



Ministry of  
Transportation  
and Infrastructure

# Pattullo Bridge Replacement Project

## Business Case

January 2018

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## EXECUTIVE SUMMARY

The existing Pattullo Bridge, which spans the Fraser River between the City of Surrey and the City of New Westminster, was built in 1937 and is near the end of its useful life. It is vulnerable to seismic events and high winds, marine collisions and river scour. The bridge does not meet current roadway design guidelines, including lane widths and road curvatures.

This Business Case recommends the implementation of the Pattullo Bridge Replacement Project (the Project), which includes a new, four-lane bridge that meets current seismic and road design standards, and provides a safe and reliable crossing for vehicles, pedestrians and cyclists, network connections in Surrey and New Westminster and the removal of the existing bridge. The new bridge with key road connections in New Westminster and Surrey will be in place in 2023.

The new four-lane bridge will be designed in a manner to not preclude a potential future expansion to six lanes. Further approvals and technical work will be required to determine the broader road network improvements needed to support any potential future expansion of the bridge.

The Project represents a significant investment in multi-modal transportation mobility improvements and supports provincial and regional strategies, environmental objectives, and the economic development of transportation services in the region. This Business Case establishes the need and rationale for investing in the Project, along with the context that drives the urgent need to replace this important link in the regional transportation network.

This Business Case recommends proceeding with the Project at an estimated total cost of \$1.377 billion.

## INVESTMENT NEED

The Pattullo Bridge is an important element of the transportation network in Metro Vancouver. The bridge provides a critical transportation link for local and regional transportation and is an important component of the Asia-Pacific Gateway goods movement network, serving local, regional and national needs.

The challenges associated with the aging existing bridge include a delaminating deck; river scour around the foundations; piers not designed to withstand significant collisions with marine vessels; seismic and wind load thresholds that do not meet current standards for new structures; horizontal curves, travel lanes and sidewalk widths that do not meet current standards for new structures; and the absence of safety features such as median barriers and shoulders.

A regular maintenance program has extended its lifespan, but escalating efforts to prolong its use are no longer cost effective. An assessment of maintenance needs has revealed that upgrading the bridge to meet modern safety standards would be extremely challenging, both technically and financially.

## THE PROJECT

Efforts to identify a solution for the aging Pattullo Bridge have been underway since 2006. Between 2012 and 2014, a comprehensive joint technical Strategic Review Process (the Strategic Review) was led by TransLink 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. As a result of this work, replacement of the bridge was determined to be the most viable solution.

Three general goals guide the Project:

- **Provide a structurally sound bridge crossing** to maintain a critical local and regional connection;
- **Improve safety for all users** with modern lane widths, road curvature, centre median and separated pedestrian/cyclist facilities; and
- **Improve connectivity, reliability and modal choice** while supporting environmental objectives.

In June 2014, the Mayors' Council on Regional Transportation (Mayors' Council) confirmed the region's preferred solution to replace the existing structure in its *Vision for Regional Transportation for Metro Vancouver*. The Mayors' Council determined that the replacement bridge should be a new, four-lane bridge, designed in a manner to not preclude potential future expansion to six lanes. On January 25, 2018 the Mayors' Council unanimously reaffirmed its support for the Project.

## SCOPE OF THE PROJECT

The Pattullo Bridge is planned to be replaced with a new four-lane bridge. The scope of the Project is as follows:

- A safer crossing with modern lane widths to accommodate standard passenger and commercial vehicles sizes, separated by a centre median to ensure improved safety for all bridge users;
- Pedestrian and cyclist facilities, separated from traffic on both sides of the bridge;
- Network connections to New Westminster and Surrey; and
- Removal of the existing aging structure.

The Project will be designed to meet modern seismic, structural, and roadway geometry standards. It will improve safety for drivers, cyclists and pedestrians.

## BENEFITS FOR THE PROVINCE AND REGION

The Project provides a number of benefits to the region and the local communities. With a benefit-cost ratio (BCR) of 2.01, this Project fulfills the requirement to provide a new, four-lane bridge, which will meet modern seismic and road geometry standards for a safer and more reliable crossing. The improved cycling and pedestrian facilities will make active travel on and around the bridge safer.



**Table 1: Summary MAE and BCR Table (NPV 2017)**

MAE Account (Incremental to the Base Case)	Project
Customer Service	●
Economic Development	●
Environment	○
Social and Community	●
<b>Total Net Benefits (NPV, \$M)</b>	<b>523</b>
Capital Costs (NPV, \$M)	
Maintenance/Rehab	
Salvage	
Base Case	
<b>Total Net Costs (NPV, \$M)</b>	<b>260</b>
<b>Benefit/Cost Ratio</b>	<b>2.01</b>
<p>● Significantly worse   ● Somewhat worse   ○ Neutral (same as Base Case)</p> <p>● Somewhat better   ● Significantly better</p>	

## PROCUREMENT ASSESSMENT AND PROJECT DELIVERY

A number of delivery models were assessed to identify the best model for the project. Detailed qualitative and quantitative assessment of delivery models was undertaken to identify a model that offers the greatest value for money, manages risks effectively and allows for the Project to be delivered quickly and efficiently. This assessment identified the Design-Build-Finance (DBF) model as the preferred model to most comprehensively:

- Manage and mitigate the key Project risks;
- Maximize cost and schedule certainty; and
- Provide value for money.

The value for money achieved using a DBF model is estimated to be \$41 million, or 3.57 per cent compared to the Public Sector Comparator (PSC) of Design-Build (DB).

TransLink led the Project through the conceptual development and planning phases. The Province will deliver the Project.

Work is underway to develop a new provincial community benefits policy framework. The new policy will be implemented as part of the Project.

The recommended competitive selection process for the Project will follow a two-stage approach: a Request for Qualifications (RFQ) followed by a Request for Proposals (RFP). The expected timeline for the Project, including procurement activities, is outlined in Table 2.

**Table 2: Project Timeline**

Timeline	Activities
Spring 2018	Issue RFQ
Summer 2018	Issue RFP
Summer 2019	Award contract
2019 to 2023	Design and construction
2023	New bridge in service
2023/24	Existing bridge removal

## FUNDING

The total cost of the Project, including procurement, project management, construction, removal of the existing bridge, and interest during construction is estimated at \$1.377 billion. The Project will be funded through Provincial debt and short-term private financing, which will be provided by the successful DBF contractor during construction and repaid upon removal of the existing bridge.

**Table 3: Provincial Debt**

(Nominal \$ millions)

Provincial debt	(\$M)
Provincial borrowings (during construction)	\$1,077
Private Finance - DBF contractor (repaid after construction)	\$300
<b>Total Provincial debt (on completion)</b>	<b>\$1,377</b>

An application for Federal grant funding of approximately \_\_\_\_\_ from the National Trade Corridor Fund has been submitted. As the application is currently under review, the Business Case does not assume any federal funding. If received, federal contributions would reduce the Provincial funding required for the Project.

