by proposed Project activities, and is defined for each VC and IC.
- **Regional Study Area (RSA)** – The area that encompasses the LSA plus additional area intended to capture more remote sensitive receptors that could reasonably be expected to be subject to indirect<sup>12</sup> disturbance from the Project. The RSA is also intended to provide context for the assessment of potential effects of the Project, and may be applied as the spatial boundary for assessment of potential cumulative effects. The RSA is defined for each VC and IC.

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intended to capture areas for temporary works, such as temporary workspace, laydown areas, storage areas, temporary detours and access roads, temporary marine access or falseworks, equipment maintenance areas, site offices, and other such support areas or activities that typically occur within or close to the extents of the design footprint.

<sup>12</sup> “Indirect disturbance” area means the area that will not be subjected to ground disturbance but may nevertheless be reasonably expected to be subject to potential effects, during construction and operation, from support activities, such as conveyance of equipment or supplies to or from the construction site or from one part of the Project to another; may include ancillary areas used on a temporary basis for soil storage or fabrication or barge loading (e.g., temporary plant for manufacturing bridge segments if segmental construction is used), assuming such areas or facilities are located in the general Project area.

# 1.0 INTRODUCTION

The British Columbia Ministry of Transportation and Infrastructure (MOTI or “Proponent”) is proposing to replace the existing Pattullo Bridge with a new four-lane bridge spanning the Fraser River just north and upstream of the existing bridge. Similar to the existing bridge, its approaches will connect to McBride Boulevard in the City of New Westminster and King George Boulevard in the City of Surrey, British Columbia. The proposed Project will also involve the removal of the existing bridge.

Opened in 1937, the existing 80-year-old Pattullo Bridge is nearly 30 years beyond its original design life, resulting in a number of age-related challenges. The existing bridge is functionally inadequate and increasingly expensive to operate and maintain, and must therefore be replaced. A new bridge is essential for maintaining a critical transportation connection for people and goods between New Westminster and Surrey, as part of the region’s Major Road Network.

A Project Description was submitted to British Columbia’s Environmental Assessment Office (EAO) in September 2016. The EAO determined that, pursuant to British Columbia’s *Environmental Assessment Act* (BCEAA) and Part 5 of the Reviewable Projects Regulation (B.C. Reg. 370/02), the proposed Project is reviewable as it is expected to cause direct physical disturbance of greater than or equal to 2 hectares of foreshore or submerged land, or a combination of foreshore and submerged land, below the natural boundary of the Fraser River.

On November 9, 2016, the EAO issued an order under Section 10(1)(c) of the BCEAA, stating that the proposed Project requires an Environmental Assessment Certificate (EAC) and that the Proponent may not proceed with the proposed Project without an assessment. With the issuance of the Section 10 Order, the assessment of the proposed Project commenced at the pre-Application stage. Documentation required from the Proponent during pre-Application includes a Valued Components Selection and Rationale Document as provided herein.

Canadian Environmental Assessment Agency has confirmed that the proposed Project does not trigger an environmental assessment pursuant to the *Canadian Environmental Assessment Act* 2012 (CEAA 2012), because the proposed works do not correspond to the list of physical activities that constitute a “designated project” that may require an environmental assessment under CEAA 2012. However, the Project is partially located on federal lands, in this case lands and waters lying within jurisdiction of the Vancouver Fraser Port Authority (“VFPA”). Project implementation will require a VFPA Project Environmental Review (PER) Permit as a “Category D” project. In such circumstances, Section 67 of the *Canadian Environmental Assessment Act* 2012 (CEAA 2012) requires VFPA to consider the likelihood of significant adverse environmental effects prior to making a decision as to whether or not to issue a PER Permit.

EAO and VFPA have agreed to a harmonized approach to the Environmental Assessment (EA). The EAO and the VFPA co-signed a letter on October 6, 2016, that describes their combined approach. Formal harmonization is limited to EAO and VFPA, and does not encompass other federal authorities that may need to issue permits or authorization(s) for the Project. The

Proponent intends that its Application for an EAC will be supported by an EA that would provide sufficient information to other federal authorities, including Transport Canada and Fisheries and Oceans Canada (DFO), who may need to make their own determination pursuant to s. 67 of CEAA 2012 prior to issuing a permit or authorization relating to the Project.

On June 6, 2017, pursuant to s. 11 of the BCEAA, EAO issued a letter permitting initial public consultation on the draft Valued Component Selection and Rationale document for the Project. The public comment period ran from June 26 to July 26, 2017, during which two public open houses were held, one in New Westminster and one in Surrey, on June 26 and 27, 2017, respectively.

On June 22, 2017, EAO held a first meeting of the Advisory Working Group (AWG) at which the Proponent presented the Project, as well as the draft Valued Component Selection and Rationale document, dated June 2017.

The present version of the Valued Component Selection and Rationale document, dated September 2017, amends the June 2017 version that was presented to the public and to the AWG, addressing AWG and public comments on the initial draft document, as received by August 11, 2017.

On August 8, 2017, EAO issued a further Order pursuant to s. 11 of BCEAA that set out the scope, procedures and methods for conducting the EA.

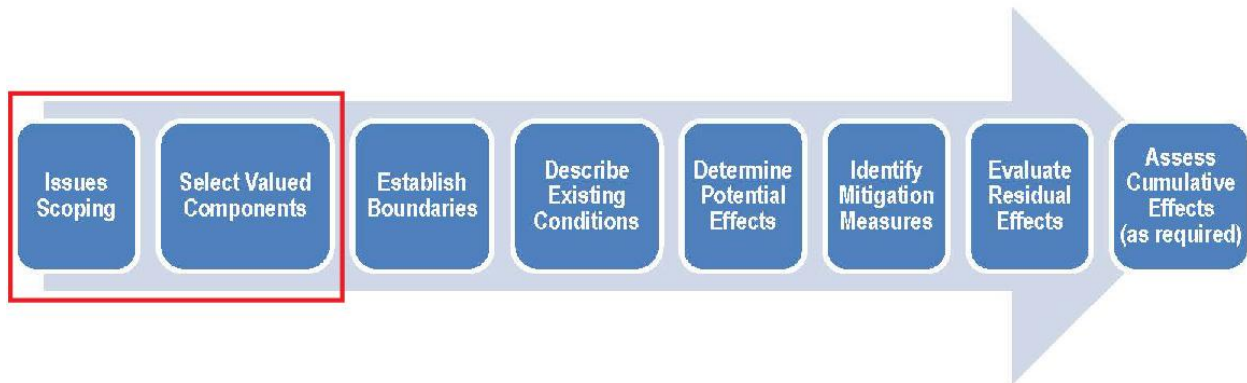
## **1.1 DOCUMENT PURPOSE**

Environmental assessment in BC applies a valued-based approach to conduct transparent, comprehensive, and accessible assessments of the potential effects of projects under five pre-defined Pillars (British Columbia 2013a). Pillars refer broadly to the environmental, economic, social, heritage, and health effects of a reviewable project, while Valued Components (VCs) are the basis for focusing the defined as components of the natural and human environment considered by a proponent, regulatory agencies, the public, Aboriginal groups, and/or technical specialists to have scientific, ecological, economic, social, cultural, archaeological, historical, or other importance (British Columbia 2013a). Assessment of Project-specific VCs will also be informed by VFPA PER guidance documents.

The purpose of the present document is to explain how issues and VCs were scoped, broadly identified, defined, and refined for the proposed Project. This document is the culmination of the first two steps of EAO's assessment process (Figure 1), with some overflow into the third step, *Establish Boundaries*, to adequately refine VC issues in relation to spatial interactions of the proposed Project. As relevant to VC selection, this document also updates information on key areas of study that was provided previously in the Project Description submitted to the EAO in September 2016. This document focuses on the selection of VCs for assessment, and it is not intended to identify all requirements that must be included in the Application. Scope of assessment and information requirements of the Application will be identified in the Application Information Requirements (AIR). The scope of the Proponent's Application, including provision of information relating to Aboriginal and public consultation, cumulative

effects, potential for accidents and malfunctions, effects of the environment on the Project, and information specific to applicable requirements for a decision on significant adverse effects under s. 67 of CEAA 2012 will be clearly defined in the AIR.

Figure 3 Summary of Methodology in an Environmental Assessment, Highlighting VC Selection (British Columbia 2013a)



## 1.2 PROPONENT AND PROPOSED PROJECT OVERVIEW

The Project Proponent for the Pattullo Bridge Replacement Project (Project) is the BC Ministry of Transportation and Infrastructure (MOTI). MOTI plans transportation networks, provides transportation services and infrastructure, develops and implements transportation policies, and administers related acts and regulations. MOTI opens up BC through innovative, forward-thinking strategies that move people and goods safely, and fuel the provincial economy. Improvement of vital infrastructure is a key goal, along with enhancing the competitiveness of BC's transportation industries, reducing transportation-related greenhouse gas emissions and providing BC with a safe and reliable highway system.

Consistent with the vision of the Mayors' Council on Regional Transportation for the region (Mayors' Council) as outlined in the 2014 *Regional Transportation Investments: a Vision for Metro Vancouver*, the proposed replacement bridge (Figure 2) will be a four-lane crossing that is designed in a manner that does not foreclose the consideration of a potential future expansion to six lanes, subject to an all-party agreement and Mayors' Council approval. The proposed Project will also include decommissioning and removal of the existing bridge.

The new bridge will be located north and upstream of the existing bridge (Universal Transverse Mercator [UTM] Coordinates: Zone 10, 5450718 N and 507751 E) (**Error! Reference source not found.**), and, similar to the existing bridge, its approaches will connect to McBride Boulevard in New Westminster and to King George Boulevard in Surrey. Please refer to the Project Description for further details on the proposed Project available at:

<https://projects.eao.gov.bc.ca/p/pattullo-bridge-replacement/docs>

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Figure 4 Proposed Project Location

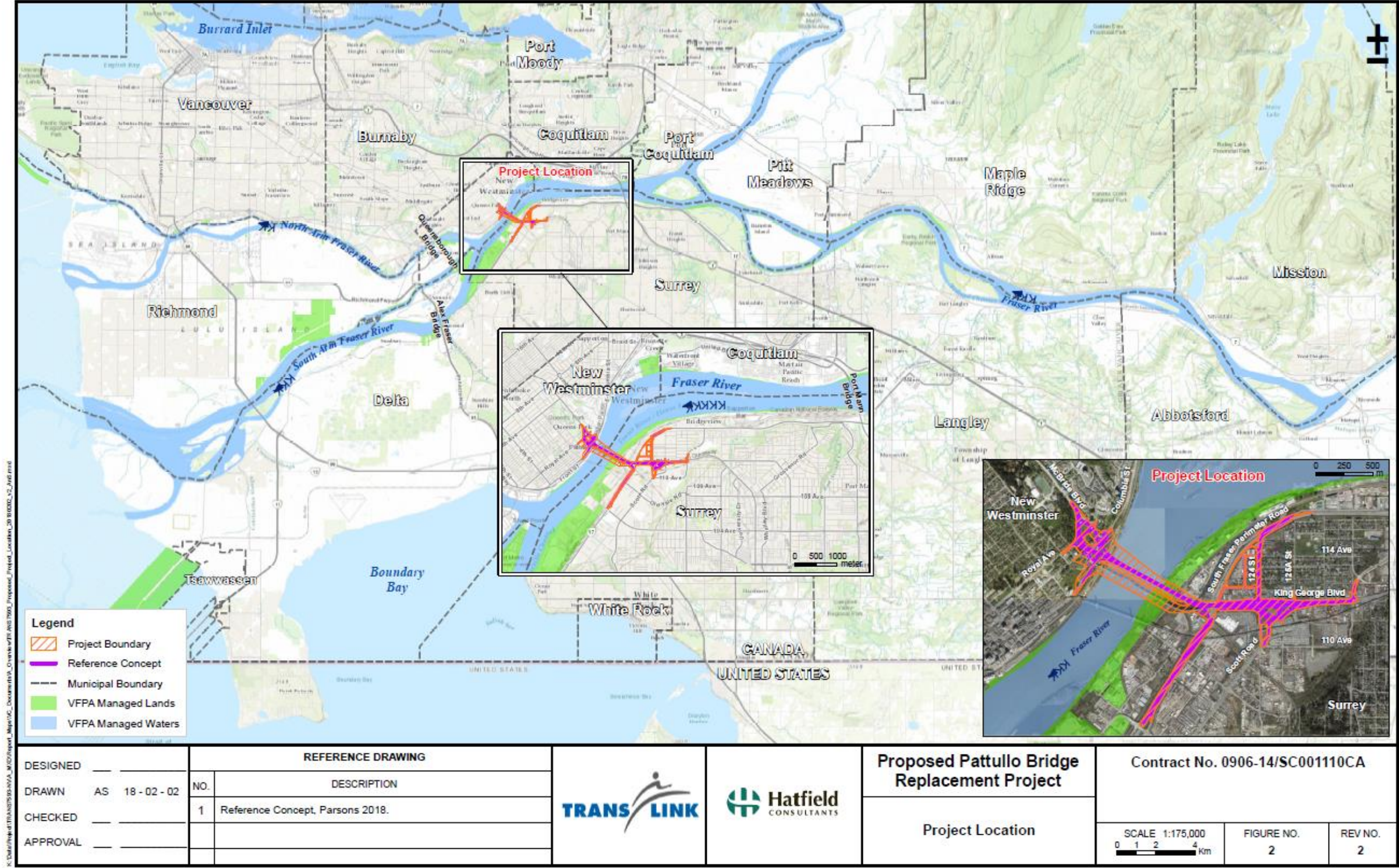
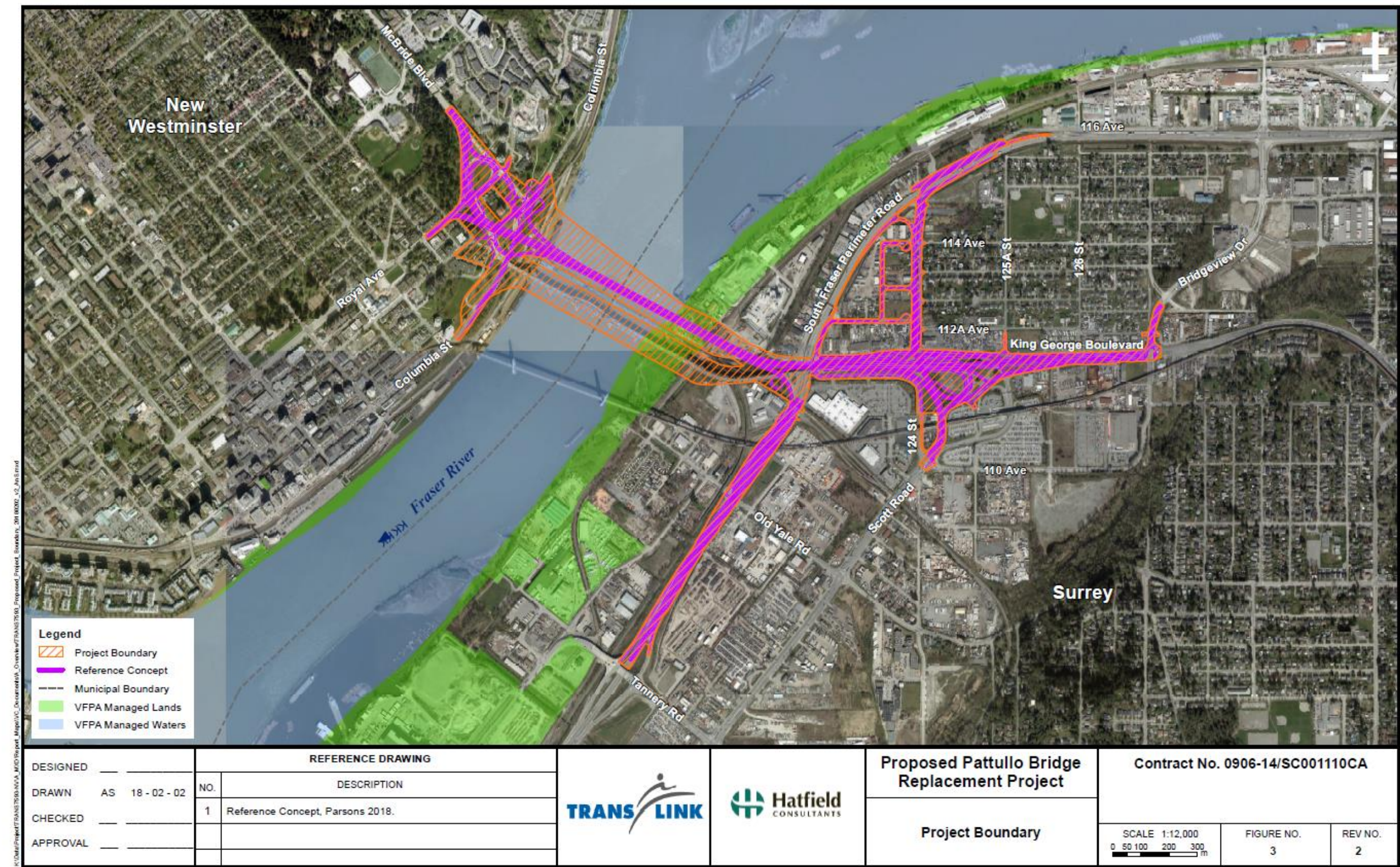




Figure 5 Project Boundary and Reference Concept





## 2.0 VALUED COMPONENT SELECTION PROCESS

Valued components collectively represent the five Pillars of assessment (environmental, economic, social, heritage, and health), as referred to by EAO. The selection of VCs for assessment is a key early step in assessing potential effects of a project. The method for selecting VCs used for the Project was based on the EAO's *Guideline for the Selection of Valued Components and Assessment of Potential Effects* (British Columbia 2013a) (Figure 6). The guidance distinguishes between VCs and Intermediate Components (ICs). An IC is a VC that is not the ultimate receptor of proposed Project-related effects but is part of the effects pathways, and is studied to support the assessment of the end-of-pathway VCs. Accordingly, the Proponent has defined VCs as end-receptor VCs and used the term IC to mean a VC that occurs within an effects pathway (see flow chart, Figure 5).