## 1 PURPOSE AND APPROACH

### 1.1 PURPOSE

This Business Case establishes the need to invest in replacing the Pattullo Bridge and improving the Pattullo Bridge corridor, and describes how the Project will contribute to provincial and regional objectives and strategies to improve transportation infrastructure in Metro Vancouver.

The main purpose of this Business Case is to:

- Demonstrate the need and provide background information with respect to the Project;
- Describe in detail the planning process and recommended project scope to meet the need;
- Describe in detail the procurement analysis conducted for the Project; and
- Recommend a procurement approach and implementation strategy.

This Business Case is intended to provide information and analysis to inform decisions on the Project.

### 1.2 APPROACH

The document consists of the following five main sections:

**Part A - Rationale for the Project:** Describes the need for the new bridge and improved community connections based on current and forecasted traffic demands, community improvements, and regional plans. This includes a description of the strategic context and an overview of the Project.

**Part B - Delivery of the Project:** Describes the physical project elements through the development of a reference concept, and estimates the costs that will be incurred to implement these recommendations.

**Part C - Procurement Delivery Model Options Analysis:** Analyzes and compares the procurement methods considered. This section uses qualitative and quantitative analysis based on the results of financial modeling, risk quantification, risk analysis, and a Multiple Criteria Analysis (MCA) of the procurement options, to ensure the Project goals and procurement objectives are satisfied.

**Part D - Procurement Plan and Funding:** Identifies funding sources and recommends the preferred procurement process. Part D also includes the procurement plan, schedule and budget.

**Part E - Recommendation:** Presents the specific recommendation to proceed with this Project.

## PART A – RATIONALE FOR THE PROJECT

This section of the Business Case describes the need for the Project. The discussion highlights key aspects of the Project, and how planned improvements will address the challenges.

## 2 STRATEGIC CONTEXT

### 2.1 METRO VANCOUVER

Metro Vancouver is one of Canada's most diverse and livable regions, with vibrant communities and an internationally recognized high quality of life. It is the third-largest urban area in Canada, with 2.3 million residents and 1.3 million jobs across a diverse economy. Metro Vancouver is expected to welcome one million additional residents over the next 30 years, adding 500,000 jobs and three million more passenger trips every day.

The location of Metro Vancouver makes it an ideal centre for international trade, connecting British Columbia and Canada with the United States, Asia and the rest of the world. The Metro Vancouver region plays a critical role as one of Canada's Pacific Gateways, connecting international port terminals in Roberts Bank and Burrard Inlet with the country's national road and rail transportation corridors, and providing critical transportation networks that connect Canada's economy to Asia-Pacific trading partners. Gateway-related goods movement is forecast to grow and drive the regional, provincial and national economies, increasing the need for a reliable and efficient regional transportation network. The Pattullo corridor is a key component of this transportation network.

Transportation planning in the Metro Vancouver region is guided by a number of overarching strategies, including Metro Vancouver's *Metro Vancouver 2040 (Regional Growth Strategy, RGS)* and TransLink's *Regional Transportation Strategy (RTS)* and *Moving the Economy: A Regional Goods Movement Strategy for Metro Vancouver (RGMS)*. These regional strategies seek to balance social, economic, and environmental objectives and address challenges common to urban regions. Metro Vancouver's role as one of Canada's Pacific Gateways amplifies the challenges of balancing livability with providing a transportation system that not only supports local residents and businesses, but also supports a growing volume of trips passing through the region to markets beyond our borders.

### 2.2 PATTULLO CORRIDOR AND CONNECTIONS

The central location of the bridge makes it a vital link in the regional transportation network for people, goods and services. Before tolls were removed from the Port Mann and Golden Ears Bridges, the bridge carried, on average, 77,000 vehicles per day, approximately seven per cent of which were trucks. Since the tolls were removed, traffic counts are showing an approximate 12 percent reduction in average daily traffic (approximately 68,000 vehicles per day) in the month of September 2017 over September 2016. The Pattullo corridor connects King George Boulevard, Scott Road and, indirectly, Highway 17 in Surrey with McBride Boulevard, Columbia Street and Royal Avenue in New Westminster.

#### 2.2.1 Linking Metro Vancouver Communities

The Pattullo corridor is critical for local travel between two city centres on either side of the Fraser River: New Westminster and Surrey.

**Figure 1 - Existing Pattullo Bridge Corridor**



Surrey is a rapidly expanding city experiencing significant growth in commercial, institutional and large format retail centered primarily around a new and growing city centre, as well as industrial growth, much of it related to the port economy. Close to the bridge head, a new health and technology hub is planned in proximity to Surrey Memorial Hospital. With a growing population of over 500,000 people, Surrey is recognized as the fastest growing city on Canada's west coast. Widespread single and multi-family development is occurring across the city, increasing the need for reliable regional transportation.

**Figure 2: Downtown Surrey**



The City of New Westminster is home to approximately 70,000 residents and is centrally located within Metro Vancouver with excellent rapid transit access. As an established community with traditional single-family homes and recent high density, sustainable transit-oriented developments, the City of New



Westminster's key considerations regarding the new bridge are that it supports existing economic activity and facilitates redevelopment while preserving community livability goals. Significant commercial and industrial development happening on both sides of the city (Queensborough and Brunette areas) are creating more demand for better transportation links through and in and out of New Westminster. Ensuring good access to the Royal Columbian Hospital, close to the Pattullo Bridge and Highway 1, is also a priority.

**Figure 3: New Westminster Boardwalk**



### **2.2.2 Service to Major Gateways**

The Pattullo corridor connects provincial and regional routes with municipalities north and south of the Fraser River. The corridor also supports Metro Vancouver's role as one of Canada's Asia Pacific Gateways by linking key Regional Activity Centres with Gateway/International Activity Centres. It provides a direct connection between industrial lands in New Westminster and Surrey.

The existing Pattullo Bridge is identified as a transportation network priority in a number of strategic plans, including the Gateway Transportation Collaboration Forum's *Greater Vancouver Gateway 2030* report. In combination with Highway 17, it also provides important goods movement and trade linkages between Roberts Bank Terminal, the Fraser River Trade Area and the adjacent communities.

Of the one million heavy trucks that cross the bridge each year, 45 to 50 per cent of them are transporting goods for the Asia-Pacific Gateway. Figure 4 highlights the relative volume and proportion of heavy trucks on major corridors in Metro Vancouver.

**Figure 4: Proportion of Heavy Truck Trips by Freight Market Sector in Metro Vancouver**



## 2.3 PROVINCE OF BRITISH COLUMBIA

The Province has identified a number of key strategic initiatives to **make life more affordable, improve services, and create good jobs and a sustainable economy** for residents of BC. The Project is aligned with these initiatives.

Transportation investments generate immediate employment, underpin ongoing job creation and promote economic development by providing people with better access jobs and enabling goods and services to be delivered more efficiently.

In addition, the transportation sector plays an important role in B.C.'s economy. A 2016 study by the Conference Board of Canada identified transportation and warehousing as the most concentrated industrial cluster in the Metro Vancouver area relative to the rest of Canada. According to the Economic Impact Analysis produced for the Vancouver Gateway Council in 2017, the sector is growing at rates exceeding the national average and has created more than 30,000 jobs in Metro Vancouver in the last 25 years.



## 2.4 PATTULLO BRIDGE REPLACEMENT PROJECT

### 2.4.1 Project Drivers

The 80-year-old Pattullo Bridge does not comply with modern design standards and would be at risk in the event of a moderate earthquake, ship collision or high wind event. Its piers are at risk of being undermined by river scour and many bridge components have surpassed their useful lives. Existing facilities, such as sidewalks, barriers, and connections for pedestrians and cyclists, do not provide the level of protection from traffic that a newer facility would provide. The following table summarizes key project drivers:

**Table 4: Project Drivers**

Project Drivers	Description
Seismic and ship collision issues	<ul style="list-style-type: none"> <li>The aging bridge does not meet current seismic standards and would be at risk in the event of a moderate earthquake.</li> <li>The bridge is vulnerable to damage from a potential ship collision with its structural supports.</li> <li>An assessment of rehabilitation needs revealed that upgrading the bridge to meet modern seismic standards would be technically infeasible and cost prohibitive.</li> </ul>
User safety and sub-optimal design standards	<ul style="list-style-type: none"> <li>The bridge does not meet current roadway design guidelines for lane widths and curvature.</li> <li>To mitigate impacts of narrow lanes, centre lanes are closed at night when vehicle collision risks are highest.</li> <li>The bridge does not meet modern wind load design standards.</li> <li>The piers are at risk of being undermined by river scour.</li> </ul>
Pedestrian/cycling issues	<ul style="list-style-type: none"> <li>Bridge facilities, such as sidewalks, barriers, and connections for pedestrians and cyclists, do not provide the level of protection from traffic that a newer facility would provide.</li> </ul>
Unreliable travel times	<ul style="list-style-type: none"> <li>During rush hours, travel demand on the roads leading to the bridge results in queuing and unreliable travel times for the movement of people, goods and services.</li> <li>Large trucks straddle the lanes, reducing available capacity.</li> </ul>
Community impacts	<ul style="list-style-type: none"> <li>Current traffic volumes (including truck volumes) and related congestion and neighbourhood traffic infiltration adversely affect the livability of adjacent communities due to air quality, noise and resulting health impacts.</li> </ul>
Ongoing maintenance and repairs	<ul style="list-style-type: none"> <li>Many bridge components have surpassed their useful lifespan and are in need of replacement or major rehabilitation.</li> </ul>

Project Drivers	Description
	<ul style="list-style-type: none"> <li>An assessment of rehabilitation needs revealed that rehabilitating the existing structure would be financially prohibitive and ineffective in addressing the aforementioned issues.</li> </ul>

## 2.4.2 Project Goals

From this list of project drivers, a set of three overarching goals were developed for the Project. These goals served to guide the design development:

- **Provide a structurally sound bridge crossing** to maintain a critical local and regional connection;
- **Improve safety for all users** with modern lane widths and road curvature, a centre median and separated pedestrian and cyclist facilities; and
- **Improve connectivity, reliability and modal choice** while supporting environmental objectives.

## 2.4.3 Project Objectives

The Project supports the following objectives:

- Provide a river crossing for all modes that is structurally sound, and meets current standards for withstanding seismic and ship impacts;
- Support local and regional land use plans and economic development;
- Provide reliable access and predictable travel times for all modes;
- Minimize single-occupancy vehicle use and vehicle kilometers travelled;
- Move toward the regional goal that, by 2040, half of all trips will be by walking, cycling or transit;
- Minimize emissions of greenhouse gases and pollutants;
- Minimize impacts to the natural environment; and
- Support neighbourhood livability by minimizing and mitigating impacts, including during construction.

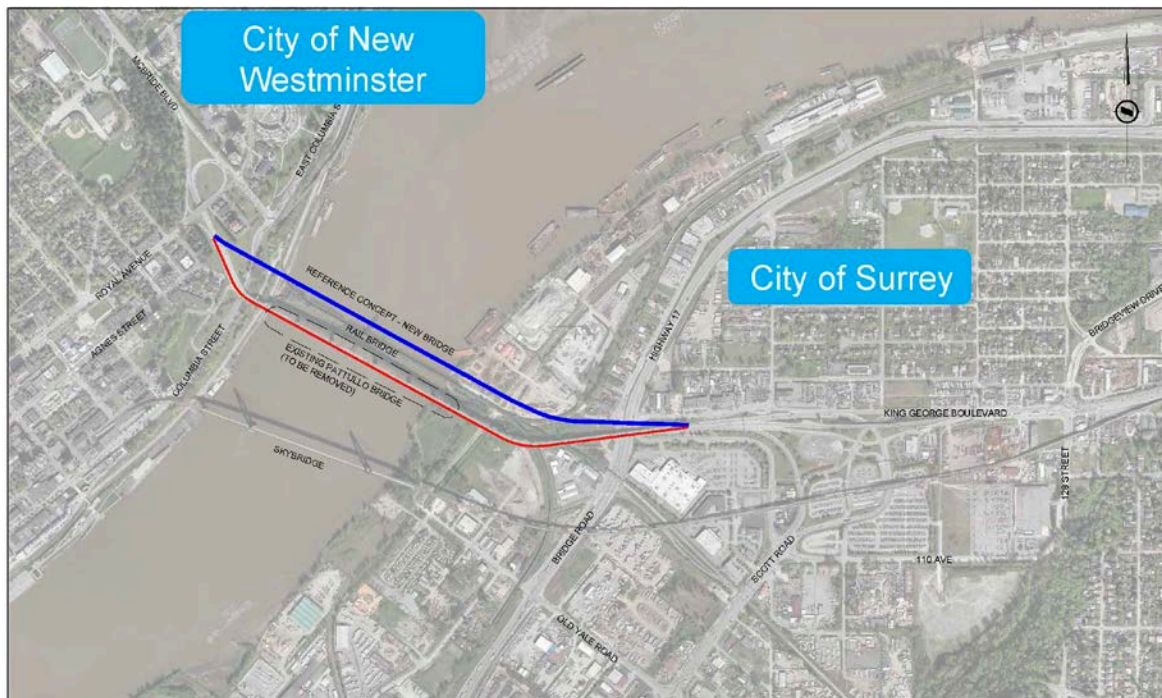
## 2.4.4 Key Project Elements

To address these objectives, the Project will replace the existing aging bridge with a new, four-lane bridge. The Project will provide:

- A safer crossing with modern lane widths to accommodate standard passenger and commercial vehicles sizes, separated by a centre median to ensure improved safety for all bridge users;
- Pedestrian and cyclist facilities on both sides of the bridge, separated from traffic;
- Network connections to New Westminster and Surrey; and
- Removal of the existing structure.

The Project will be located just north and upstream of the existing bridge and continue to link the communities of New Westminster and Surrey (see Figure 5). This will allow the new bridge to optimize the use of existing road infrastructure and established travel patterns, and improve connections to Highway 17. Constructing the bridge in parallel to the existing bridge will also allow the continuous operation of the old bridge until the new one is open.