As a first step in the scoping process, candidate VCs/ICs and associated candidate subcomponents were identified through analysis of Project-specific effect pathways and a thorough check of available Environmental Assessments completed previously for recent comparable projects.

Scoping also considered the following: industry relevance; geographic location and the Project's environmental and human setting; input from initial engagement with Aboriginal Groups, agencies, municipalities, and the public; results of assessments that had been conducted previously by TransLink in support of the then-proposed Pattullo Bridge Rehabilitation Project; and professional judgment and experience of technical experts involved in the environmental assessment of the proposed Project. As a second step, the candidate VCs and subcomponents were refined through an inclusion/exclusion process that is outlined in this document.

VCs/ICs that were considered for inclusion in the assessment exhibited the following attributes:

- **Relevant** to at least one of the five Pillars outlined in EAO's guideline (British Columbia 2013a) and connected to an issue(s) identified in respect of the proposed Project;
- **Comprehensive**, so that all VCs and ICs jointly provide a full understanding of the potential effects of the proposed Project;
- **Representative** of the potential environmental and human issues likely to be adversely affected by the proposed Project;
- **Responsive** to the potential effects of the proposed Project; and
- **Concise**, so as to avoid redundancy in analysis and application, and ensure clear understanding of interactions, potential effects, and effects pathways.

The VC/IC selection process presented in this document reflects a general preference for selecting fewer well-defined VCs/ICs with appropriate attributes over choosing more, less meaningful VCs/ICs, as outlined in EAO's *Guideline for the Selection of Valued Components and Assessment of Potential Effects* (British Columbia 2013a).

Figure 6 Relationship between Pillars, Issues, and VCs (Flowchart from British Columbia 2013a)

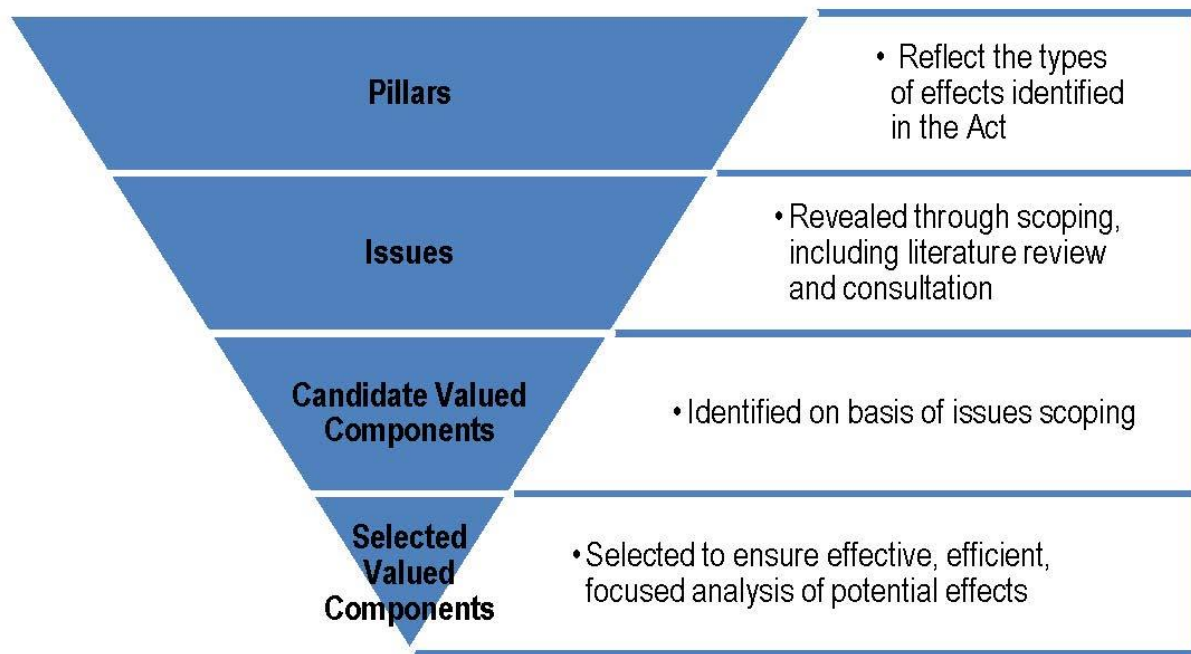
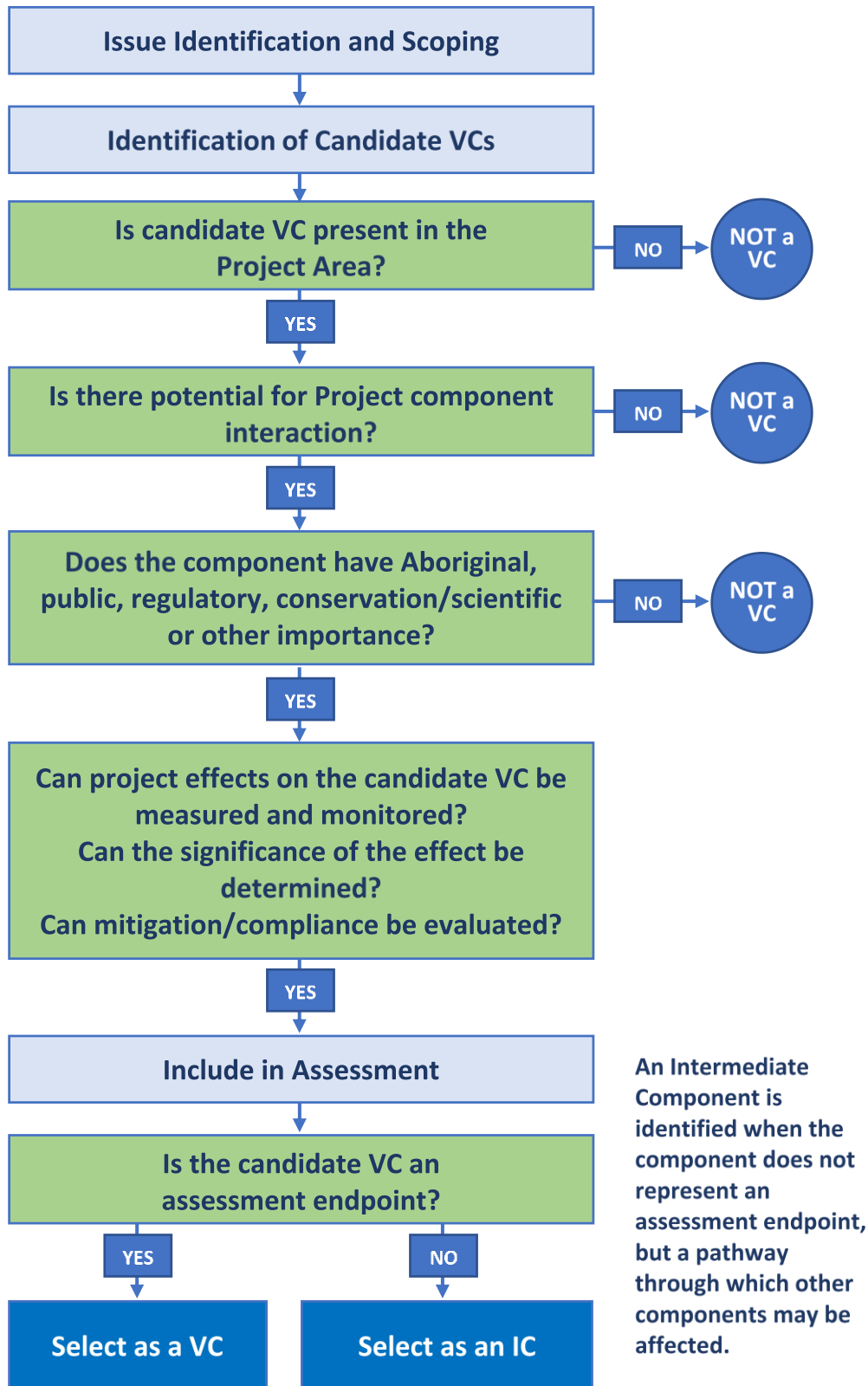


Figure 7 VC and IC Selection Process (adapted from British Columbia 2013a)



## 3.0 ISSUES SCOPING

VCs/ICs were identified on the basis of comprehensive issues scoping, including review of available information (e.g., literature review and experience with comparable projects) and a comprehensive consultation process that revealed the values and priorities of government, Aboriginal groups, the public, and stakeholders.

### 3.1 REVIEW OF COMPARABLE PROJECTS

The proposed Project is located in a region where several comparable projects (Table 5) were either issued an Environmental Assessment Certificate recently, or are currently undergoing environmental assessment (EA) and review pursuant to BCEAA. Some comparable projects were not reviewable under BCEAA, but required studies to address issues that would be expected to be considered in a BCEAA process. Initial selection of candidate VCs for the proposed Project was based on a thorough review of the EA documentation completed for those projects (further details in Section 3.2), as well as on the professional judgement of the technical and discipline experts involved in the EA of the proposed Project, several of whom participated directly in the EA of at least one of comparable projects in the region.

Table 5 Comparable Projects Relevant to the Identification of VCs and ICs for PBRep

| Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Comparability                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pattullo Bridge Deck Rehabilitation</b><br>Status: construction completed in August 2016                                                                                                                                                                                                                                                                                                                                                                                                                                 | Environmental studies conducted in support of the deck rehabilitation project apply to the proposed Project (particularly with respect to the proposed eventual demolition of the existing bridge).                                                                                                                               |
| <b>George Massey Tunnel Replacement (GMTR)</b><br>Status: EAC granted but not yet under construction<br><br>On September 6, 2017, the provincial government announced an independent technical review of options for George Massey Tunnel corridor. The Province will determine next steps in addressing congestion along the corridor based on recommendations received from this independent review, which is expected to be completed in Spring 2018. Some early works associated with this project have been completed. | Similar to PBRep, GMTR required an EAC and involves construction of a major new bridge across the Fraser River (GMTR is located downriver of PBRep). Also similar to PBRep, GMTR involves an in-river demolition component (demolition of the existing tunnel structure) and roadway improvements on either side of the crossing. |
| <b>Port Mann/Highway 1 Improvements (PMH1)</b><br>Status: construction completed in 2015, currently in operation                                                                                                                                                                                                                                                                                                                                                                                                            | Similar to PBRep, PMH1 required an EAC and involved construction of a major new bridge across the Fraser River (PMH1 is located up-river from PBRep). Also similar to PBRep, PMH1 involved demolition of the then existing Port                                                                                                   |



| Project                                                                                                                         | Comparability                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                 | Mann Bridge.                                                                                                                                                                                                                                           |
| <b>South Fraser Perimeter Road (SFPR)</b><br>Status: construction completed in 2013, currently in operation                     | SFPR intersects and will connect with PBRep on the Surrey side of the Fraser River. Similar to PBRep, SFPR required an EAC and included road construction. VCs/ICs that were assessed for SFPR in the PBRep area should be directly relevant to PBRep. |
| <b>Canada Line (CL)</b><br>Status: construction completed in 2008, currently in operation                                       | Similar to PBRep, CL involved construction of bridges across the Fraser River (the two CL crossings are located down-river of PBRep, in the North and Middle Arms of the Fraser River respectively).                                                   |
| <b>Golden Ears Bridge (GEB)</b><br>Status: construction completed in 2009, currently in operation                               | Similar to PBRep, GEB was a TransLink Project that required an EAC. Also similar to PBRep, GEB involved a major new bridge across the Fraser River (GEB is located up-river of PBRep).                                                                 |
| <b>WesPac Tilbury Marine Jetty</b><br>Status: not yet under construction, currently in the EAO pre-Application phase.           | Similar to PBRep, WesPac Tilbury requires an EAC and involves construction of a new structure in the Fraser River.                                                                                                                                     |
| <b>Vancouver Airport Fuel Delivery Project (VAFDP)</b><br>Status: EAC granted, and construction and operation permits underway. | Similar to PBRep, VAFDP required an EAC and involves construction of a new marine terminal facility on the Fraser River.                                                                                                                               |

## 3.2 INITIAL LITERATURE REVIEW

The following key information sources and reference materials were reviewed to complete the issues scoping exercise and identify candidate VCs/ICs and candidate VC/IC subcomponents:

- Pattullo Bridge Alignment and Connection Options (HB Lanarc – Golder 2012).
- Pattullo Bridge Joint Review: Initial Screening of Long List of Alternatives Summary Report (TransLink 2013).
- Pattullo Bridge Replacement Project, Community Connections Phase 1 Consultation (TransLink 2016a).
- Pattullo Bridge Replacement Project, Community Connections Phase 2 Consultation (Translink 2016b).
- EAO AIR template (British Columbia 2015) and Guideline for the Selection of Valued Components and Assessment of Potential Effects (British Columbia 2013a).
- Applicable VFPA PER Guidelines:
  - Project and Environmental Review Application Guide (VFPA 2016);
  - Air Emission Management Plan (VFPA 2015);

- Environmental Air Assessment (VFPA 2015);
  - Demolition (VFPA 2016);
  - Environmental Noise Assessment (VFPA 2015);
  - Habitat Assessment (VFPA 2015);
  - Lighting (VFPA 2015);
  - View and Shade Impact (VFPA 2015);
  - Stakeholder Consultation (VFPA 2015);
  - Stormwater Pollution Prevention Plan (VFPA 2015); and
  - Transportation Guidelines (VFPA 2015).
- George Massey Tunnel Replacement Project; Application for an Environmental Assessment Certificate (MoTI 2016a).
  - George Massey Tunnel Replacement Project; draft AIR working group comment tracking table and Application public comment tracking table (MoTI 2016b and MoTI 2016c).
  - WesPac-Tilbury docking area Valued Components Rationale Document (WesPac Midstream-Vancouver LLC 2016).
  - WesPac-Tilbury public and working group comment tracking tables on VC rationale document and public comment period tracking table (WesPac Midstream-Vancouver LLC 2016).
  - Applicable provincial and federal legislation and regulations.
  - Health Impact Assessment of Transportation and Land Use Planning Activities: Guidebook (Metro Vancouver 2016).
  - Provincial land use plans (e.g., Land and Resource Management Plans) and other regional and local government plans (e.g., Official Community Plans, Regional Growth Strategies, Regional Sustainability Strategies, Climate Action Plans, and other environmental, social, and/or economic development strategies).
  - The BC Conservation Data Centre, the federal *Species at Risk Act*, and applicable documents issued by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
  - Aboriginal Treaties and information regarding asserted claims, from the BC Treaty Commission.
  - Available studies documenting traditional knowledge and traditional use (subject to confidentiality provisions that may apply).
  - The Provincial Archaeological Report Library and the Provincial Archaeological Site Inventory.