**Figure 5: Location of the New Bridge**



#### **2.4.5 Key Project Milestones**

The Project is currently undergoing a review by the BC Environmental Assessment Office and the Vancouver Fraser Port Authority through a harmonized provincial Environmental Assessment (EA) and Port Project Environmental Review (PER). This review is anticipated to be completed in late 2018. The new four-lane bridge and road connections are included in the scope of the EA to ensure that the impacts of all planned project elements are studied.

### 3 EXISTING CHALLENGES

#### 3.1 PHYSICAL CONDITION

##### 3.1.1 Existing Bridge – Structural

The Pattullo Bridge was designed based on the 1929 Canadian Engineering Standards Association design code. While the bridge is inspected regularly to ensure it remains functional, it does not meet the current design standards for a new bridge built today:

- The absence of safety features such as median barriers and shoulders;
- Horizontal curves, travel lanes and sidewalk widths that do not meet current standards for new structures;
- Delaminating deck;
- River scour around the foundations;
- Piers not designed to withstand collisions with marine vessels; and
- Seismic and wind load thresholds that do not meet current standards for new structures.

A regular maintenance regime has extended its lifespan, but escalating efforts to prolong its use are no longer cost effective. An assessment of maintenance needs has revealed that upgrading the bridge to meet modern standards would be extremely challenging, both technically and financially.

##### 3.1.2 Existing Bridge - Lane Widths

The current bridge was originally constructed as a two-lane crossing and is now configured for four lanes. Each lane is 2.9 to 3.0 metres in width, significantly narrower than the current Transportation Association of Canada (TAC) standard of 3.5 to 3.7 metre lane widths for straight sections of road, with additional width required on curves. Commercial vehicles often straddle two lanes in order to safely use the bridge, which reduces bridge capacity, impeding the flow of other vehicles, and increases driver workload when crossing the bridge.

The current bridge deck is not wide enough to accommodate a centre median. For safety reasons, current practice has the centre lanes closed at nighttime when the risk of a collision is greatest. While this has reduced the number of nighttime accidents on the bridge, such closures are not a viable long-term solution.

As shown in Figure 6, narrow lane widths combined with heavy traffic volumes frequently lead to extended bridge closures during incidents.

**Figure 6: Sub-optimal Design Standards on the Existing Pattullo Bridge**



### 3.1.3 Existing Bridge- Condition and Maintenance

The existing structure has a number of age-related and design standard-related challenges, resulting in increased maintenance and repair costs. In 2015, the rehabilitation design process revealed that the existing bridge structure should not be considered viable as a long term solution, from a financial and risk management perspective.

In September 2015, an essential rehabilitation program focused on deck repairs was approved. This rehabilitation program extended the operational lifespan of the bridge by seven to ten years, by which time a replacement bridge would be open (in 2023). At the same time, procurement readiness activities for the Project were started in an expedited manner.

In 2016, the essential rehabilitation program focused on essential deck repairs to address concrete delamination was completed. Crews repaired 1,180 square metres of bridge deck, with 67 full-depth repairs.

The scope involved rehabilitation of the deck that included the following:

- Removing existing asphalt and concrete deck to the top of rebar;
- Surveying the deck on site to identify zones for partial depth repairs;
- Removing delaminated concrete in designated zones;
- Performing full depth repairs where needed;
- Cleaning, repairing, and/or replacing damaged or corroded reinforcement;
- Placing concrete overlay to elevation of top of present asphalt; and
- Reinstating all lane markings and center delineators.

Figure 7 below shows the bridge deck before repairs were made.



**Figure 7: Pattullo Bridge Deck Condition Before Repairs**



During the rehabilitation work, the bridge was reduced to one lane in each direction to create a safe work zone for the work crews. Pedestrians, cyclists and large trucks were allowed to use the bridge. The bridge speed limit was posted at 30 kilometres per hour. Full overnight and weekend closures were required.

The Deck Rehabilitation Project addressed the most urgent deck delamination risk on the existing bridge. The risk of full-depth failures (small deep potholes due to delamination) on the south approach spans will continue to be mitigated through frequent and detailed inspections. Should such potholes materialize, the bridge may need to be temporarily closed for emergency repairs.

### **3.1.4 Connecting Road Network**

In addition to sub-standard bridge structure elements, the narrow cross section of the bridge deck also introduces a poor transition between the bridge approaches where the travel lanes are more generous in width. The existing on- and off-ramps on the New Westminster side are also narrow, which causes significant speed differential between vehicles approaching the ramps, merging on to or off of the ramps, and using the ramps, making this portion of the bridge more collision prone.

The East Columbia Street on-ramp for the bridge is closed daily during the PM peak period as the merging conditions from the ramp onto the bridge are unsafe and sub-standard, making it difficult for drivers to negotiate the ramp and find an adequate gap between vehicles to join the bridge traffic. The daily closure of this ramp causes traffic to infiltrate the residential neighbourhoods as drivers look for short-cuts around the long queues on local roads.

### **3.1.5 Pedestrian and Cyclist Facilities**

The pedestrian and cyclist facilities on the existing bridge do not meet current TAC standards, nor do they meet current urban design guidelines. As the only Fraser River crossing for the BC Parkway (a 26-km multi-use path that roughly parallels the Expo SkyTrain Line, connecting Surrey City Centre, New Westminster, South Burnaby and Vancouver), and a critical pedestrian and cyclist link between the communities north and south of the Fraser, improving the on-bridge facilities is important for

encouraging walking and cycling in the region. A 2002 study by Urban Systems on the bridge bicycle safety and access identified the following issues:

- Lack of barriers between the roadway and sidewalk;
- Narrow width of sidewalk to accommodate multi-modal use;
- Limited sight distance; and
- Intrusions/obstructions on bridge sidewalk and its approaches.

Off the bridge deck there are also a number of issues with pedestrian and cyclist safety. In New Westminister, the primary areas of concern are related to how the bridge head and connecting roads divide the community without adequate facilities to walk and cycle between the Victoria Hill neighbourhood and downtown New Westminister. The current conditions make walking and cycling undesirable for all users.

In Surrey, the primary areas of concern are related to indirect connections between the BC Parkway and the Scott Road SkyTrain Station, and between the Bridgeview neighbourhood (both residential and industrial) and Scott Road SkyTrain Station.

## **3.2 ACCESS AND TRAVEL TIME CHALLENGES**

### **3.2.1 Travel Time Challenges**

The narrow lanes and the sub-standard geometry on the existing bridge reduce the traffic capacity on the bridge due to slower traveling speeds and lane straddling. Traffic counts have shown that the maximum throughput of the existing bridge, which is the maximum amount of traffic able to cross the bridge in each direction, is approximately 3100 to 3200 vehicles per hour (vph). A modern four-lane bridge with standard lane widths and design should have a throughput in the range 3500 to 3600 vph.