### 3.3 INITIAL CONSULTATION

The Project team has engaged in consultation with Aboriginal Groups, stakeholder groups, and the public, regarding the proposed Project, since 2016 (see summary of initial consultation in the Project Description available at:

[http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_project\\_doc\\_list\\_464\\_p\\_pro.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_doc_list_464_p_pro.html))

These consultations have informed the scoping exercise and the selection of proposed VCs/ICs and their subcomponents.

Feedback on the proposed Project and proposed VCs has been solicited from:

- **Aboriginal Groups:** Those aboriginal entities as defined in Section 35(2) of the *Constitution Act, 1982* of Canada as set out in Schedules B and C of EAO's Section 11 Order.
- **Federal and provincial government and agencies:** EAO, Canadian Environmental Assessment Agency, VFPA, Transport Canada, Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNR), and Ministry of Transportation and Infrastructure (MoTI).
- **Local and regional government:** New Westminster, Surrey, City of Coquitlam, City of Richmond, Corporation of Delta, and Metro Vancouver.
- **Industry:** BC Automobile Association (BCAA), BC Business Council (BCBC), BC Chamber of Commerce, BC Trucking Association, BC Taxi Association, Council of Marine Carriers, Downtown Surrey Business Improvement Association (BIA), Insurance Corporation of BC (ICBC), merchant associations, New Westminster Chamber of Commerce, Surrey Board of Trade, Vancouver Board of Trade, and select VFPA tenants.
- **Community associations:** Resident and community associations in New Westminster and Surrey, and adjacent to the proposed bridge connections in New Westminster.
- **First responders:** Fire, police, ambulance, and emergency services.
- **Public:** New Westminster, Surrey, Delta, and Metro Vancouver.

Aboriginal groups, Federal and Provincial agencies, and stakeholders will continue to be actively consulted by the Project team during the pre-Application stage, in part for the purpose of providing input to and finalizing the list of VCs to be included in the assessment.

## 4.0 CANDIDATE VALUED COMPONENTS AND INTERMEDIATE COMPONENTS

Candidate VCs and ICs were identified based on the issues scoping exercise described above and then evaluated using a 3-step process as outlined below (Figure 8).

- Step 1: Identify candidate VCs/ICs and VC/IC subcomponents informed by the process described in Section 3.0.
- Step 2: Evaluate the potential of each candidate VC/IC to interact with the proposed Project (yes/no). Where no interaction existed, a candidate VC/IC was excluded from further consideration for assessment. Where an interaction was present, the candidate VC/IC and its candidate subcomponents were further evaluated in Step 3.
- Step 3: Select the most appropriate VCs/ICs and subcomponents from the perspectives of importance from an Aboriginal, regulatory, scientific, or other perspective. VCs/ICs and subcomponents that were evaluated as being important from at least one of those perspectives were selected for assessment.

Figure 8 Flowchart for Selecting and Evaluating Candidate VCs/ICs (British Columbia 2013a)



### 4.1 IDENTIFY CANDIDATE VCS/ICS IN PROJECT AREA

Based on issues scoping, comparable local and regional projects, and consideration of effect pathways and ongoing consultation, VCs and ICs were identified through potential for spatial and temporal interaction with the proposed Project.

The following is a list of VCs/ICs that were broadly scoped based on information gathered through activities described in Section 3.0 and are proposed for assessment of potential adverse Project effects:

- Fish and Fish Habitat;
- Vegetation;
- Wildlife;
- Economic Activity;
- Marine Use;
- Land Use;

- Community Cohesion;
- Visual Quality;
- Heritage Resources;
- Physical Determinants of Human Health; and
- Social Determinants of Human Health.

In addition, the following VCs that are not the ultimate receptors of proposed Project-related effects, but are part of an effect pathway, are proposed to be studied as ICs to support the assessment of the end-of-pathway VCs listed above:

- Fraser River Hydraulics and River Morphology;
- Soil and Groundwater;
- Surface Water and Sediment;
- Noise and Vibration;
- Air Quality;
- Lighting; and
- Shading.

#### **4.1.1 Updates to Initially Scoped VCs/ICs**

The VCs/ICs that were identified previously on a preliminary basis in the Project Description have been updated in the present document as follows (reflecting new information and awareness since the Project Description was issued in September 2016):

- Terrestrial Wildlife VC was updated to a more general VC called Wildlife.
- At-Risk Amphibians VC was converted to a more general Amphibian subcomponent of the Wildlife VC.
- Socio-Economic Factors VC was updated to Economic Activity.
- An additional social VC, Community Cohesion, was introduced.
- Surface Water Quality IC was updated to Surface Water and Sediment.
- Lighting and Shading were introduced as additional ICs.
- Human Health VC was partitioned into two separate (but interrelated) VCs called Physical Determinants of Human Health and Social Determinants of Human Health.

## **4.2 EVALUATE FOR PROPOSED PROJECT INTERACTIONS**

Based on a review of information sources, consultations, and proposed Project boundaries, candidate VCs/ICs were evaluated for potential interactions with the proposed Project, directly or indirectly, through potential Project-effects pathways. Interactions are grouped by proposed Project phase: design, construction (including decommissioning and removal of the existing bridge), and operations (Table 6).



Table 6 Proposed Project Interactions Matrix and Candidate VCs/ICs

| Proposed Project Activities by Phase<br>✓ = Interaction<br>- = No Interaction                    | Pillars for Assessment and Candidate VC/IC |            |          |                                              |                      |                            |                     |             |                   |            |          |                    |                |          |         |                    |                                       |                                     |
|--------------------------------------------------------------------------------------------------|--------------------------------------------|------------|----------|----------------------------------------------|----------------------|----------------------------|---------------------|-------------|-------------------|------------|----------|--------------------|----------------|----------|---------|--------------------|---------------------------------------|-------------------------------------|
|                                                                                                  | Environmental                              |            |          |                                              |                      |                            |                     |             | Economic          | Social     |          |                    |                |          |         | Heritage           | Health                                |                                     |
|                                                                                                  | Fish and Fish Habitat                      | Vegetation | Wildlife | Fraser River Hydraulics and River Morphology | Soil and Groundwater | Surface Water and Sediment | Noise and Vibration | Air Quality | Economic Activity | Marine Use | Land Use | Community Cohesion | Visual Quality | Lighting | Shading | Heritage Resources | Physical Determinants of Human Health | Social Determinants of Human Health |
| Activities during Planning and Procurement Phase                                                 |                                            |            |          |                                              |                      |                            |                     |             |                   |            |          |                    |                |          |         |                    |                                       |                                     |
| Procurement/tender                                                                               | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | ✓          | ✓        | ✓                  | -              | -        | -       | ✓                  | ✓                                     | ✓                                   |
| Land or right-of-way acquisition                                                                 | ✓                                          | ✓          | ✓        | -                                            | ✓                    | -                          | -                   | -           | ✓                 | ✓          | ✓        | ✓                  | -              | -        | -       | ✓                  | -                                     | ✓                                   |
| Transport of worker/materials/equipment to site                                                  | ✓                                          | ✓          | ✓        | -                                            | ✓                    | ✓                          | -                   | ✓           | ✓                 | ✓          | ✓        | ✓                  | -              | -        | -       | -                  | -                                     | -                                   |
| Seismic/engineer surveys                                                                         | -                                          | -          | -        | -                                            | -                    | -                          | ✓                   | -           | -                 | -          | ✓        | -                  | -              | -        | -       | ✓                  | ✓                                     | -                                   |
| Geotechnical surveys                                                                             | ✓                                          | ✓          | ✓        | -                                            | ✓                    | ✓                          | ✓                   | -           | -                 | ✓          | ✓        | -                  | -              | -        | -       | ✓                  | ✓                                     | -                                   |
| Test pitting/soil sampling                                                                       | ✓                                          | ✓          | ✓        | -                                            | ✓                    | ✓                          | ✓                   | -           | ✓                 | -          | ✓        | -                  | -              | -        | -       | ✓                  | ✓                                     | -                                   |
| Construction Phase                                                                               |                                            |            |          |                                              |                      |                            |                     |             |                   |            |          |                    |                |          |         |                    |                                       |                                     |
| Clearing and grubbing                                                                            | ✓                                          | ✓          | ✓        | -                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | -          | ✓        | ✓                  | ✓              | -        | -       | ✓                  | ✓                                     | -                                   |
| Temporary work spaces/laydowns (offices/housing)                                                 | ✓                                          | ✓          | ✓        | -                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | ✓          | ✓        | ✓                  | ✓              | ✓        | -       | ✓                  | ✓                                     | ✓                                   |
| Installation of temporary drainage/diversion structures                                          | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | ✓          | ✓        | ✓                  | -              | -        | -       | ✓                  | ✓                                     | ✓                                   |
| Installation of temporary roads/access                                                           | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | -          | ✓        | ✓                  | ✓              | -        | -       | ✓                  | ✓                                     | ✓                                   |
| Marine/land transport of construction workers, materials, and equipment to/from the Project site | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | ✓                          | -✓                  | ✓           | ✓                 | ✓          | ✓        | ✓                  | -              | -        | -       | -                  | ✓                                     | ✓                                   |
| Construction of new roads/interchange structures                                                 | ✓                                          | ✓          | ✓        | -                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | -          | ✓        | ✓                  | ✓              | ✓        | ✓       | ✓                  | ✓                                     | ✓                                   |
| In-river piling/abutment works                                                                   | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | ✓          | -        | -                  | ✓              | ✓        | ✓       | ✓                  | ✓                                     | ✓                                   |
| On-shore abutment works                                                                          | ✓                                          | ✓          | ✓        | -                                            | ✓                    | -                          | ✓                   | ✓           | ✓                 | -          | ✓        | ✓                  | ✓              | ✓        | ✓       | ✓                  | ✓                                     | ✓                                   |
| Construction of bridge structures                                                                | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | ✓          | ✓        | ✓                  | ✓              | ✓        | ✓       | ✓                  | ✓                                     | ✓                                   |
| Shoreline enhancement of disturbed areas                                                         | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | -                          | ✓                   | ✓           | ✓                 | -          | ✓        | ✓                  | -              | -        | -       | ✓                  | ✓                                     | ✓                                   |
| Removal of offshore/onshore facilities/bridge                                                    | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | ✓          | ✓        | ✓                  | ✓              | ✓        | ✓       | ✓                  | ✓                                     | ✓                                   |
| Marine/land transport of decommissioned materials                                                | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | ✓          | ✓        | ✓                  | -              | -        | -       | ✓                  | ✓                                     | ✓                                   |
| Operations Phase                                                                                 |                                            |            |          |                                              |                      |                            |                     |             |                   |            |          |                    |                |          |         |                    |                                       |                                     |
| Operating new bridge/traffic                                                                     | ✓                                          | ✓          | ✓        | ✓                                            | ✓                    | ✓                          | ✓                   | ✓           | ✓                 | ✓          | ✓        | ✓                  | ✓              | ✓        | ✓       | -                  | ✓                                     | ✓                                   |
| Bridge maintenance                                                                               | ✓                                          | ✓          | -        | ✓                                            | -                    | ✓                          | -                   | -           | ✓                 | ✓          | ✓        | ✓                  | -              | ✓        | -       | -                  | -                                     | -                                   |

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## 4.3 SELECT APPROPRIATE CANDIDATE VCS/ICS AND THEIR SUBCOMPONENTS

Candidate VCs/ICs that interacted with the Project were evaluated according to the following criteria:

- **Aboriginal importance:** The candidate VC/IC is potentially associated with the current use of lands and resources for traditional purposes or other CEAA 2012 5(1)(c) factor (refer to Section 4.3.2) or the practice of Aboriginal Interests (refer to Section 4.3.3), or is otherwise of particular concern to Aboriginal Groups, as informed through ongoing consultations and regulatory framework (British Columbia 2013b).
- **Regulatory Importance:** The candidate VC/IC is subject to regulatory requirements and agency input is anticipated.
- **Scientific/Conservation Importance:** The candidate VC/IC is identified in government conservation databases and legal frameworks and is significant to the scientific community for conservation importance.
- **Other importance:** The candidate VC/IC is significant to other public stakeholders or user groups.

### 4.3.1 Rationale for Exclusion

Candidate VCs/ICs were excluded from further consideration if their components were beyond direct and indirect disturbance of the Project, or if no interaction with proposed Project activities was anticipated. Also, some VCs/ICs were excluded because they were better represented by another included VC/IC or because they were poor candidates for measurability. The selected VCs/ICs were subjected to another round of scrutiny, to determine which VC/IC subcomponents would be included or excluded from study (Table 7).

Traffic assessment, including traffic assumptions and traffic modelling, will be summarized in a stand-alone section in Part A (Project Description). The Application will also provide a technical appendix on traffic. Traffic assessment will support discussion of the Project rationale and Project benefits in Part A of the Application. Traffic assessment will also inform assessment of some VCs/ICs reported in Part B (Effects Assessment), notably the Noise and Vibration IC the Air Quality IC, the Land Use VC, and the Community Cohesion VC. The results of those assessments will in turn inform the human health assessments (including the Physical Determinants of Human Health VC and the Social Determinants of Human Health VC). The specific method(s) by which traffic data are used for those assessments will be reported in the Application chapters devoted to those respective VCs. Traffic will not itself be assessed as a VC/IC.

### 4.3.2 Consideration of CEAA 2012 Requirements

For each applicable VC, the Application will assess potential Project-related effects as defined in subsection 5(1) or 5(2) of CEAA 2012. For clarity, assessment of potential effects of each VC

under the economic, social, heritage, and health pillars will include consideration of environmental effects as defined in subsections 5(1)(c)(i), (ii) and (iv), which relate to potential effects of Project-induced changes to the environment on Aboriginal peoples' health, socio-economic conditions, and physical heritage, including any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance. Assessment of potential effects of Project-related changes to the environment on the current use of land and resources for traditional purposes per section 5(1)(c)(iii) of CEAA 2012 will be presented within the Application section that summarizes the results of assessments pertaining to statutory requirements under CEAA 2012.

The assessment of CEAA 2012 section 5(1) and 5(2) factors will consider Aboriginal perspectives and Aboriginal traditional knowledge (ATK), where available publicly or provided during ongoing consultation between the Proponent and Aboriginal Groups, including through Project-specific studies. If it is determined that the Project will not result in environmental effects defined in subsection 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

#### **4.3.3 Bridging of Part B VC/IC Assessments and Part C Aboriginal Interests Assessment**

The VC/IC assessments in Part B will be undertaken in a manner that meaningfully incorporates ATK, as provided by and discussed with Aboriginal Groups during consultation on the Project, including through Project-specific studies. Where provided with permission for use in the Application, ATK will be reviewed and integrated into Part B of the Application to inform the understanding of:

- Project-VC/IC interactions;
- Existing VC/IC conditions, including trends over time that have influenced these conditions; and
- Project and cumulative effects on VCs/ICs, including thresholds of acceptable change related to biophysical resources that support the practice of Aboriginal Interests.

The results of the VC/IC assessments, as informed by ATK, will be used to support the assessment of potential Project-related adverse impacts to the practice of Aboriginal Interests in Part C of the Application.