To mitigate impacts of the existing narrow lanes, the centre lanes are also now closed at night when vehicle collision risks are highest. In New Westminister, the on-ramp from westbound Columbia Street to the bridge is closed during the afternoon/evening peak period due to concerns with the merge onto the bridge. The daily closure of this ramp causes additional traffic to infiltrate the surrounding residential neighbourhoods.

Unreliable access and unpredictable travel times also affect goods movement and the overall economy. The existing bridge is cited by truck drivers as one of the top congestion hotspots for heavy trucks in the region. This is consistent with general observations of queueing leading to the bridge in Surrey on King George Boulevard and Scott Road in the morning peak period, and on Royal Avenue and McBride Boulevard in the afternoon/evening peak period.

### **3.2.2 Local Road Network Connectivity Deficiencies**

As part of the Project, the connections to the road network on each side of the bridge were studied. Based on this examination, the following deficiencies were noted with the existing configurations and operations in New Westminister and Surrey.

## **New Westminster**

Currently, the bridge connects directly to McBride Boulevard, with some level of connectivity to and from East Columbia Street and Royal Avenue. The connectivity to East Columbia Street is indirect in the northbound to eastbound movement and as such, the required routing involves traversing a section of lower McBride Boulevard between Royal Avenue and Columbia Street. The connectivity from East Columbia Street in the westbound to southbound movement is indirect during the afternoon peak period when the direct ramp from East Columbia Street to the bridge is closed. The current route to accomplish this movement involves Braid Street, 8<sup>th</sup> Avenue, and McBride Boulevard.

## **Surrey**

In Surrey, the bridge connects directly to King George Boulevard and Scott Road, with Scott Road connecting with the King George Boulevard approach. No direct connections are provided between the existing bridge and Highway 17, a major east-west corridor in the region that links the major Fraser River crossings. To travel between the regional river crossing and the provincial highway facility, municipal routes must be used.

### **3.3 COMMUNITY LIVABILITY CHALLENGES**

Formal consultation with the public and the cities of Surrey and New Westminster identified the following community livability challenges:

- Traffic congestion on local roads;
- Use of local roads by regional through-traffic, particularly trucks;
- Inadequate pedestrian and cyclist connectivity; and
- Pedestrian and cyclist facilities on the bridge itself that do not meet today's standards.

The current bridge is located within the highly urbanized New Westminster and Surrey communities, and connects the arterial roads between the two cities (primarily King George Boulevard and McBride Boulevard). During rush hours, the movement of people, goods and services is constrained by congestion and unreliable travel times, causing increased traffic infiltration onto local and residential roads. This affects the livability of adjacent communities through added noise and emissions, and inhibits local access to residences and businesses.

Insufficient pedestrian and cyclist facilities hinder the use of active transportation modes, thus affecting the health and wellbeing of local residents and employees, and do not support regional goals and objectives.



### 3.4 CAPITAL INVESTMENT NEED

A significant number of studies have been undertaken, including detailed analysis since 2012, to review and validate the economic, social, and environmental need for a long-term crossing solution. Given the current deficiencies with the seismic resiliency, existing bridge geometries, structure condition, conditions for traffic, pedestrians and cyclists, reliability and community livability, capital investment is needed. The Ministry of Transportation and Infrastructure (the Ministry) and TransLink have assessed a number of connection options to address the above-noted needs. These are discussed in Section 4.

## 4 ASSESSMENT OF OPTIONS

The assessment of options for the Project included a review of options for bridge replacement as well as options for network connections on each side of the Fraser River. Full details of the assessment and selection of options can be found in the report, *Strategic Options Analysis*.

### 4.1 OPTIONS FOR BRIDGE REPLACEMENT

The Ministry, TransLink, the City of Surrey, and the City of New Westminster have explored more than 25 alternatives to rehabilitate or replace the existing Pattullo Bridge, encompassing alternative routes, number of bridge lanes, and community connections. A Pattullo Bridge Strategic Review Process (Strategic Review) was conducted from 2012-2014 to examine and assess these options through broad consultation and technical review.

The public and stakeholders provided input through an extensive public consultation process. The following options were examined at the existing alignment:

- Remove and do not replace the existing bridge;
- Remove the existing bridge and replace it with a pedestrian and cycling bridge;
- Rehabilitate the existing structure to create a two-lane, three-lane or four-lane bridge;
- Replace the existing bridge with a new four-lane, five-lane, six-lane or eight-lane bridge; or
- Replace the existing bridge with a four-lane tunnel.

Based on technical analysis and public and stakeholder consultation, the Strategic Review partners narrowed the list of options to six, all of which involved a multi-modal transportation connection. The removal of the bridge without a replacement link was not deemed acceptable, and options involving a tunnel were rejected on the grounds of capital cost. Alternative crossing locations at either Surrey-Coquitlam or Richmond-Burnaby were not deemed to adequately support local and regional land use plans because they did not provide a direct multi-modal connection between Surrey and New Westminster town centres. As a result, these locations were not considered further.

Two viable options were identified: a new four-lane bridge and a new six-lane bridge, both at the existing crossing location. When evaluated against a set of technical, environmental and economic objectives, the four-lane option scored better than the six-lane option in terms of providing a cost-effective solution, supporting the regional goal of moving people out of cars, and reducing emissions, whereas the six-lane option scored better in terms of transportation reliability and supporting economic development.

In early 2014, the Mayors' Council established a Subcommittee on Transportation Investment to define its vision for the region, establish spending priorities and recommend new funding mechanisms capable of supporting those priorities. The Subcommittee considered established regional and community plans as well as the results of the Pattullo Bridge Strategic Review process.

The Mayors' Council recognized the differing goals of the cities of Surrey and New Westminster with respect to the Project. Surrey's priority was to reduce congestion in their local road network and increase the efficiency of movement over the bridge; New Westminster's priority was to retain the urban context of their community and encourage the use of other modes of transportation, such as transit, cycling and walking. With the concurrence of the mayors from both communities, the Mayors' Council agreed that the preferred Pattullo Bridge replacement should be a new four-lane bridge, designed in a manner so as not to preclude potential expansion to six lanes in the future.

Since 2014, the Ministry, TransLink and the cities of Surrey and New Westminster have worked collaboratively to examine options for network connection to the new bridge. The Ministry initiated a technical due diligence review of the Project in March 2017. The review was focused on the network improvements on the north and south sides of the river required to support the new four-lane bridge on opening day.

## 4.2 STRATEGIC OPTIONS ANALYSIS

A Strategic Options Analysis (SOA) was carried out to identify a preferred option for the replacement of the Pattullo Bridge. Four network connection options, all in conjunction with a new four-lane bridge, were analyzed against a base case three-lane rehabilitated bridge. All of the four-lane bridge options included improved pedestrian and cycling facilities and connections across the new bridge, designed to modern standards and able to withstand a 1 in 2475 year seismic event.

The SOA was carried out in a manner consistent with provincial capital planning policy and requirements, including British Columbia's Capital Asset Management Framework (CAMF) and the Ministry's guidelines for transportation infrastructure planning. The Ministry's guidelines for business cases recommend that multiple account evaluation (MAE) be used to evaluate service delivery options for transportation projects.