Table 7 Rationale for Inclusion and Exclusion of Specific VC/IC Subcomponents

| Proposed VC/IC                                                                                                                                                 | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental Pillar                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>Fish and Fish Habitat (VC)</p> <p>This VC was defined and selected on the basis of Aboriginal, regulatory, conservation, and/or stakeholder importance.</p> | <p>Included:</p> <ul style="list-style-type: none"> <li>Key species: <ul style="list-style-type: none"> <li>Salmon – pink, sockeye, chum, coho, chinook (<i>Oncorhynchus</i> sp.)</li> <li>Trout – steelhead, rainbow trout, coastal cutthroat (<i>Oncorhynchus</i> sp.)</li> <li>Char – Dolly Varden, bull trout (<i>Salvelinus</i> sp.)</li> <li>Sturgeon – white sturgeon (<i>Acipenser transmontanus</i>) (Lower Fraser population), green sturgeon (<i>Acipenser medirostris</i>)</li> <li>Eulachon (<i>Thaleichthys pacificus</i>)</li> <li>Mountain sucker (<i>Catostomus platyrhynchus</i>)</li> </ul> </li> <li>“Forage” fish</li> </ul> | <p>The assessment will focus on fish species documented to be present or potentially present in the Project area and that 1) form part of a commercial, recreational, or Aboriginal fishery (collectively termed “CRA” fisheries as defined in the federal <i>Fisheries Act</i>); 2) are classified as a species at risk (i.e., listed under schedules of the federal <i>Species at Risk Act</i> [SARA]) and/or provincially “red-listed” or “blue-listed”; or 3) have Aboriginal importance. Key species that will be assessed include all five species of Pacific salmon, steelhead/rainbow trout, coastal cutthroat trout, Dolly Varden, bull trout (South Coast population), white sturgeon (Lower Fraser River population), green sturgeon, eulachon, and mountain sucker. Green sturgeon and mountain sucker are unlikely to be present in the Project area, but these species are included because they are each listed as a species of Special Concern under SARA. It is intended that these key species would collectively represent fish in general, including fisheries that support a CRA fishery. Results of the assessment of the Fish and Fish habitat VC will be used to address the requirements of s. 5(1)(a)(i) of CEAA 2012, to facilitate a determination, pursuant to CEAA 2012 s. 67 by VFPA and other federal authorities who would issue statutory permits for the Project.</p> <p>The assessment will also include consideration of a general category, termed “forage fish”, which are prey for the key (i.e., CRA) species listed above. Forage fish are considered to include various species of minnows.</p> |
|                                                                                                                                                                | <p>Excluded:</p> <ul style="list-style-type: none"> <li>Kokanee (<i>Oncorhynchus</i> sp.)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>Kokanee inhabit lakes for the better part of their life history and are not expected to occur within the proposed Project footprint at any stage of their life cycle.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                | <p>Excluded:</p> <ul style="list-style-type: none"> <li>Westslope cutthroat trout</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>At present, native westslope cutthroat in the Fraser River basin can be found in the South Thompson watershed, with introduced populations occurring in at least 27 waterbodies in the Fraser and North Thompson river systems. Stocking records from</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Proposed VC/IC | Included/Excluded VC/IC Subcomponents                                                                                                       | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | ( <i>Oncorhynchus clarki lewisi</i> )                                                                                                       | 1860 to present for the Lower Mainland indicate that westslope cutthroat trout were introduced into only four waterbodies, all in 1957: Como Lake, Dee Lake, Hicks Lake, and Schkam Lake. As a result, the likelihood of westslope cutthroat trout interacting with the Pattullo Bridge Replacement Project is considered low.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                | <ul style="list-style-type: none"> <li>White sturgeon (<i>Acipenser transmontanus</i>) (Middle Fraser, Upper Fraser populations)</li> </ul> | Middle and Upper Fraser River populations of white sturgeon occur in portions of the Fraser River that are located far upstream of the Project. These white sturgeon populations are not expected to occur within the proposed Project footprint at any stage of their life cycle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                | <ul style="list-style-type: none"> <li>Starry flounder (<i>Platichthys stellatus</i>)</li> </ul>                                            | Starry flounder is most often associated with estuarine environments. Although some juvenile starry flounders have been observed in the Fraser River upstream of the Pattullo Bridge, they have only been observed in small numbers outside of the Fraser River salt wedge. They are therefore unlikely to be significantly affected by the proposed Project.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                | <ul style="list-style-type: none"> <li>Burbot (<i>Lota lota</i>)</li> </ul>                                                                 | Burbot are largely confined to the Fraser Canyon and continental portions of the Fraser River upstream of the Canyon, with occasional single observations of burbot downstream of the Canyon. This species is therefore unlikely to occur within the proposed Project footprint.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                | <ul style="list-style-type: none"> <li>Smelt – surf (<i>Hypomesus pretiosus</i>), longfin (<i>Spirinchus thaleichthys</i>)</li> </ul>       | Surf smelt are a largely marine species that can be found in the Lower Fraser River up to Pitt River and sometimes Pitt Lake. They are not known to spawn in freshwater, typically spawning on sandy and gravel beaches in the intertidal zone. Although they may be found in the general project area, there is no evidence to suggest that the Project area supports a critical life stage for this species. Longfin smelt in the Fraser River are most abundant in their lacustrine forms in Pitt Lake and Harrison Lake. Some longfin smelt do migrate into the Fraser River, with the majority occurring downstream of New Westminster, but some migrating as far upstream as Chilliwack. There is no commercial, recreational or Aboriginal fishery for this species in the Fraser River. |



| Proposed VC/IC | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                                                                                                                                                          | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | <p>Excluded:</p> <ul style="list-style-type: none"> <li>Whitefish – mountain, pygmy (<i>Prosopium</i> sp.)</li> <li>Lamprey – river, Pacific (<i>Thaleichthys pacificus</i>)</li> <li>Suckers (<i>Catostomus</i> sp.) other than mountain sucker, which is included – longnose, largescale, bridgelip, white, northern</li> <li>Sculpins – coastrange, slimy, prickly, staghorn (<i>Cottus</i> sp.)</li> </ul> | These groups of fishes (whitefish, lampreys, suckers and sculpins) have negligible commercial, recreational or Aboriginal fisheries value and are not listed as species of management concern.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                | <p>Excluded:</p> <ul style="list-style-type: none"> <li>Shellfish</li> </ul>                                                                                                                                                                                                                                                                                                                                   | Potential for presence of shellfish in the Project area is very limited due to a general absence of favourable habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                | <p>Excluded:</p> <ul style="list-style-type: none"> <li>Invasive fish species – pumpkinseed, carp, brown catfish, goldfish, black crappie, largemouth bass, perch</li> </ul>                                                                                                                                                                                                                                   | Invasive fish species are introduced species of fish that would otherwise not occur naturally in the Fraser River system. These species often outcompete native fishes for food and habitat, have the capacity to alter habitats, and may prey upon native fish species. These species have been excluded from the assessment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                | <p>Included:</p> <ul style="list-style-type: none"> <li>Fish habitat form and function <ul style="list-style-type: none"> <li>Habitat of Key Species</li> <li>Habitat for fish in general, including forage fish</li> </ul> </li> </ul>                                                                                                                                                                        | Fish habitat was identified as an important issue during Project-specific consultation with Aboriginal Groups. Fish habitat also has regulatory importance, e.g., provisions under the Fisheries Act and SARA. The assessment of habitat form and function will focus on habitat used by the key species listed earlier, with consideration given to habitat used by forage fish. It is intended that focusing on the habitat of key species would produce assessment findings that are representative of more general fish habitat. The assessment will address fish life cycles and seasonality of fish species, as related to potential Project interactions. For example, the Fraser River narrows, where the Project is located, fulfills an important migration function, so the Reference Concept design and design implementation will be assessed in relation to potential effects on both upstream |

| Proposed VC/IC                                                                                                           | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | and downstream migration of the key fish species identified for assessment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Vegetation (VC)<br><br>This VC was selected due to its regulatory, conservation, Aboriginal, and stakeholder importance. | Included:<br><ul style="list-style-type: none"> <li>• Rare plants</li> <li>• Plant communities/assemblages, including at-risk plant communities</li> <li>• Wetland ecosystems</li> </ul>                                                                                                                                                                                                                                                                                                                                                                       | The proposed Project involves land disturbance that has the potential to affect rare plants, plant communities, and wetland ecosystems. The assessment will focus on consolidated patches of riparian habitat and forest cover that may include rare species and/or represent plant communities that are red- or blue-listed by the BC Conservation Data Centre (CDC). The Project also has the potential to eliminate or degrade wetland ecosystems.                                                                                                                              |
|                                                                                                                          | Included:<br><ul style="list-style-type: none"> <li>• Marine plants</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Marine plants are included as a general category to address the requirements of s. 5(1)(a)(ii) of CEAA 2012, to facilitate a determination, pursuant to CEAA 2012 s. 67, by VFPA and other federal authorities that would issue statutory permits for the Project.                                                                                                                                                                                                                                                                                                                 |
| Wildlife (VC)<br><br>This VC was selected due to its regulatory, conservation, Aboriginal, and stakeholder importance.   | Included:<br><ul style="list-style-type: none"> <li>• Wildlife: <ul style="list-style-type: none"> <li>○ Migratory birds (general)</li> <li>○ Great blue heron (<i>Ardea Herodias fannini</i>)</li> <li>○ Green heron (<i>Butorides virescens</i>)</li> <li>○ Bald eagle (<i>Haliaeetus leucocephalus</i>)</li> <li>○ Peregrine falcon (<i>Falco peregrinus anatum</i>)</li> <li>○ Red-tailed hawk (<i>Buteo jamaicensis</i>)</li> <li>○ Osprey (<i>Pandion haliaetus</i>)</li> <li>○ Western screech-owl (<i>Megascops kennicotti</i>)</li> </ul> </li> </ul> | The proposed Project has the potential to affect provincial and federal at-risk wildlife species, mainly through loss of habitat (if present), or through direct disturbance to wildlife as a result of construction activities.<br><br>Note that the key species identified in column 2 include individual migratory birds. However, migratory birds are also included as a general category to address the requirements of s. 5(1)(a)(iii) of CEAA 2012, to facilitate a CEAA 2012 s. 67 determination by federal authorities who would issue statutory permits for the Project. |

| Proposed VC/IC | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                                                                                                                                                                                                                      | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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|                | <i>kennicottii</i> ) <ul style="list-style-type: none"> <li>Urban birds</li> <li>Common nighthawk (<i>Chordeiles minor</i>)</li> <li>Barn swallow (<i>Hirundo rustica</i>)</li> <li>Pacific water shrew (<i>Sorex bendirii</i>)</li> <li>At-risk amphibians (general)</li> <li>Red-legged frog (<i>Rana aurora</i>)</li> <li>Western toad (<i>Anaxyrus boreus</i>)</li> <li>Wildlife habitat form and function (relating primarily to the above-listed species)</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                | Excluded: <ul style="list-style-type: none"> <li>Marine and riverine birds <ul style="list-style-type: none"> <li>Gulls, terns, shorebirds, waterfowl and their allies, seabirds</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                    | Gulls are common in the Lower Mainland. Terns require islands or large wetlands, which are not present in the Project area. Shorebirds and water birds have the potential to travel through the proposed Project area, but do not generally stage in large numbers at this industrial/urban location. There is limited tidal influence at the proposed Project location, which eliminates the potential for the interaction of Project-related activities with seabirds. |
|                | Excluded: <ul style="list-style-type: none"> <li>Non-urban birds <ul style="list-style-type: none"> <li>Habitat specialists, such as the cliff-nesting black swift (<i>Cypseloides niger</i>)</li> <li>Forest-dwelling band-tailed pigeon (<i>Patagioenas</i></li> </ul> </li> </ul>                                                                                                                                                                                       | Habitat for non-urban bird species that rely on special features such as cliffs or complex forest stands is not present in the proposed Project area.                                                                                                                                                                                                                                                                                                                    |

| Proposed VC/IC | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                                                   | Rationale                                                                                                                                                                                                                                              |
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|                | <i>fasciata</i> <ul style="list-style-type: none"> <li>Olive-sided flycatcher (<i>Contopus cooperi</i>)</li> </ul>                                                                                                                                                                                      |                                                                                                                                                                                                                                                        |
|                | Excluded: <ul style="list-style-type: none"> <li>Bat species               <ul style="list-style-type: none"> <li>Little brown myotis (<i>Myotis lucifugus</i>)</li> <li>Keen's myotis (<i>Myotis keenii</i>)</li> <li>Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)</li> </ul> </li> </ul> | Bat maternal colonies and hibernacula, or habitat features that would accommodate critical life history requisites for bat species, are not present in the Project area.                                                                               |
|                | Excluded: <ul style="list-style-type: none"> <li>Reptiles               <ul style="list-style-type: none"> <li>Western painted turtle (<i>Chrysemys picta</i>)</li> <li>Gartersnakes (<i>Thamnophis sp.</i>)</li> </ul> </li> </ul>                                                                     | There are no large water bodies in the proposed Project area that could accommodate turtles, which are wetland obligates. No snake hibernacula have been documented in the floodplains of the Lower Fraser River.                                      |
|                | Excluded: <ul style="list-style-type: none"> <li>At-risk marsh birds (Obligates)               <ul style="list-style-type: none"> <li>American bittern (<i>Botaurus lentiginosus</i>)</li> </ul> </li> </ul>                                                                                            | Habitat for marsh-obligate birds is not present in the proposed Project area.                                                                                                                                                                          |
|                | Excluded: <ul style="list-style-type: none"> <li>Grassland raptors               <ul style="list-style-type: none"> <li>Short-eared owl (<i>Asio flammeus</i>), rough-legged hawk (<i>Buteo lagopus</i>), barn owl (<i>Tyto alba</i>)</li> </ul> </li> </ul>                                            | Habitat for raptor species that rely on grasslands, cultivated fields, fallow fields, or meadows is not present in the proposed Project area, due either to previous industrial and urban development or lack of agricultural development in the area. |

| Proposed VC/IC                                                                                                                                                           | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                                           | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|                                                                                                                                                                          | Excluded: <ul style="list-style-type: none"> <li>• Small mammals of the Lower Fraser River               <ul style="list-style-type: none"> <li>○ Trowbridge's shrew (<i>Sorex trowbridgii</i>)</li> <li>○ Southern red-backed vole (<i>Myodes gapperi occidentalis</i>)</li> </ul> </li> </ul> | Small mammal species of the Lower Fraser River have not been documented in the New Westminster and Surrey municipalities.                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                          | Excluded: <ul style="list-style-type: none"> <li>• Marine mammals</li> </ul>                                                                                                                                                                                                                    | Marine mammals are generally absent from the Project area. Assessment of marine mammals would be appropriate if the Project were situated closer to the Strait of Georgia.                                                                                                                                                                                                                                                                                                                          |
| Fraser River Hydraulics and River Morphology (IC)<br><br>This IC was selected and defined because it has Aboriginal, regulatory, scientific, and stakeholder importance. | Included: <ul style="list-style-type: none"> <li>• River hydraulics</li> <li>• River morphology</li> </ul>                                                                                                                                                                                      | The proposed Project has the potential to change Fraser River hydraulics and river morphology. These river processes were categorized as an IC because potential Project-related changes in river hydraulics and morphology can be assessed effectively in terms of consequent effects on end-of-pathway VCs, including Fish and Fish Habitat, Economic Activity, and Marine Use.                                                                                                                   |
| Soil and Groundwater (IC)<br><br>This IC was selected and defined because it                                                                                             | Included: <ul style="list-style-type: none"> <li>• Soils</li> <li>• Groundwater</li> </ul>                                                                                                                                                                                                      | The proposed Project infrastructure and the anticipated construction activities have the potential to adversely affect soil and groundwater quality. Given the Project's industrial history and setting, construction activities may disturb or mobilize pre-existing soil and groundwater contamination, thereby increasing exposure to contaminants.<br><br>Soil and Groundwater was categorized as an IC because:<br>(1) Project induced effects on soil and groundwater are expected to pertain |

| Proposed VC/IC                                                                                                                             | Included/Excluded VC/IC Subcomponents                                                                                              | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| has regulatory and stakeholder importance.                                                                                                 |                                                                                                                                    | <p>primarily to disturbance of, handling of, and changes in exposure to pre-existing contamination, rather than direct changes to soil and groundwater; and</p> <p>(2) Soil and groundwater quality comprise one step of a project-effect pathway and do not comprise the ultimate component of concern (i.e., Fish and Fish Habitat, Wildlife, and Vegetation), which are dependent on, or exposed to, soil and groundwater.</p>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p>Surface Water and Sediment (IC)</p> <p>This IC was selected and defined because it has regulatory and stakeholder importance.</p>       | <p>Included:</p> <ul style="list-style-type: none"> <li>• Surface water</li> <li>• Sediment</li> </ul>                             | <p>The proposed Project could potentially cause adverse effects on surface water quantity and quality. For example, Project implementation may alter surface topography, thereby changing surface drainage patterns and the flow characteristics of individual watercourses. Water quality concerns relate mainly to Project-induced increases in suspended sediment (e.g., as a by-product of Project induced acceleration of erosion or as a direct result of stream bed disturbance from instream works).</p> <p>The Surface Water and Sediment VC was designated an IC because it represents an intermediate step in a project-effect pathway, and potential Project-related changes in this component can be assessed effectively in terms of consequent effects on end-of-pathway VCs, including Fish and Fish Habitat, Vegetation, and Wildlife.</p> |
| <p>Noise and Vibration (IC)</p> <p>This IC was selected and defined because it has Aboriginal, regulatory, and stakeholder importance.</p> | <p>Included:</p> <ul style="list-style-type: none"> <li>• Operational noise</li> <li>• Construction noise and vibration</li> </ul> | <p>The proposed Project has the potential for operational (traffic) noise impacts, as well as construction noise and vibration impacts. Noise impacts have regulatory importance, as documented in the following policies and guidelines: Health Canada (2017), World Health Organization guideline (1995), 2014 MOTI noise policy, and VFPA noise guidelines (VFPA 2015).</p> <p>The Noise and Vibration VC was categorized as an IC because it acts within an effects pathway, and potential Project-related changes in this component can be assessed effectively in terms of consequent effects on end-of-pathway VCs, notably the Physical Determinants of Human Health VC.</p>                                                                                                                                                                        |
|                                                                                                                                            | <p>Included:</p> <ul style="list-style-type: none"> <li>• Underwater noise</li> </ul>                                              | <p>Elevated underwater noise levels may adversely affect both fish and marine mammals. Marine mammals are generally absent in the Project area, so the assessment will focus on potential adverse effects of underwater noise on fish. Underwater noise will be addressed as part of assessing the Fish and Fish Habitat VC.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