An MAE process provides for the evaluation of both quantitative and qualitative factors across options in terms of five different accounts: customer service, financial, economic development, environmental, and social and community. Each account is represented by one or more metrics which represent the important implications of each option and demonstrate the trade-offs involved in selecting one option in relation to the others. The MAE analysis considers the costs, benefits and other impacts of each option in relation to a base case, which is the most likely solution in the event none of the alternative strategic options moves forward.

## 4.3 CONNECTION OPTIONS ANALYZED

**Base Case – Three-lane Rehabilitated Bridge:** The base case option involves structural seismic retrofit and rehabilitation of the existing bridge while reducing the existing four-lane configuration (at sub-standard lane widths) to three lanes with modern lane-widths. The centre lane is intended to be a

counter-flow lane that changes direction depending on the flow of peak period traffic. At a high level, the retrofit program is expected to include strengthening of structural elements such as piers and the superstructure, bridge foundation improvements, additional scour protection and marine vessel impact protection, and a full deck rehabilitation. Rehabilitation of the existing bridge would not be expected to fully address the Project objectives.

**Option 1 (Minimum Scope):** This option replaces the existing bridge with a new four-lane bridge with only minor changes to effectively connect to adjacent road networks at both sides of the crossing.

**Option 2 (Moderate Scope A):** This option provides greater connectivity between the new bridge and adjacent road and multi-modal networks, including improved pedestrian and cycling facilities, improved access and connections in New Westminster, a new partial interchange in Surrey to provide free flow traffic movements between Scott Road, King George Boulevard, and the new bridge and minor intersection improvements made to the Bridgeview/King George Blvd intersection to improve traffic operations. No direct connections to/from Highway 17 are provided.

**Option 3 (Moderate Scope B):** This option is the same as Option 2 on the New Westminster side of the crossing, but provides a direct southbound ramp from the bridge to connect to westbound Highway 17 in Surrey, grade-separation at the existing signalized intersection at Highway 17 and Old Yale Road, and improvements to Bridge Road.






















**Option 4 (Full Scope):** This option encompasses the most extensive scope of network connectivity works by including all network improvements identified in Options 1 to 3, plus full movement connections to Highway 17 provided via a new Scott Road Extension.

#### 4.4 MAE FRAMEWORK AND RESULTS

This analysis utilizes the five accounts used to evaluate transportation projects. Each is described below, including the qualitative and quantitative measures chosen to best reflect the individual characteristics and goals of this project.

The overall results of the MAE analysis are summarized in Table 5.

**Table 5: MAE Analysis Summary**

MAE Account	Option 1: Minimum Scope	Option 2: Moderate Scope A	Option 3: Moderate Scope B	Option 4: Full Scope
<b>Customer Service</b>				
<b>Financial:</b> Benefit Cost Ratio	2.42	1.72	2.01	1.30
<b>Economic Development</b>				
<b>Environment</b>				
<b>Social and Community</b>				
 Significantly worse  Somewhat worse  Neutral (same as Base Case)  Somewhat better  Significantly better				

#### 4.4.1 Customer Service

This account includes both quantitative and qualitative measures of the benefits to road users of each option. The quantitative measures include estimates of the incremental economic values, relative to the base case, associated with:

- Regional travel time savings (NPV (\$M));
- Traffic Impacts During Construction (NPV (\$M));
- Collision cost savings (NPV (\$M));
- Vehicle operating savings (NPV (\$M));
- Travel time reliability- standard deviation of travel time (NPV (\$M)); and
- Improved seismic resiliency (bridge) (NPV (\$M)).

Qualitative benefits are assessed relative to the base case in terms of each option's:

- Flexibility to not preclude potential future expansion to six lanes;
- Regional network connectivity;
- Improved local road network access; and
- Reliable access to and from the bridge.

Option 3 (Moderate B Scope) provides the highest quantified benefits to road users as indicated in Table 6. Option 4 provides improved regional connectivity through the provision of direct connections between the bridge and all major routes on both sides of the bridge, improved local access in the Bridgeview industrial and residential neighbourhoods, and Bridge Road access reliability is improved through the provision of secondary access routes, such as the Scott Road Extension and the southbound bridge off-ramp to westbound Highway 17. Preliminary traffic analysis indicates the Scott Road extension, included in Option 4, will result in unacceptable queuing onto Highway 17 during the AM peak. Option 4 attracts more demand to the bridge, and thus has less Travel Time Reliability Savings as compared to the other options.

#### **4.4.2 Financial**

This account measures the net present value cost of each option relative to the base case and encompasses capital, operating, maintenance, and rehabilitation of all capital works.

The ratio of quantified benefits to project costs, on a net present value, incremental (to base case) basis, provides the benefit-cost ratio (BCR) for each option. Option 1 offers the highest benefit cost ratio but the lowest quantified benefits due to the limited scope in network connections. Option 3 offers the highest quantified benefits and the second highest BCR, as indicated in Table 6.

**Table 6: Financial Account Summary**

Financial Account (Discounted to 2017\$ at 6%)	Option 1: Minimum	Option 2: Moderate A	Option 3: Moderate B	Option 4: Full Scope
<b>Benefits (NPV, \$M)</b>				
Collision Cost Savings	44	48	42	45
Travel Time Savings	52	58	87	91
Traffic Disruption During Construction	64	64	64	64
Vehicle Operating Savings	25	27	34	30
Travel Time Reliability	50	41	32	8
Improved Seismic Resiliency	188	188	188	188
Goods Movement Benefits	76	76	76	76
<b>Total Benefits (NPV,\$M)</b>	<b>499</b>	<b>502</b>	<b>523</b>	<b>502</b>
<b>Costs (NPV, \$M)</b>				
Capital Cost				
Maintenance/Rehab				
Salvage				
Base Case				
<b>Total Costs (NPV,\$M)</b>	<b>206</b>	<b>292</b>	<b>260</b>	<b>385</b>
<b>Benefit/Cost Ratio</b>	<b>2.42</b>	<b>1.72</b>	<b>2.01</b>	<b>1.30</b>
<b>NPV (B-C, \$M)</b>	<b>293</b>	<b>210</b>	<b>263</b>	<b>117</b>

#### 4.4.3 Economic Development

Measures identified as most relevant to the MAE analysis include the extent to which the option facilitates:

- Development potential of commercial, industrial and residential land with proximity to regional routes (assessed qualitatively); and
- Goods movement benefits (NPV (\$M)).

Option 4 performs best in terms of land development potential due to improved internal access in the Bridgeview industrial area with new local roads, and provides better access to Highway 17 and Scott Road, which could allow for higher value use in the Bridgeview industrial area. All options have the same estimated benefits to goods movement, estimated at \$76 million in reduced operating costs for logistics and shipping companies, driven by reductions in congestion delays. These reduced delays help facilitate or expand economic activity due to increased competitiveness and market access.

#### 4.4.4 Environment

This account assesses the nature, degree and mitigation of environmental impacts associated with each option, relative to the base case. Quantitative measures include:

- Greenhouse gas emissions (GHG) (tonnes); and
- Regional vehicle kilometers travelled (VKT) savings (km).