| Proposed VC/IC                                                                                                                     | Included/Excluded VC/IC Subcomponents                                                                                    | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <p>Air Quality (IC)</p> <p>This IC was selected and defined because it has Aboriginal, regulatory, and stakeholder importance.</p> | <p>Included:</p> <ul style="list-style-type: none"> <li>Select criteria air contaminants (CAC)</li> </ul>                | <p>Project operation has the potential to adversely affect ambient air quality; for example, as a result of possible increases in vehicle engine emissions and road dust. Initial assessment indicates CAC impacts are likely to be highly localized. Air quality is guided by regulatory objectives and thresholds that focus on CACs, notably nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), particulate matter (PM), including inhalable particulate matter (PM<sub>10</sub>) and fine (or respirable) particulate matter (PM<sub>2.5</sub>), diesel particulate matter, and volatile organic compounds (VOCs).</p> <p>The Air Quality VC was categorized as an IC, as this component acts within an effects pathway, and potential Project-related changes in this component can be assessed effectively in terms of consequent effects on the end-of-pathway VC, i.e., Physical Determinants of Human Health VC.</p> |
|                                                                                                                                    | <p>Excluded CACs:</p> <ul style="list-style-type: none"> <li>Sulphur oxides (SO<sub>x</sub>)</li> <li>Ammonia</li> </ul> | <p>Regulations have lowered the sulfur content of fuel (gasoline and diesel) in on-road vehicles and most large vehicles and machinery (2015). Due to these regulations, SO<sub>x</sub> emissions from on-road vehicles have ceased to be an issue.</p> <p>A review of emissions data for the Metro Vancouver region indicates the contribution of ammonia from transportation projects is negligible. The largest contribution to ammonia in the Lower Fraser Valley comes from agriculture, which does not occur in the Project Area. In addition, there are no applicable air quality standards for ammonia. Metro Vancouver's monitoring of ammonia emissions began only recently and only for a limited number of air quality monitoring stations. Data are therefore limited.</p>                                                                                                                                            |
|                                                                                                                                    | <p>Included:</p> <ul style="list-style-type: none"> <li>Greenhouse gases (GHGs)</li> </ul>                               | <p>Consistent with current government direction, the EA will assume a "no-toll" scenario, whereby the new Pattullo Bridge, as well as other bridges in the region, would not be tolled. Under this scenario, there may be Project-induced changes in regional traffic volume, as well as regional changes in congestion and truck mix. These changes could result in Project-induced adverse effects with respect to GHG emissions at a regional or larger scale.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Economic Pillar                                                                                                                    |                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Economic Activity (VC)                                                                                                             | <p>Included:</p> <ul style="list-style-type: none"> <li>Employment (cumulative adverse crowding out effects)</li> </ul>  | <p>The proposed Project is located in an urban setting that already experiences a high level of economic activity, as reflected by the presence of a large number of industrial, commercial and retail businesses. The Project has the potential to further increase</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Proposed VC/IC                                                                                                                   | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                          | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| This VC was selected and defined because it has Aboriginal and stakeholder importance.                                           | <ul style="list-style-type: none"> <li>Business activity/existing businesses</li> </ul>                                                                                                                                                                                        | <p>business opportunity within the study area as well as provide specific economic benefits such as increased employment, employment income, gross domestic product (GPD) and government revenues. The assessment of Economic Activity will confirm these benefits, which will be reported in Part A of the Application.</p> <p>Potential adverse economic effects relate mainly to temporary and/or permanent disruption of business activity and to temporary labour market crowding-out effects</p>                                                                                                                                                       |
|                                                                                                                                  | <p>Excluded:</p> <ul style="list-style-type: none"> <li>Employment income</li> <li>Government tax revenues</li> <li>Gross domestic product (GDP)</li> <li>Property values</li> </ul>                                                                                           | <p>The proposed Project will increase employment income through associated direct and indirect employment. No adverse effects on employment income are expected.</p> <p>The proposed Project benefits will include government tax revenues generated by Project capital investments, which will be discussed in Part A of the Application.</p> <p>Potential adverse effects on specific properties will be addressed as part of assessing the Land Use VC. The proposed Project benefits will include increased GDP through capital investments, reduced traffic congestion, and time savings, which will be discussed elsewhere in the EAC Application.</p> |
| Social Pillar                                                                                                                    |                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p>Marine Use (VC)</p> <p>This VC was selected and defined because it has Aboriginal, regulatory, and stakeholder importance</p> | <p>Included:</p> <ul style="list-style-type: none"> <li>Commercial and recreational marine traffic</li> <li>Commercial and recreational fisheries</li> <li>Aboriginal fisheries</li> <li>Water lot leases</li> <li>New Westminster Railway Bridge (NWRB) operations</li> </ul> | <p>The proposed Project has the potential to affect marine activities during bridge construction and removal of the existing bridge, as well as during proposed Project operation.</p> <p>The proposed Project has the potential to affect waterfront activities in North Surrey and New Westminster, specifically during construction of the new bridge and approaches, and removal of the existing bridge.</p>                                                                                                                                                                                                                                             |
| <p>Land Use (VC)</p> <p>This VC was selected and defined because it has Aboriginal,</p>                                          | <p>Included:</p> <ul style="list-style-type: none"> <li>Transportation infrastructure including railways</li> <li>Commercial/retail and industrial lands</li> </ul>                                                                                                            | <p>Land acquisition and disposal for the proposed Project infrastructure and rights-of-way will affect specific properties.</p> <p>The proposed Project has the potential to conflict with neighbourhood, local, and regional land use and transportation plans, including plans by the VFPA (i.e., the EAC Application will assess the extent to which the proposed Project is consistent with relevant land use and transportation plans).</p>                                                                                                                                                                                                             |

| Proposed VC/IC                                                                                                   | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                                                                   | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| regulatory, and stakeholder importance.                                                                          | <ul style="list-style-type: none"> <li>Residential lands and dwellings</li> <li>VFPA lands and leases</li> <li>Community and regional infrastructure and services (e.g., education facilities, parks, health care, emergency and protection services)</li> <li>Utilities, pipelines, and other rights-of-way</li> </ul> | The proposed Project has the potential to affect land use activities through changes in access, changes in traffic volumes (motorized and non-motorized), changes in travel times and traffic patterns, and nuisance effects (e.g., noise, air quality, visual quality). Land uses potentially adversely affected include: commercial/retail, industrial, residential, community/regional infrastructure and services (e.g., education facilities, parks, health, emergency and protection services), road and railway infrastructure and utility rights-of-way.                                                                                  |
|                                                                                                                  | <p>Excluded:</p> <ul style="list-style-type: none"> <li>Demand for infrastructure and services</li> </ul>                                                                                                                                                                                                               | <p>Construction workforce required for the proposed Project will not be significant, relative to the Metro Vancouver labour force, and should not result in changes in demand for local community infrastructure or services during proposed Project construction.</p> <p>Similarities in location and capacity between the existing Pattullo Bridge and the proposed Project suggest little potential for Project-induced changes in land use zoning, population growth, or population distribution that would result in changes in demand for community and regional infrastructure.</p>                                                        |
|                                                                                                                  | <p>Excluded:</p> <ul style="list-style-type: none"> <li>Agriculture</li> </ul>                                                                                                                                                                                                                                          | There are no Agricultural Land Reserve lands or documented agricultural use in the Project area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>Community Cohesion (VC)</p> <p>This VC was selected and defined because it has Aboriginal and stakeholder</p> | <p>Included:</p> <ul style="list-style-type: none"> <li>Neighbourhood connectivity</li> <li>Social equity</li> </ul>                                                                                                                                                                                                    | <p>The proposed Project has the potential to adversely affect neighbourhood connectivity through changes in access and traffic patterns, specifically during construction.</p> <p>The Project is expected to result in social benefits related to Community Cohesion and Physical and Social Determinants of Human Health, which will be discussed in Part A of the Application (e.g., long term motor vehicle connection between New Westminster and Surrey, greater connectivity between neighbourhoods and between Surrey and New Westminster for pedestrian/ bicycle traffic, improvements to parks/green spaces along waterfront, etc.).</p> |

| Proposed VC/IC                                                                                                                    | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                                                                                                                                                                                                  | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| importance.                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p>Visual Quality (VC)</p> <p>This VC selected and defined because it has Aboriginal, regulatory, and stakeholder importance.</p> | <p>Included:</p> <ul style="list-style-type: none"> <li>• Daytime viewing</li> <li>• Nighttime viewing</li> </ul>                                                                                                                                                                                                                                                                                                                                      | <p>Construction of the new bridge and removal of existing bridge, and associated road extensions and interchanges in New Westminster and Surrey, have the potential to affect scenic views and visual quality.</p> <p>VFPA has established guidelines related to Visual Quality and views as part of its Project and Environmental Review process. These guidelines provide direction to address potential view, lighting, and shading effects where developments are proposed in close proximity to residential or public areas (see Lighting IC and Shading IC rationales below).</p>                                                                                                                                                                                                                                                                                                                             |
| <p>Lighting (IC)</p> <p>This IC was selected and defined because it has Aboriginal, regulatory, and stakeholder importance.</p>   | <p>Included (see Visual Quality):</p> <ul style="list-style-type: none"> <li>• Lighting effects relevant to visual quality during evening and nighttime viewing</li> <li>• Lighting effects relevant to biological factors (e.g., fish and fish habitat, vegetation, and wildlife)</li> <li>• Lighting effects relevant to marine use</li> <li>• Lighting effects relevant to land use</li> <li>• Lighting effects relevant to human health</li> </ul> | <p>There is potential for a change in lighting levels in the vicinity of the proposed Project from navigational lighting and operational street lighting associated with the new bridge and approaches, which may alter existing nighttime views from nearby areas. Project-related change in lighting may also have an effect on fish and fish habitat, and wildlife, as well as marine and land use in the area.</p> <p>VFPA has established guidelines related to lighting as part of its Project and Environmental Review process.</p> <p>Lighting was categorized as an IC, as opposed to a VC, because potential Project-related changes in lighting can be assessed in terms of consequent effects on the ultimate receptor VCs identified as Visual Quality VC [Nighttime Viewing subcomponent], Fish and Fish Habitat VC, Marine Use VC, Vegetation VC, Wildlife VC, Land Use VC, and Human Health VC.</p> |
| <p>Shading (IC)</p> <p>This IC was selected and defined because it has Aboriginal,</p>                                            | <p>Included (see Visual Quality):</p> <ul style="list-style-type: none"> <li>• Shading effects relevant to visual quality during day-time viewing</li> <li>• Shading effects relevant to biological factors (e.g., fish</li> </ul>                                                                                                                                                                                                                     | <p>The new bridge and associated roadway approaches, combined with the removal of the existing Pattullo Bridge will result in a change in shading patterns that may alter existing daytime viewing for nearby areas. Project-related change in shading patterns may also have an effect on fish and fish habitat, vegetation, and wildlife, as well as marine and land use in the area.</p> <p>VFPA has established guidelines related to Shading as part of its Project and</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Proposed VC/IC                                                                                                                     | Included/Excluded VC/IC Subcomponents                                                                                                                                              | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| regulatory, and stakeholder importance.                                                                                            | and fish habitat, vegetation, and wildlife) <ul style="list-style-type: none"> <li>Shading effects relevant to marine use</li> <li>Shading effects relevant to land use</li> </ul> | Environmental Review process.<br>Shading was categorized as an IC, as opposed to a VC, because Project-related change in shading patterns can be assessed in terms of consequent effects on the ultimate receptor VCs identified as Visual Quality VC [Daytime Viewing subcomponent], Fish and Fish Habitat VC, Marine Use VC, Vegetation VC, Wildlife VC, Land Use VC, and Human Health VC.                                                                                                                                                                                                                                                                              |
| <b>Heritage Pillar</b>                                                                                                             |                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Heritage Resources (VC)<br><br>This VC was selected and defined because it has Aboriginal, regulatory, and stakeholder importance. | Included: <ul style="list-style-type: none"> <li>Archaeological resources</li> </ul>                                                                                               | The proposed Project has the potential to adversely affect archaeological resources, particularly during construction of the new bridge and removal of the existing bridge. Assessment of this subcomponent will meet regulatory and institutional requirements pertaining to heritage protection and mitigation of heritage risk. The focus will be on archaeological resources that are of Aboriginal origin (e.g., physical evidence of Aboriginal/Indigenous use and habitation of an area).                                                                                                                                                                          |
|                                                                                                                                    | Included: <ul style="list-style-type: none"> <li>Historical heritage resources</li> </ul>                                                                                          | The proposed Project has the potential to adversely affect historical heritage resources which, for the purpose of assessment, are defined as occurring post-AD 1846, which is recognized by Canadian courts as signifying the establishment of British sovereignty in British Columbia. Assessment under this category will be limited to considering sites or structures that are currently protected, or are in the process of becoming protected, by provincial or municipal heritage protection mechanism (i.e., protected under the provincial <i>Heritage Conservation Act</i> or through municipal heritage bylaw, site registry, or other municipal mechanisms). |
|                                                                                                                                    | Included: <ul style="list-style-type: none"> <li>Heritage value of existing Pattullo Bridge</li> </ul>                                                                             | The scope of the proposed Project includes demolition of all or part of the existing Pattullo Bridge. The bridge is not protected, nor in the process of becoming protected, by any heritage protection mechanisms and is therefore distinct from the more general historical heritage resources defined in the row above. Nevertheless, the bridge has potential heritage value, and there could be heritage loss as a result of its removal. The EA will assess the heritage value of the existing bridge, rationalize its demolition/removal, and address options for mitigating resulting heritage loss (if any).                                                     |
|                                                                                                                                    | Included: <ul style="list-style-type: none"> <li>Paleontological resources</li> </ul>                                                                                              | No fossil finds have been recorded in the Project area, and it is unlikely that fossils would be encountered given the geological history of the area. However, the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Proposed VC/IC                                                                                                                                               | Included/Excluded VC/IC Subcomponents                                                                                                                                                                                                                                                   | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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|                                                                                                                                                              |                                                                                                                                                                                                                                                                                         | assessment will nevertheless address paleontological resources in order to fulfill the requirements of CEAA 2012, s. 5(1)(c)(iv).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Health Pillar</b>                                                                                                                                         |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>Physical Determinants of Human Health (VC)</p> <p>This VC was selected and defined because it has Aboriginal, regulatory, and stakeholder importance.</p> | <p>Included:</p> <ul style="list-style-type: none"> <li>• Human health effects stemming from noise and vibration</li> <li>• Human health effects stemming from changes in air quality effects</li> <li>• Human health effects stemming from exposure to aquatic contaminants</li> </ul> | <p>The proposed Project has the potential to affect human health parameters through changes in physical (e.g., air quality, noise and vibration) parameters. The Project involves potential changes in volume and composition of traffic, which could change air emissions and alter ambient air quality, and result in noise levels that can lead to increased stress levels. In addition, construction of the new bridge could potentially cause new contamination or result in disturbance and/or mobilization of pre-existing contamination in the aquatic environment, which may have implications for human health.</p>                                                                                                                                                                                                                                                                                                                                                                     |
| <p>Social Determinants of Human Health (VC)</p> <p>This VC was selected and defined because it has Aboriginal and stakeholder importance.</p>                | <ul style="list-style-type: none"> <li>• Services</li> <li>• Social interactions</li> <li>• Livelihood factors</li> <li>• Active living</li> </ul>                                                                                                                                      | <p>The proposed Project works involve a major road network connecting Surrey and New Westminster. The new bridge may change traffic patterns and affect community connectivity and access to residential areas, employment centres, social services, health services, community institutions, and recreation areas. Real and perceived changes in access through differences in public and active transport, affordability, ease, distance, and travel time may affect community well-being, mental health, exercise, and stress. These SDOH subcomponents will be assessed based on interpretation of several assessment results (e.g. Economic and Community Cohesion VC).</p> <p>Expected human health benefits associated with the proposed Project could include increased opportunity for physical activity through facilitation of improved pedestrian/bicycle traffic and improvements to parks/green spaces along the waterfront, as well as expected improvements to public safety.</p> |



## 5.0 INDICATORS AND SPATIAL BOUNDARIES OF SELECTED COMPONENTS

### 5.1 INDICATORS OF POTENTIAL PROJECT-RELATED EFFECTS FOR SELECTED VCS/ICS

Indicators are metrics applied to measure and assess the condition/trend of a selected VC related to interactions between the VC and proposed Project (British Columbia 2013a). Indicators are chosen based on their connectivity to the VC and ability to measure potential effects from Project activities. Effective indicators exhibited the following attributes (British Columbia 2013a):

**Relevant** – indicators must relate directly or indirectly to the selected VC/IC;

**Practical** – there must be a practical way to evaluate the indicator, by obtaining achievable data, predicative models, etc.;

**Measurable** – the indicator measurement must generate useful data that informs the understanding of potential effects on the VC/IC;

**Responsive** – to the potential effects of the proposed Project in a timely manner;

**Accurate** – in reflecting changes to the VC/IC; and

**Predictable** – in terms of response to the proposed Project.

The proposed VC/IC subcomponent indicators for the assessment of potential effects of the proposed Project are described in Table 8 and based on the processes described in this document. Assessment approaches are included to display proposed methods of assessment only, and will be refined through the pre-Application process and input from the Working Group.

The parameters and metrics that will be used to measure Project-induced changes to indicators will be described in the Application Information Requirements.

Table 8 Indicators of Selected VC/IC Subcomponents

| Subcomponents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fish and Fish Habitat (VC)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>Fish Species: <ul style="list-style-type: none"> <li>Salmon – pink, sockeye, chum, coho, chinook</li> <li>Trout – steelhead, rainbow trout, coastal cutthroat</li> <li>Char – Dolly Varden, bull trout</li> <li>Sturgeon – white sturgeon (Lower Fraser population) and green sturgeon</li> <li>Eulachon</li> <li>Mountain sucker (<i>Catostomus platyrhynchus</i>)</li> </ul> </li> <li>“Forage” fish</li> <li>Fish habitat form and function (relating primarily to the above-listed species)</li> </ul> | <ul style="list-style-type: none"> <li>Potential for physical injury/mortality to fish</li> <li>Changes to habitat quantity, quality, and function for life cycle components of included fish species: <ul style="list-style-type: none"> <li>Changes to habitat suitability and availability</li> <li>Changes to Fraser River hydraulics and river morphology</li> <li>Changes to water quality (e.g., temperature, turbidity etc.)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Review existing data on fish and fish habitat for the key species listed</li> <li>Review results of the Fraser River Hydraulics and River Morphology (IC) study to inform assessment of potential hydraulic effects on fish and fish habitat form and function in the Fraser River</li> <li>Review results of assessments of other relevant VCs/ICs: <ul style="list-style-type: none"> <li>Surface Water and Sediment</li> <li>Soil and Groundwater</li> <li>Lighting and Shading</li> </ul> </li> <li>Review Aboriginal traditional use information and knowledge, as shared and made available for use in the EA, through Project-specific studies and consultation with Aboriginal Groups, and integrate this information into the assessment of the Fish and Fish Habitat VC (subject to confidentiality provisions in the MOUs signed by TransLink or MOTI with Aboriginal Groups who have rights and interests in the Project area)</li> <li>Conduct fish presence/absence surveys in upland tributaries to Fraser River</li> <li>Conduct habitat assessment (connectivity, quantity, quality, and function) in affected upland tributaries to the Fraser River and in the Fraser River itself</li> <li>Assess Project interactions and related potential adverse effects on fish and fish habitat (includes reference to fish life</li> </ul> |

| Subcomponents                                                                                                                        | Indicators                                                                                                                                                                                                                                                                                                                                                                                  | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                             | <p>cycles and seasonality of fish species)</p> <ul style="list-style-type: none"> <li>Identify measures to mitigate identified potential adverse effects on fish and fish habitat (as necessary)</li> <li>Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Vegetation (VC)                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>Rare plants and plant communities/assemblages, including at-risk plant communities</li> </ul> | <ul style="list-style-type: none"> <li>Presence/absence of red-listed and blue-listed plants and their locations and areal extent (if present)</li> <li>Presence/absence of plant communities (general) and their locations and aerial extent (if present)</li> <li>Presence/absence of red- and blue-listed plant communities and their locations and areal extent (if present)</li> </ul> | <ul style="list-style-type: none"> <li>Review existing data on at-risk plant species and ecological communities</li> <li>Review results of assessments of other relevant VCs: <ul style="list-style-type: none"> <li>Surface Water and Sediment</li> <li>Soil and Groundwater</li> <li>Lighting and Shading</li> <li>Historical Heritage (i.e. landscape elements)</li> </ul> </li> <li>Review the results of Aboriginal traditional use and knowledge studies, as available, and integrate this information into the assessment of the Vegetation VC (subject to confidentiality provisions in the MOUs signed by TransLink with First Nations who have rights and interests in the Project area)</li> <li>Conduct field surveys on at-risk plant species, ecological communities, and wetlands</li> <li>Terrestrial Ecosystem Mapping</li> <li>Assess Project interactions and related potential adverse effects on vegetation</li> <li>Identify measures to mitigate identified potential adverse effects on vegetation (as necessary)</li> </ul> |
| <ul style="list-style-type: none"> <li>Wetland ecosystems</li> </ul>                                                                 | <ul style="list-style-type: none"> <li>Presence/absence of wetlands and their location and aerial extent (if present)</li> </ul>                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Subcomponents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Indicators                                                                                                                                                                                         | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>Identify and evaluate possible residual and cumulative adverse effects (if any)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Wildlife (VC)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>Wildlife:               <ul style="list-style-type: none"> <li>Migratory birds</li> <li>Great blue heron (<i>Ardea Herodias fannini</i>)</li> <li>Green heron (<i>Butorides virescens</i>)</li> <li>Bald eagle (<i>Haliaeetus leucocephalus</i>)</li> <li>Peregrine falcon (<i>Falco peregrinus anatum</i>)</li> <li>Red-tailed hawk (<i>Buteo jamaicensis</i>)</li> <li>Osprey (<i>Pandion haliaetus</i>)</li> <li>Western screech-owl (<i>Megascops kennicotti kennicottii</i>)</li> <li>Urban birds</li> <li>Common nighthawk (<i>Chordeiles minor</i>)</li> <li>Barn swallow (<i>Hirundo rustica</i>)</li> <li>Pacific water shrew (<i>Sorex bendirii</i>)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Presence/absence of at-risk wildlife</li> <li>Amount, quality, and function of habitat suitable for at-risk wildlife species and migratory birds</li> </ul> | <ul style="list-style-type: none"> <li>Review existing data on at-risk wildlife species and their habitat</li> <li>Review results of assessments of other relevant VCs:               <ul style="list-style-type: none"> <li>Vegetation</li> <li>Surface Water and Sediment</li> <li>Soil and Groundwater</li> <li>Lighting and Shading</li> </ul> </li> <li>Review ATK information provided by Aboriginal Groups through consultation or Project-specific studies, and integrate relevant information into assessment of the Wildlife VC (subject to confidentiality provisions in the MOUs signed by TransLink or MOTI with Aboriginal Groups who have rights and interests in the Project area)</li> <li>Conduct field studies to confirm the presence of at-risk wildlife and migratory birds</li> <li>Undertake habitat assessment to assess presence/absence and areal extent of habitat that is suitable for at-risk wildlife species and migratory birds</li> <li>Assess Project interactions and related potential adverse effects on wildlife and wildlife habitat</li> <li>Identify measures to mitigate identified potential adverse effects on wildlife and wildlife habitat (as necessary)</li> </ul> |

| Subcomponents                                                                                                                                                                                                                                                                    | Indicators                                                                                                                                                                                                                                                            | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>○ At-risk amphibians (general)</li> <li>○ Red-legged frog (<i>Rana aurora</i>)</li> <li>○ Western toad (<i>Anaxyrus boreus</i>)</li> <li>• Wildlife habitat form and function (relating primarily to the above-listed species)</li> </ul> |                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Fraser River Hydraulics and River Morphology (IC)                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>• River hydraulics</li> <li>• River morphology</li> </ul>                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>• Changes to flow distribution and flow patterns</li> <li>• Velocity changes</li> <li>• Changes to river scour</li> <li>• Changes to sediment deposition patterns</li> <li>• Changes to water levels and bathymetry</li> </ul> | <ul style="list-style-type: none"> <li>• Review existing information on Fraser River hydraulics and morphology</li> <li>• Conduct field surveys to gather additional information on existing conditions (to calibrate and validate the models that will be used to assess potential Project effects)</li> <li>• Assess Project interactions and related potential adverse effects on flow properties, bed erosion, and sediment deposition</li> <li>• Also use numerical (i.e., computer) modelling to assess both “near-field” and “far-field” hydraulics and sediment transport</li> <li>• Identify measures to mitigate identified potential adverse effects on Fraser River hydraulics and morphology (as necessary)</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul> |
| Soil and Groundwater (IC)                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>• Soils</li> <li>• Groundwater</li> </ul>                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>• Presence/absence, character, and extent of pre-existing contaminated</li> </ul>                                                                                                                                              | <ul style="list-style-type: none"> <li>• Review existing information on surficial geology and soils</li> <li>• Review results of geotechnical assessments</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Subcomponents                                                                         | Indicators                                                                                                                                                                                                                                                                 | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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|                                                                                       | soil <ul style="list-style-type: none"> <li>• Presence/absence, character, and extent of pre-existing contaminated groundwater</li> <li>• Presence/absence of potentially affected wells</li> </ul>                                                                        | <ul style="list-style-type: none"> <li>• Review information on historical and current land use and from the contaminated sites registry</li> <li>• Assess Project interactions and related potential adverse effects on soils and groundwater</li> <li>• Potential disturbance of pre-existing contaminated soils and groundwater</li> <li>• Assessment of contamination of Fraser River sediment will be conducted if dredging is undertaken (dredging is not anticipated at this stage of project planning)</li> <li>• Potential adverse effects on wells (if present)</li> <li>• Identify measures to mitigate identified potential adverse effects on soil and groundwater (if any)</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul>                                           |
| Surface Water and Sediment (IC)                                                       |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• Surface water</li> <li>• Sediment</li> </ul> | <ul style="list-style-type: none"> <li>• Changes in surface water quality, focusing on potential contaminants of concern;</li> <li>• Changes in sediment quality, focusing on potential contaminants of concern; and</li> <li>• Changes in sediment deposition.</li> </ul> | <ul style="list-style-type: none"> <li>• Review existing information on drainage and surface water quality, including information on temporal trends in Fraser River water quality</li> <li>• Review results of hydro-technical assessments, including the hydraulic modelling conducted specifically for the Project</li> <li>• Review the results of the Soil and Groundwater assessment to inform assessment of potential contaminants of concern in surface water</li> <li>• Conduct field studies to assess water quality in the Pattullo Channel and other tributaries to the Fraser River</li> <li>• Assess Project interactions and related potential adverse effects on surface water and sediment               <ul style="list-style-type: none"> <li>○ Potential effects on surface water quality, focusing on</li> </ul> </li> </ul> |



| Subcomponents                                                                                                     | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                  | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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|                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>potential contaminants of concern and suspended sediment</p> <ul style="list-style-type: none"> <li>○ Potential changes in sediment deposition</li> <li>• Identify measures to mitigate identified potential adverse effects on surface water and sediment (as necessary)</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Noise and Vibration (IC)                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• Operational noise</li> <li>• Construction noise and vibration</li> </ul> | <ul style="list-style-type: none"> <li>• Incremental change in noise levels as a result of operating the new bridge (estimated for the year 2033)</li> <li>• Incremental change in noise levels attributable to constructing the new bridge and removing the existing bridge (excluding pile driving noise)</li> <li>• Incremental change in noise and vibration levels resulting specifically from pile driving</li> </ul> | <ul style="list-style-type: none"> <li>• Undertake pre-Project (“baseline”) noise monitoring to establish the existing ambient noise levels in the Project area, in order to: <ul style="list-style-type: none"> <li>○ Estimate the contribution of existing Pattullo Bridge traffic to present ambient noise levels</li> <li>○ Calibrate the numerical model that will be used to estimate future noise effects resulting from Project operation</li> <li>○ Establish a baseline for estimating temporary noise effects arising from construction and demolition</li> </ul> </li> <li>• Noise monitoring stations will be located so as to represent noise sensitive receptors (both residential and non-residential), including receptors expected to have the highest exposure to Project noise</li> <li>• Review results of traffic modelling and review relevant bridge and road design elements; this information will be input to the noise modelling, in combination with baseline noise monitoring data</li> <li>• Assess Project interactions and potential adverse noise effects on noise sensitive receptors:</li> </ul> |

| Subcomponents                                                                              | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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|                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>○ Use numerical modelling to estimate noise effects of Project operation</li> <li>○ Assess potential noise effects of Project construction</li> <li>○ Assess potential ground-borne vibration effects (for pile-driving only)</li> <li>• Use the results of the operational noise modelling to identify locations where consideration of noise mitigation (typically noise walls) is warranted</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Air Quality (IC)                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• CACs</li> <li>• Greenhouse gases (GHG)</li> </ul> | <ul style="list-style-type: none"> <li>• Project-induced changes in CAC concentrations during operational phase (estimated for first year of operation):               <ul style="list-style-type: none"> <li>○ NO<sub>x</sub></li> <li>○ PM<sub>x</sub> (total PM, PM<sub>10</sub> and PM<sub>2.5</sub>)</li> <li>○ CO</li> <li>○ VOCs</li> </ul> </li> <li>• Project-induced changes in CAC concentrations during construction/demolition phase (qualitative approach)</li> <li>• Project-induced changes in GHG emissions</li> </ul> | <ul style="list-style-type: none"> <li>• Review traffic modelling information and Project design elements influencing air quality</li> <li>• Review weather data (weather is a primary factor in dispersion of air-borne contaminants)</li> <li>• Identify air sensitive receptors that are potentially subject to adverse air quality effects (within 1 km of the Project)</li> <li>• Assess Project interactions and potential adverse air quality effects on sensitive receptors:               <ul style="list-style-type: none"> <li>○ Assess potential adverse air quality effects related to Project operation</li> <li>○ Assess potential adverse air quality effects arising from Project construction</li> </ul> </li> <li>• Use air quality modelling to assess potential adverse air quality effects attributable to Project operation               <ul style="list-style-type: none"> <li>○ Use Motor Vehicle Emission Simulator (MOVES) to characterize current emissions and predict future, Project-induced change in emission concentrations; focus</li> </ul> </li> </ul> |

| Subcomponents                                                                                                                                             | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>on Criteria Air Contaminants</p> <ul style="list-style-type: none"> <li>○ Use CAL3QHCR to model dispersion of the emissions and estimate current and future emission concentrations at select sensitive receptors</li> <li>• Use a qualitative approach to estimate changes in air quality attributable to Project construction/demolition</li> <li>• Evaluate potential Project-induced change in regional greenhouse gas emissions</li> <li>• Describe strategies and measures to mitigate potential adverse air quality effects</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul>                                                                                                                                                                                                                                                         |
| Economic Activity (VC)                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Employment (cumulative adverse crowding out effects)</li> <li>• Business activity/existing businesses</li> </ul> | <ul style="list-style-type: none"> <li>• Changes in direct employment for Project construction</li> <li>• Changes in indirect and induced employment (including changes in employment relating to supply and services)</li> <li>• Proportion of the local and regional construction labour force required to construct the Project</li> <li>• Disruptions to industrial, commercial, and retail businesses (e.g. changes in access, visibility of businesses, noise and vibration)</li> </ul> | <ul style="list-style-type: none"> <li>• Review publicly available information on economic activities that currently occur in the Project area and in the broader region (as applicable)</li> <li>• Review the Reference Concept design and other technical documentation on the Project (as relevant to economic assessment)</li> <li>• Characterize the economic baseline, including current employment and labour force</li> <li>• Identify the location and type of industrial, commercial, and retail businesses that may be adversely affected by the Project</li> <li>• Confirm the Project's economic benefits and assess potential Project-induced adverse economic effects:</li> <li>• Assess changes to direct employment, supplies and services employment, and induced employment during Project construction</li> <li>• Assess the proportion of the local and regional construction</li> </ul> |