Qualitative measures include potential:

- On-land environmental effects for at-risk wildlife, habitat and native vegetation;
- On-land environmental effects for archaeological and heritage resources;
- In-river environmental effects for hydrology and morphology and fish and fish habitat; and
- Noise and vibration near residential areas.

All options attract more traffic to the bridge than the three-lane Base Case. Option 4 attracts more demand and longer distance trips to the bridge, contributing to higher VKT and thus higher emissions than the other options. All options result in higher GHG emissions due to the higher VKT and congestion in all approaches. However, the incremental difference between the options and the Base Case is insignificant.

Given the urban and industrial context for the existing bridge and proposed options, minimal incremental on-land environmental impacts are anticipated across all options. For the most part, these impacts are expected to be mitigated through commitments set out in the Environmental Assessment Certificate. In addition, while all new bridge options require in-water works, retaining the existing structure in the Base Case would also require in-water works to strengthen structural elements. Option 4 has the potential to increase noise and vibration due to an increase in commercial traffic using the Scott Road Extension on the north side of Bridgeview residential neighbourhood; therefore, it scores the worst against all options.

#### 4.4.5 Social/Community

This account captures the potential external effects of each option on the communities impacted, including their values, goals and specific group needs. For this project, those effects are understood in terms of a number of quantitative and qualitative measures. Quantitative measures include:

- Number of residences and businesses whose access is impacted (#); and
- Number of residential and business property takings required, both partial and full (#).

Qualitative measures include:

- Alignment with both regional and community plans; and
- Community connectivity and modal integration for transit, pedestrians and cyclists

Overall, Option 4 scores the best in terms of alignment with regional and community plans and benefits to the community due to the improved road connections and pedestrian and cyclist facilities; however, it also involves the most property impacts.



## 4.5 RECOMMENDATION

Overall, Option 3 offers the highest quantified user benefits and the highest BCR among the options encompassing network enhancements on both sides of the crossing.

Option 1 has the highest BCR but does not adequately address road network connectivity challenges on either side of the bridge; therefore it offers the lowest quantified user benefits. While Option 4 offers advantages in relation to qualitative measures represented by other MAE accounts, preliminary traffic analysis conducted following the removal of point tolls on Fraser River crossings indicates that proposed connections involving Scott Road and Highway 17 result in unacceptable queuing onto Highway 17 during the AM peak. Further traffic analysis is required to better understand these impacts.

It is recommended that Option 3 be the preferred option for the Project to move to procurement (the Recommended Option). Option 3 is shown in Figure 8.

**Figure 8 - Recommended Option (Option 3) Map\***



\*Reference Concept as of February 2018.

## 4.6 CAPITAL COST ESTIMATE

A capital cost estimate was prepared based on the physical asset scope described in Section 4.5 and detailed through concept drawings prepared by the Project team. Table 7 presents the estimated capital costs required to deliver the scope.

**Table 7: Capital Cost Estimate**

Cost Category	\$M (Nominal)
<b>Contractor Construction Costs</b>	
Bridge, Approaches and Roadworks	
Removal of Existing Bridge	
Design, Management and Overhead	
<b>Owner's Construction Period Costs</b>	
Planning and Management	
Property	
<b>Subtotal</b>	
Procurement and Risk Adjustment	
Interest During Construction (Contractor)	
Interest During Construction (Owner)	
<b>Total Capital Cost</b>	<b>1,377</b>

#### 4.7 BENEFIT COST SENSITIVITY ANALYSIS

A sensitivity analysis was conducted on the BCR for the Recommended Option using six per cent, eight per cent and 10 per cent discount rates, and +/- 25 per cent changes in capital costs. Table 8 below shows the results of this analysis.

**Table 8: Benefit Cost Sensitivity Analysis**

Financial Account	Discount Rate=6%	Discount Rate=8%	Discount Rate=10%	Costs +25% (Discount Rate = 6%)	Costs -25% (Discount Rate = 6%)	Traffic Related Benefits +25%	Traffic Related Benefits -25%
Collision Cost Savings	42	32	25	42	42	42	42
Travel Time Savings	87	66	51	87	87	109	65
Traffic Disruption During Construction	64	62	61	64	64	64	64
Vehicle Operating Savings	34	25	20	34	34	43	26
Travel Time Reliability	32	25	20	32	32	40	24
Improved Seismic Resiliency	188	139	105	210	166	188	188
Goods Movement Benefits	76	55	41	76	76	76	76
<b>Total Benefits (NPV,\$M)</b>	<b>523</b>	<b>404</b>	<b>323</b>	<b>545</b>	<b>501</b>	<b>561</b>	<b>485</b>
Capital Cost							
Maintenance/Rehab							
Salvage							
Base Case							
<b>Total Costs (NPV,\$M)</b>	<b>260</b>	<b>264</b>	<b>255</b>	<b>323</b>	<b>194</b>	<b>221</b>	<b>221</b>
<b>Benefit/Cost Ratio</b>	<b>2.01</b>	<b>1.53</b>	<b>1.27</b>	<b>1.69</b>	<b>2.58</b>	<b>2.54</b>	<b>2.19</b>
<b>NPV (B-C, \$M)</b>	<b>263</b>	<b>140</b>	<b>68</b>	<b>222</b>	<b>307</b>	<b>340</b>	<b>264</b>

In relation to all sensitivities tested, the BCR of Option 3 does not fall below 1.27.

#### 4.8 ACHIEVEMENT OF PROJECT GOALS

As is shown below in Table 9, the Recommended Option will achieve all of the Project Goals established during the planning and public consultation processes.

**Table 9: Achievement of Project Goals**

Project Goals	Achievement of Goals
1. Provide a structurally sound bridge crossing to maintain a critical local and regional connection	<ul style="list-style-type: none"> <li>✓ Modern structural design which considers seismic, wind loading, and ship impact requirements</li> <li>✓ Located in existing transportation corridor</li> </ul>
2. Improve safety for all users with modern lane widths, road curvature, centre median and separated pedestrian/cyclist facilities	<ul style="list-style-type: none"> <li>✓ Modern lane widths</li> <li>✓ Improved road geometry on the bridge, ramps and connecting roads</li> <li>✓ Center median to separate traffic traveling in opposite directions</li> <li>✓ Separated pedestrian and cyclist facilities on either side of the bridge</li> </ul>
3. Improve connectivity, reliability and modal choice while supporting environmental objectives	<ul style="list-style-type: none"> <li>✓ New and improved road connections and multi-modal paths</li> <li>✓ Improved pedestrian and cyclist facilities on and off the bridge</li> <li>✓ Low environmental impacts</li> </ul>

## PART B – DELIVERY OF THE PROJECT

This section of the Business Case describes the Project in terms of physical scope, operating period activities, and current status. From this point forward, the terms ‘Recommended Option’ and ‘Project’ are used interchangeably.