| Subcomponents   | Indicators | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |            | <p>labour force required to construct the Project</p> <ul style="list-style-type: none"> <li>• Assess potential disruption of businesses and business activity during Project construction and operation phases</li> <li>• Describe strategies and measures to mitigate potential adverse economic effects</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul> |
| Marine Use (VC) |            |                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Subcomponents                                                                                                                                                                                     | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <ul style="list-style-type: none"> <li>• Navigation</li> <li>• Commercial and recreational fisheries</li> <li>• Other commercial marine use</li> <li>• Other non-commercial marine use</li> </ul> | <p>Navigation:</p> <ul style="list-style-type: none"> <li>• Navigation use</li> <li>• Navigability</li> <li>• Commercial and Recreational Fisheries:</li> </ul> <p>Commercial and recreational fishery activity</p> <ul style="list-style-type: none"> <li>• Harvest area use and access</li> <li>• Harvest levels and revenues (commercial)</li> <li>• Fishery resource availability</li> <li>• Environmental Setting (recreational fisheries)</li> </ul> <p>Other Commercial and Non-commercial Marine Use:</p> <ul style="list-style-type: none"> <li>• Types of commercial and non-commercial (e.g. recreational) marine use activity</li> <li>• Area use and access</li> <li>• Birds, wildlife, marine mammals resource availability as relevant (e.g. resources which support marine based tourism and recreation)</li> <li>• Environmental setting (e.g.</li> </ul> | <p>The following general approach is being taken to generate information with respect to existing conditions of Marine Use:</p> <ul style="list-style-type: none"> <li>• A review of secondary information and literature to inform trends analysis on marine use activity, amenities, locations and use periods; vessel type, number and movements; fishing licenses, harvest levels and revenues; and other characteristics</li> <li>• Engagement with VFPA, Transport Canada, marine users, other stakeholders and Aboriginal Groups to supplement, clarify and validate secondary data on existing and future marine use.</li> <li>• Review of information provided by Aboriginal Groups through consultation or Project-specific studies and integration of relevant information provided with permission for use in the Application and into the assessment of Marine Use VC.</li> </ul> <p>Baseline information, combined with the Project related navigation assessment, relevant Project design features (e.g., navigational clearances, number and location of piers) and results from the fish and fish habitat, hydraulic modelling, noise and vibration and air quality assessment will be used to assess potential effects of the proposed Project on navigation and marine use.</p> |

| Subcomponents                                                                                                                                                                                                                                                                                                                                                                                                                                 | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>pertaining to marine-based tourism and recreation)</p> <ul style="list-style-type: none"> <li>•</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Land Use (VC)                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• Transportation infrastructure including railways</li> <li>• Commercial/retail and industrial lands</li> <li>• Residential lands and dwellings</li> <li>• VFPA lands and leases</li> <li>• Community and regional infrastructure and services (e.g., education facilities, parks, health care, emergency and protection services)</li> <li>• Utilities, pipelines, and other rights-of-way</li> </ul> | <ul style="list-style-type: none"> <li>• Consistency with land use and transportation plans</li> <li>• Land acquisition and disposal for proposed Project infrastructure and rights-of-way</li> <li>• Disruptions to existing land uses through changes in: <ul style="list-style-type: none"> <li>○ Nuisance effects which may reduce the utility of land and improvements</li> <li>○ Traffic volumes (motorized and non-motorized)</li> <li>○ Ease of motor vehicle access (including parking availability)</li> <li>○ Cycling and pedestrian access</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Review the Official Community Plans of Surrey and New Westminster, the Vancouver Fraser Port Authority's Land Use Plan, the Regional Growth Strategy and the Regional Transportation Strategy (these documents will inform the assessment of land use.</li> <li>• Review the Reference Concept design and other technical documentation on the Project (as relevant to land use assessment)</li> <li>• Review publicly available information on residential and other land uses that currently occur in the Project area and in the broader region (as applicable)</li> <li>• Identify and assess the potential adverse effects of the Project on existing land uses: <ul style="list-style-type: none"> <li>○ Assess the Project's general consistency with land use planning</li> <li>○ Assess land acquisition and disposal for proposed Project infrastructure and rights-of-way</li> <li>○ Assess nuisance effects on existing uses of land</li> <li>○ Assess changes in traffic patterns (motorized and non-motorized)</li> <li>○ Assess changes in motor vehicle ease of access (including parking availability)</li> <li>○ Assess changes in cycling and pedestrian ease of access</li> <li>○ Assess the potential for construction-related activities to</li> </ul> </li> </ul> |



| Subcomponents                                                                                           | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>affect utilities, including water and wastewater infrastructure, within or adjacent to the Project area, either directly or indirectly</p> <ul style="list-style-type: none"> <li>• Describe strategies and measures to mitigate potential adverse effects on land uses</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Community Cohesion (VC)                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <ul style="list-style-type: none"> <li>• Neighbourhood connectivity</li> <li>• Social equity</li> </ul> | <ul style="list-style-type: none"> <li>• Change in physical connectivity within and between neighbourhoods and also between New Westminster and Surrey specifically <ul style="list-style-type: none"> <li>○ Changes in traffic patterns (including traffic volumes and travel times for motorized, transit, and non-motorized traffic)</li> <li>○ Changes in motor vehicle access</li> <li>○ Changes in cycling and pedestrian access</li> <li>○ Changes in structural barriers and safety related to transportation infrastructure (motorized and non-motorized)</li> </ul> </li> <li>• Social equity <ul style="list-style-type: none"> <li>○ Vulnerable populations likely to incur equity effects</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Review publicly available data on factors relating to community cohesion/connectivity (e.g. population, employment, location of institutions, major employers, community features)</li> <li>• Review publicly available data on commuting patterns</li> <li>• Identify indicators of socio-economic vulnerability by neighbourhood (e.g., incidence of low income, family structure)</li> <li>• Review the Reference Concept design and other technical documentation on the Project, as relevant to community cohesion</li> <li>• Review traffic data, as relevant to community cohesion (e.g. traffic diversion, changes in traffic patterns)</li> <li>• Identify and assess the potential adverse effects of the Project on connectivity within neighbourhoods and between New Westminster and Surrey: <ul style="list-style-type: none"> <li>○ Assess long-term Project related changes in transportation infrastructure (motorized and non-motorized)</li> <li>○ Assess changes in traffic patterns (including traffic volumes and travel times for motorized, transit, and non-</li> </ul> </li> </ul> |

| Subcomponents                                                                                    | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                 | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>motorized traffic)               <ul style="list-style-type: none"> <li>○ Assess changes in motor vehicle access</li> <li>○ Assess changes in cycling and pedestrian access</li> <li>○ Assess changes in structural barriers and safety related to transportation infrastructure (motorized and non-motorized)</li> <li>○ Assess the above listed changes for both the construction and operation phases</li> </ul> </li> <li>• Identify and assess vulnerable populations likely to incur equity effects (e.g., disproportionate adverse Project effects relative to Project benefits)</li> <li>• Describe strategies and measures to mitigate potential adverse effects on community cohesion</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul> |
| Visual Quality (VC)                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <ul style="list-style-type: none"> <li>• Daytime viewing</li> <li>• Nighttime viewing</li> </ul> | <ul style="list-style-type: none"> <li>• Level of change in visual quality from current daytime viewing conditions               <ul style="list-style-type: none"> <li>○ Visibility of the Project from key viewpoints to determine the visual prominence of Project features;</li> <li>○ Level of visual contrast created by the Project from key viewpoints to determine the level of change to visual character</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Review of regulatory and policy related to visual quality management</li> <li>• Review the results of public engagement, and Aboriginal traditional use and knowledge studies, as available</li> <li>• Review results of assessments of other relevant VCs/ICs:               <ul style="list-style-type: none"> <li>○ Lighting IC</li> <li>○ Shading IC</li> </ul> </li> <li>• Review the Reference Concept design and other technical documentation on the Project (as relevant to visual quality assessment)</li> <li>• Identify public viewpoints intended to collectively represent a range of viewer groups and viewing locations</li> </ul>                                                                                                                                                            |

| Subcomponents                                                                                                                                                                                                                                                                 | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|                                                                                                                                                                                                                                                                               | <p>during daytime viewing.</p> <ul style="list-style-type: none"> <li>Level of change in visual quality from current nighttime viewing conditions               <ul style="list-style-type: none"> <li>Visibility of the Project from key viewpoints to determine the visual prominence of Project lighting;</li> <li>Visual contrast from a change in perceived lighting created by the Project to determine the level of change to visual character during nighttime viewing.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Conduct photographic field surveys of existing viewing conditions</li> <li>Conduct analysis of existing viewing conditions to determine prominent landscape components and the visual character of the Project area, as seen from key viewpoints</li> <li>Use a computer-generated 3D model of the Project (i.e. the Reference Concept), combined with the photographic images, to simulate the form and character of the Project's major components</li> <li>Identify and assess the Project interactions and potential adverse effects on visual quality:               <ul style="list-style-type: none"> <li>For each key viewpoint, assess change in visual quality from current daytime viewing</li> <li>For each key viewpoint, assess change in visual quality from current nighttime viewing</li> </ul> </li> <li>Identify measures to avoid, manage, or otherwise mitigate potential adverse effects on visual quality</li> <li>Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul> |
| Lighting (IC)                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <ul style="list-style-type: none"> <li>Lighting effects relevant to visual quality during nighttime viewing</li> <li>Lighting effects relevant to biological factors (e.g., fish and fish habitat, vegetation, and wildlife)</li> <li>Lighting effects relevant to</li> </ul> | <ul style="list-style-type: none"> <li>Changes to lighting conditions that may adversely affect visual quality (nighttime viewing conditions)</li> <li>Changes to lighting conditions that may adversely affect biological factors</li> <li>Changes to lighting conditions that may adversely affect marine use</li> </ul>                                                                                                                                                                             | <ul style="list-style-type: none"> <li>Review applicable lighting design guidelines, and regulatory and policy context related to outdoor lighting</li> <li>Review the Reference Concept lighting design</li> <li>Identify potentially affected light sensitive receptors</li> <li>Conduct photographic field surveys of existing viewing conditions</li> <li>Conduct analysis of existing viewing conditions to determine lighting conditions</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Subcomponents                                                                                                                                                                                                                        | Indicators                                                                                                                                                                                                                 | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| marine use <ul style="list-style-type: none"> <li>Lighting effects relevant to land use</li> <li>Lighting effects relevant to human health</li> </ul>                                                                                | <ul style="list-style-type: none"> <li>Changes to lighting conditions that may adversely affect land use</li> <li>Changes to lighting conditions that may adversely affect human health</li> </ul>                         | <ul style="list-style-type: none"> <li>Assess the Project interactions and potential adverse lighting effects:               <ul style="list-style-type: none"> <li>For each key viewpoint, assess change in lighting from current nighttime conditions</li> </ul> </li> <li>Identify measures to avoid, manage, or otherwise mitigate potential adverse lighting effects</li> <li>Identify and evaluate possible residual adverse effects (if any)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                              |
| Shading (IC)                                                                                                                                                                                                                         |                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <ul style="list-style-type: none"> <li>Shading effects relevant to visual quality during day-time viewing</li> <li>Shading effects relevant to biological factors (e.g., fish and fish habitat, vegetation, and wildlife)</li> </ul> | <ul style="list-style-type: none"> <li>Changes to shading patterns that may adversely affect visual quality (daytime viewing)</li> <li>Changes to shading patterns that may adversely affect biological factors</li> </ul> | <ul style="list-style-type: none"> <li>Review applicable regulatory and policy context related to shade</li> <li>Review the Reference Concept to identify prominent structures that are likely to create substantial shading</li> <li>Use a computer-generated 3D model of the Project (i.e. the Reference Concept) to model pre-Project and Project related shade pattern during key dates and times (i.e., seasonal equinox and solstice dates at 9AM, 12PM, 3PM)</li> <li>Assess the Project interactions and potential adverse shading effects:               <ul style="list-style-type: none"> <li>assess change in shade pattern from current daytime conditions</li> </ul> </li> <li>Identify measures to avoid, manage, or otherwise mitigate potential adverse shade effects</li> <li>Identify and evaluate possible residual adverse effects (if any)</li> </ul> |
| Heritage Resources (VC)                                                                                                                                                                                                              |                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <ul style="list-style-type: none"> <li>Archaeological resources</li> <li>Historical heritage resources</li> </ul>                                                                                                                    | <ul style="list-style-type: none"> <li>Extent of disturbance to known heritage values</li> <li>Change in the level of accessibility to known heritage values</li> </ul>                                                    | <ul style="list-style-type: none"> <li>As per the <i>Heritage Conservation Act</i>, review existing information on heritage values known in the Project area, including the results of the heritage assessment completed previously for the rehabilitation of the existing Pattullo Bridge</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Subcomponents                                                                                                | Indicators                                                                                                                                                                        | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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|                                                                                                              |                                                                                                                                                                                   | <p>and other studies</p> <ul style="list-style-type: none"> <li>• Review heritage concerns expressed by Aboriginal Groups and by municipalities and other stakeholders</li> <li>• Review the results of Aboriginal traditional use and knowledge studies, as available, and integrate this information into the assessment of archaeological resources and historical heritage resources (subject to confidentiality provisions in the MOUs signed by TransLink or MOTI with Aboriginal Groups who have rights and interests in the Project area)</li> <li>• Assess the Project interactions and potential adverse heritage effects: <ul style="list-style-type: none"> <li>○ Conduct an archaeological overview assessment (AOA)</li> <li>○ Conduct archaeological impact assessment (AIA), informed by Aboriginal groups and involving excavation, on accessible areas that represent a high risk of encountering archaeological values during construction</li> <li>○ Conduct a historical heritage assessment</li> <li>○ Above assessments will follow applicable provincial and municipal heritage assessment guidelines</li> </ul> </li> <li>• Describe strategies and measures to mitigate potential adverse heritage effects</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul> |
| Physical Determinants of Human Health (VC)                                                                   |                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• Noise and vibration effects associated with human health</li> </ul> | <ul style="list-style-type: none"> <li>• Noise: <ul style="list-style-type: none"> <li>○ Change in annoyance associated with traffic noise, as measured by</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Review existing information on physical health determinants, as relevant to the Project area</li> <li>• Review results of assessments of other relevant VCs/ICs:</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Subcomponents                                                                                                                                                  | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <ul style="list-style-type: none"> <li>Air quality effects associated with human health</li> <li>Contamination effects associated with human health</li> </ul> | <p>the expected percent of the community that is “highly annoyed” (%HA)</p> <ul style="list-style-type: none"> <li>Air quality:               <ul style="list-style-type: none"> <li>Change in acute inhalation risk quotient (chemical exposure ÷ chemical exposure limit) for select airborne contaminants modelled in the air quality assessment, over short-term averaging times</li> <li>Change in chronic inhalation risk quotient for select airborne contaminants modelled in the air quality assessment, over long-term averaging times</li> </ul> </li> <li>Soil, groundwater and surface water contamination:               <ul style="list-style-type: none"> <li>Change in human exposure (qualitative assessment)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Noise and Vibration IC</li> <li>Air Quality IC</li> <li>Define the spatial limits of communities for which %HA will be estimated</li> <li>Define the spatial limits of communities for which risk quotients will be estimated</li> <li>Define the spatial limits of communities that could be subject to Project-induced contamination of soils, groundwater, and surface water</li> <li>Assess the Project interactions and potential adverse effects on the physical determinants of human health:               <ul style="list-style-type: none"> <li>Estimate %HA</li> <li>Estimate risk quotient for select airborne contaminants</li> <li>Qualitatively assess effects pathways and risk related to new and pre-existing contamination of soil, groundwater, and surface water</li> </ul> </li> <li>Describe strategies and measures to mitigate potential adverse health effects</li> <li>Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul> |
| Social Determinants of Human Health (VC)                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <ul style="list-style-type: none"> <li>Services</li> <li>Social interactions</li> <li>Livelihood factors</li> <li>Active living</li> </ul>                     | <ul style="list-style-type: none"> <li>Changes in physical connectivity within and between neighbourhoods as well as between Surrey and New Westminster</li> <li>Changes in perceptions of safety, risk, and ease of travel within and between neighbourhoods, as well as between Surrey and New</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>Review existing information on the social determinants of human health, as relevant to the Project area</li> <li>Review traffic information and other technical data, as relevant to assessing the social determinants of human health</li> <li>Review results of assessments of other relevant VCs:               <ul style="list-style-type: none"> <li>Visual Quality VC</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



| Subcomponents | Indicators  | Proposed Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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|               | Westminster | <ul style="list-style-type: none"> <li>○ Marine Use VC</li> <li>○ Land Use VC</li> <li>○ Community Cohesion VC</li> <li>○ Economic Activity VC</li> <li>• Define the spatial limits of communities or populations to which the various indicators will be applied</li> <li>• Assess the Project interactions and potential adverse effects on the social determinants of human health</li> <li>• Describe strategies and measures to mitigate potential adverse effects on the social determinants of human health</li> <li>• Identify and evaluate possible residual and potential cumulative adverse effects (if any)</li> </ul> |

## **5.2 PROPOSED SPATIAL ASSESSMENT BOUNDARIES**

Spatial boundaries define the geographic extent of potential proposed Project effects on each of the VCs/ICs (Table 9). Initial spatial boundaries were developed as part of the VC/IC selection process. These boundaries will be further developed and finalized as part of the next step in the assessment process (see Figure 3, page 2).

The Local Study Areas (LSAs) were selected on a discipline-specific basis to capture the spatial extent of potential direct proposed Project-related effects. The Regional Study Areas (RSAs) are broader in extent and provide context for the assessment of effects within the LSAs. The RSA reflects potential proposed Project-related interactions of relatively remote sensitive receptors (compared to those identified within LSA boundaries) and are also intended to provide the initial spatial boundary for assessment of potential cumulative effects (if any). Maps of LSAs and RSAs for VCs and ICs are presented in Appendix A1.

Table 9 Spatial Boundaries for Assessing Potential Proposed Project Effects on VCs/ICs

| Pillar, VC and IC                      | Local Study Area Boundary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Regional Study Area Boundary                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Environmental Pillar</b>            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Fish and Fish Habitat (VC)             | <u>Local Study Area (LSA)</u> : Section of the Fraser River extending from 1 km upstream to 1 km downstream of the existing Pattullo Bridge, and 30 metres (m) either side of the Fraser River within the upstream and downstream boundaries plus the following upland areas. The boundaries of the physical hydraulic model for assessing Fraser River Hydraulics and Morphology (as influenced by scour and depositional processes) fall within these boundaries. In Surrey, the area bounded by Tannery Road from the Fraser River to 120 Street, then 120 Street/Scott Road to Old Yale Road, then Old Yale Road to Bridgeview Drive, north along 130 Street to the Fraser River. In New Westminster, the area bounded by Fourth Street from the Fraser River to Third Avenue, Third Avenue to First Street, First Street to Sixth Avenue, and Cumberland Street from Sixth Avenue to the Fraser River. | <u>Regional Study Area (RSA)</u> : Section of the <u>Fraser</u> River extending from 6 km upstream to 5.5 km downstream of the existing Pattullo Bridge for the Mainstem and North Arm, and 8 km downstream for the South Arm, plus upland areas covered by the LSA and a 100m buffer around it. These boundaries are consistent with the boundaries of the numerical hydraulic model that will be used to assess Fraser River Hydraulics and Morphology. |
| Vegetation (VC)                        | 250 m buffer from the Project Boundary, which represents a broader area within which potential effects from the proposed Project may potentially adversely affect vegetation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | The RSA is not applicable because of the disturbed nature of the Project Boundary; any potential impacts to vegetation are expected to be minimal and limited to the LSA.                                                                                                                                                                                                                                                                                 |
| Wildlife (VC)                          | 250 m buffer from the Project Boundary, which represents an area within which potential effects from the proposed Project may interact directly with wildlife.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5 km spatial buffer from the Project Boundary. The area includes Burnaby Lake Regional Park, the edge of Green Timbers Park, Invergarry Park, and forest patches near Burn Creek. These parks represent potential species pools for the Project area.                                                                                                                                                                                                     |
| Fraser River Hydraulics and Morphology | Corresponds to the limits of the physical model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Corresponds to the limits of the numerical                                                                                                                                                                                                                                                                                                                                                                                                                |

| Pillar, VC and IC               | Local Study Area Boundary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Regional Study Area Boundary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (IC)                            | <p>that will be built to scale in order to simulate the effect of the proposed Project on hydraulic and morphological processes.</p> <p>Boundaries are located 1 km upstream and 1 km downstream from the existing Pattullo Bridge. In-river, the model will extend to geodetic elevation 8 m.</p> <p>The upstream boundary is approximately at the downstream end of Sapperton Bar. The downstream boundary is immediately downstream of the existing Skytrain Bridge, and will incorporate instream portions of the New Westminster Rail Bridge, existing Pattullo Bridge, existing Skytrain Bridge, and proposed Pattullo Replacement Bridge.</p> | <p>(computer) modelling that will be undertaken to simulate the effect of the proposed Project on hydraulic and morphological processes.</p> <p>Boundary is 6 km upstream from the existing Pattullo Bridge. Downstream of the existing bridge, the boundary is located 5.5 km downstream for each of the Annacis Channel and North Arm Fraser River, and 8 km downstream for the South Arm Fraser River.</p> <p>The numerical model will cover an area extending from downstream of the Port Mann Bridge to downstream of Alex Fraser Bridge in Anniesville Channel (mainstem). In Annacis Channel, the model extends to upstream of the Annacis Channel Bridge. In the North Arm, it extends to downstream of the Queensborough Bridge.</p> |
| Soil and Groundwater (IC)       | 250 m buffer surrounding the extent of the Project Boundary on land. This area is expected to encompass all proposed Project related soil excavation, as well as potential Project-induced migration of possible groundwater contaminants.                                                                                                                                                                                                                                                                                                                                                                                                           | An RSA is not applicable, as any potential impacts to soil and groundwater are anticipated to be highly localized and within the LSA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Surface Water and Sediment (IC) | <p><u>Fraser River</u></p> <p>The section of the Fraser River extending from about 1 km upstream to 1 km downstream of the existing Pattullo Bridge. Upstream, this corresponds to the downstream end of Sapperton Bar. Downstream, this roughly corresponds to Tannery Road on the Surrey Side and Fourth Street on the New Westminster side.</p> <p>On the Fraser River banks, the LSA extends to the Higher High Water Level (HHWL) – large tide along</p>                                                                                                                                                                                        | <p><u>Fraser River</u></p> <p>Within the Fraser River, the RSA boundary corresponds to the RSA boundary of the Fraser River Hydraulics and Morphology IC.</p> <p><u>Uplands</u></p> <p>The RSA is not applicable for upland areas, because watercourses within the LSA discharge to the Fraser River within the LSA.</p>                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Pillar, VC and IC        | Local Study Area Boundary                                                                                                                                                                                                                                                                                                               | Regional Study Area Boundary                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          | <p>the reach of the Fraser River defined above.</p> <p><u>Uplands</u></p> <p>The LSA extends upland to surface water courses where they discharge into the Fraser River and within an approximately 30 m buffer around the proposed Project Boundary on both the Surrey and New Westminster banks.</p>                                  |                                                                                                                                                                                                                                                                                                                                                                                             |
| Noise and Vibration (IC) | <p>500 m from the extent of the Reference Concept over land and 1,500 m over water.</p> <p>These boundaries are consistent with Health Canada (2017), World Health Organization guideline (1995), 2014 MoTI noise policy, and VFPA noise guidelines (2015), for assessment of potential noise effects on noise sensitive receptors.</p> | The RSA is not applicable, because any potential impacts to noise-sensitive locations within the acoustic zone of influence of the proposed Project are anticipated to be highly localized and within the LSA.                                                                                                                                                                              |
| Air Quality (IC)         | 500 m buffer from the extent of the Reference Concept. Air quality impacts are expected to be highly localized.                                                                                                                                                                                                                         | Traffic modelling is being undertaken based on a no-toll scenario (i.e. no tolls on the new bridge or any other bridge in the region). The RSA <b>consists of the area covered by the regional traffic modelling undertaken for the study.</b>                                                                                                                                              |
| <b>Economic Pillar</b>   |                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                             |
| Economic Activity (VC)   | 500 m from the Project Boundary, to capture areas that may experience direct adverse economic effects from the proposed Project (e.g., changes in access, visibility of businesses, noise and vibration).                                                                                                                               | The RSA includes the Cities of New Westminster and Surrey, where indirect adverse effects from the Project may occur. The Project is expected to have broad social and economic implications for all of Metro Vancouver and beyond, mainly through Project benefits relating to employment, time savings, increased safety, and better access for both motorized and non-motorized traffic. |
| <b>Social Pillar</b>     |                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                             |

| Pillar, VC and IC | Local Study Area Boundary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Regional Study Area Boundary                                                                                                                                                                                                                                                         |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Marine Use (VC)   | <p>Waterway and foreshore area covering 1 km upstream from existing Pattullo Bridge through Lower South Arm of the Fraser River and downstream to Sands Head – with a focus on 1 km upstream and 1 km downstream of the Project. Includes the in-water construction and demolition areas of the Project Boundary, including staging areas and spatial extent of construction-related marine vessel traffic, as well as fish and fish habitat, river hydraulics and morphology, visual quality, air quality, and noise and vibration LSAs.</p>                                                                                                                                                                                                                                                                                                                                                          | <p>The LSA plus 6 km upstream of the Pattullo Bridge, which encompasses the fish and fish habitat, river hydraulics and morphology, visual quality, air quality, and noise RSAs.</p>                                                                                                 |
| Land Use (VC)     | <p>LSA boundaries were selected to represent the spatial extent to which the Project is likely to interact with planned and existing land uses through direct effects from the Project (e.g. land acquisition and disposal for Project infrastructure and rights-of-way, changes in noise and other nuisance factors, changes in access for motor vehicles and pedestrian/ cycling traffic, and changes in traffic patterns resulting from individual structural components of the Project).</p> <p>The LSA includes the Project Boundary and surrounding neighbourhoods in accordance with the following Census Area boundaries:</p> <ul style="list-style-type: none"> <li>• In New Westminster: the eastern part of Downtown New Westminster (Census Tract #207), part of the Queen's Park and Glenbrooke North neighbourhoods (Census Tract #208), and the Glenbrooke South and Victory</li> </ul> | <p>The RSA includes all areas within the Cities of Surrey and New Westminster.</p> <p>The RSA boundaries are intended to capture areas that may experience indirect adverse Project effects on land uses through broader changes in traffic patterns resulting from the Project.</p> |



| Pillar, VC and IC       | Local Study Area Boundary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Regional Study Area Boundary                                                                                                                                                                                                               |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         | <p>Heights neighbourhoods (Census Tract #209)</p> <p>In Surrey: the Bridgeview and South Westminster neighbourhoods (Census Tract #192).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                            |
| Community Cohesion (VC) | <p>The LSA includes the proposed Project design footprint and the surrounding neighbourhoods following Census Area boundaries: New Westminster – the eastern portion of Downtown New Westminster (Census Tract #207), part of the Queen’s Park neighbourhood and Glenbrooke North neighbourhood (Census Tract #208) and the Glenbrooke South neighbourhood (Census Tract #209). Surrey – the Bridgeview neighbourhood and the South Westminster neighbourhood (Census Tract #192).</p> <p>The LSA boundary was selected to represent the spatial extent to which the Project is likely to interact with community cohesion through direct effects on:</p> <ul style="list-style-type: none"> <li>▪ neighbourhood connectivity infrastructure such as roads, sidewalks, and paths from Project construction disturbance and through bridge access/exit ramps from Project operations affecting traffic patterns near the Project; and</li> <li>▪ social equity through Project effects that may be experienced predominantly or disproportionately in LSA neighbourhoods that are more vulnerable and less resilient to those effects (e.g. construction noise,</li> </ul> | <p>The RSA includes the cities of Surrey and New Westminster. The RSA boundary is intended to capture areas that may be subject to indirect adverse Project effects on community cohesion through broader changes in traffic patterns.</p> |

| Pillar, VC and IC       | Local Study Area Boundary                                                                                                                                                                                                                                                                                                                                                                                   | Regional Study Area Boundary                                                                                                                                                                                                                                                                                    |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         | vibration and access disturbance).                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                 |
| Visual Quality (VC)     | 5 km spatial buffer from the Project Boundary. Includes potential public viewing locations within New Westminster and Surrey that represent residential, transportation, and recreational land-use settings and locations of interest to Aboriginal groups. These locations are within viewing distances that generally allow for a discernible level of visual detail to be perceived by viewers.          | 10 km spatial buffer from the Project Boundary. Provides a regional landscape context within Metro Vancouver. The extent of the RSA represents viewing distances where the perception of visual detail is less discernible by viewers and more frequently affected by atmospheric conditions (e.g., fog, haze). |
| Lighting (IC)           | 5 km spatial buffer from the Project Boundary. Includes potential public viewing locations within New Westminster and Surrey that represent residential, transportation, and recreational land-use settings and locations of interest to Aboriginal groups. These locations are within viewing distances that generally allow for a discernible level of visual detail to be perceived by viewers at night. | The RSA is not applicable because of the existing level of lighting within Metro Vancouver; that is any potential impacts of lighting are expected to be limited to the LSA                                                                                                                                     |
| Shading (IC)            | 1 km spatial buffer from the Project Boundary. Includes an area adequate to evaluate the length of the shadows during key periods throughout the year with the longest shadow.                                                                                                                                                                                                                              | The RSA is not applicable because any potential impacts to shading beyond the LSA distance is expected to be minimal; shadows are expected to dissipate before reaching residential or public areas beyond the LSA.                                                                                             |
| <b>Heritage Pillar</b>  |                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                 |
| Heritage Resources (VC) | Defined by the limits of the Archaeological/Historical Heritage Investigation Permit. The permit boundary captures the Reference Concept, with a 50 m wide buffer added to the permit boundary to allow for design uncertainty (and possible expansion of the footprint).                                                                                                                                   | 1 km wide zone around the outside of the LSA boundary. The RSA is intended to include the larger regional area in which archaeological values are entrenched as part of ancient and modern networks respectively.                                                                                               |

| Pillar, VC and IC                          | Local Study Area Boundary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Regional Study Area Boundary                                                                             |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Health Pillar</b>                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          |
| Physical Determinants of Human Health (VC) | Corresponds to the boundary that is formed by summing the LSA boundary of the Air Quality and Noise and Vibration ICs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | An RSA is not applicable (see Air Quality IC and Atmospheric Noise IC spatial boundaries and rationale). |
| Social Determinants of Human Health (VC)   | <p>Corresponds to the larger LSA boundary of the Community Cohesion VC encompassing the proposed Project design footprint, plus the surrounding neighbourhoods following Census Area boundaries:</p> <ul style="list-style-type: none"> <li>▪ <u>New Westminster</u> – the eastern portion of Downtown New Westminster (Census Tract #207), part of the Queen’s Park neighbourhood and Glenbrooke North neighbourhood (Census Tract #208) and the Glenbrooke South neighbourhood (Census Tract #209).</li> <li>▪ <u>Surrey</u> – the Bridgeview neighbourhood and the South Westminster neighbourhood (Census Tract #192).</li> </ul> | The RSA includes the cities of Surrey and New Westminster.                                               |

## **6.0 CONCLUSION**

This document provides the rationale for the proposed Project VCs and ICs for the EA process. It is anticipated that the final VCs/ICs and indicators will be further refined through the Advisory Working Group and Aboriginal and public consultation processes, to arrive at an approved Application Information Requirements. Any changes made to pre-approved VCs/ICs will be vetted by EAO and, if acceptable, will be implemented and documented in the Application.

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## APPENDICES

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## **Appendix A1**

### **VC and IC Spatial Study Area Boundaries**

**See Appendix 18.3 of this document**

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