TransLink led the Project through its conceptual development and planning phases. The Province will fund and build the Project. Upon completion, the Province will own and operate the asset.

## 5 PHYSICAL ASSET SCOPE

### 5.1 OVERVIEW

The Project will include a new, four-lane bridge. The Project will also include improved road connections on both sides of the bridge.

More specifically, the Project includes the following key components:

- Design and construction of a new four-lane replacement bridge will provide:
  - A safer crossing with wider vehicle lane widths that conform to current roadway design standards and a centre median that separates traffic travelling in opposite directions;
  - Pedestrian and cyclist facilities that are separated from traffic on both sides of the bridge;
  - Consistency with current seismic, wind load and ship impact standards.
- New and enhanced connections with the local road network in municipalities on both sides of the bridge – New Westminster and Surrey – including:
  - In New Westminster:
    - Improvements to McBride Boulevard to accommodate the new bridge alignment;
    - New direct Columbia Street on and off-ramps; and
    - An improved Royal Avenue interchange, including an improved on-ramp from Royal Avenue.
  - In Surrey:
    - A new direct off-ramp from the bridge to westbound Highway 17;
    - Old Yale Road grade separation and new Bridge Road connection;
    - Improvements to Bridgeview Drive intersection with King George Boulevard
- Removal of the existing bridge after service commencement on the new bridge.

The new bridge will be located just north and upstream of the existing bridge and continue to link the communities of New Westminster and Surrey. This route will tie into the existing road networks on both sides of the bridge and add a new connection to Highway 17.

The Project is expected to open to the public in 2023. This timeline assumes a four-year design and construction period and is contingent upon procurement activities commencing in 2018.

The new bridge will comply with modern roadway geometry standards, as well as standards for seismic events and ship impacts. It will support alternate modes of travel while providing reliable travel time and capacity to address current and forecasted needs.

The constructability, expandability requirements and cost of the four-lane bridge concept are confirmed by the reference design.

## **5.2 OPERATION, MAINTENANCE, AND REHABILITATION SCOPE**

Future operations, maintenance and rehabilitation for the new bridge and improvements will be the responsibility of the Ministry.

## 6 PROJECT STATUS

### 6.1 CONSULTATION WITH STAKEHOLDERS AND THE PUBLIC TO DATE

#### 6.1.1 Pattullo Bridge Strategic Review (2013)

As described in Section 4.1, a Strategic Review and extensive public and stakeholder consultation were led by TransLink from June 3 to 28, 2013, involving residents, businesses, local and regional stakeholders, and bridge users. Through this review, 25 bridge replacement options were narrowed down to six, which were ultimately reduced to two options following further analysis: a new four-lane bridge or a new six-lane bridge in the current location.

In 2014, these two options were put forward to the Mayors' Council on Regional Transportation for consideration. In its 2014 *Regional Transportation Investments: a Vision for Metro Vancouver*, the Mayors' Council recommended that the replacement bridge should be a new, four-lane bridge, designed in a manner so as not to preclude potential future expansion to six lanes.

#### 6.1.2 Community Connections Public Consultation – Phase 1 and Phase 2 (2016)

TransLink led two rounds of public consultation in 2016 to gather input on community connections, including road network improvements, as well as cycling and pedestrian access on both sides of the bridge in New Westminster and Surrey.

A preliminary bridge design concept, including network connections, was developed based on extensive public consultation, technical review and financial considerations led by TransLink. This design concept was endorsed by the Mayors and Councils of both, Surrey and New Westminster in December 2016. The design concept has since been updated to reflect new technical information, including anticipated traffic disruption on Highway 17. Further traffic analysis is required to better understand the impact of changes in regional traffic patterns following the removal of point tolls on Fraser River crossings.

#### 6.1.3 Current Consultation and Communications Planning

A consultation and communications plan has been developed for the Project. The plan addresses the need to ensure that Aboriginal groups, local governments, stakeholders and members of the public are advised of the planning process. In addition, the plan will allow for the provision of appropriate information and venues to allow the public to provide meaningful input to the design process as appropriate.

### 6.2 TECHNICAL PLANNING

Initial technical planning was undertaken in relation to the alternate solutions identified through the various public consultation processes.

Since then, further technical analysis has been undertaken including:

- A geotechnical drilling program;
- Ongoing traffic modelling and forecasting;



- Investigation of utility relocation requirements;
- Both physical and numerical hydraulic modelling;
- Ongoing consultation and engagement with Aboriginal groups, local governments, Metro Vancouver, Port of Vancouver, and others;
- Property impact and acquirement assessments;
- Detailed studies of potential environmental, agricultural, recreational, and community effects; and
- Development of an EA Application submission to the BCEAO.

### 6.3 ENVIRONMENTAL REVIEW AND PERMITTING

The Project is subject to review under British Columbia's *Environmental Assessment Act*. It is also subject to a *Canadian Environmental Assessment Act, 2012* section 67 determination and permitting by the Vancouver Fraser Port Authority (VFPA), which will be supported by VFPA's Project and Environmental Review (PER) process. The BCEAO and VFPA have agreed to a harmonized environmental assessment process, led by BCEAO, which meets both federal and provincial environmental assessment review requirements. At the end of the environmental assessment review process, BCEAO and VFPA will come to separate decisions regarding issuance of an Environmental Assessment Certificate (EAC) and a PER permit, respectively, that would allow the Project to proceed.

The first step of the environmental assessment process is the Application Information Requirements (AIR). The AIR is the identification of Valued Components (VC) to be studied and the areas within which the studies would occur. This is done through the Valued Components Selection Rationale Document (VC Document). As part of this process, Aboriginal groups, federal and provincial agencies, and municipalities were consulted. The BCEAO also invited public and stakeholder comment on this document through a public comment period which closed on July 27, 2017.

The environmental submission will include studies and potential mitigation for review by BCEAO and VFPA. The overall Environmental Assessment will also be coordinated with technical requirements, property requirements, affected municipalities, Aboriginal groups and others including utilities, railways and the public.

As part of the environmental permitting process, the federal, provincial, and municipal authorities will be issuing site approval permits. These permits will detail requirements related to the design and construction phase of the project.

### 6.4 MUNICIPAL LIAISON

The project team maintains regular contact with elected officials from both Surrey and New Westminster, and senior staff including City Managers and municipal technical staff. The municipalities have been invited by the EAO to participate in a project working group (the Working Group).

## 6.5 ABORIGINAL GROUPS

The following Aboriginal groups were contacted in order to initiate consultation in accordance with direction provided by the project's regulators (EAO and the VFPA). These groups have also been invited by the EAO to participate in the Working Group:

- 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
- Tsleil-Waututh Nation.

Aboriginal groups who have engaged in consultation with the Project team or through the EAO's Working Group have been provided with information about the Project and the Environmental Assessment. The Ministry will continue to consult with Aboriginal groups through the Environmental Assessment process and project implementation. As required under the regulatory process, the proposed consultation is documented in an Aboriginal Consultation Plan that was developed in consultation with Aboriginal groups. This plan was submitted by TransLink to the EAO within 60 days of issuance of the EAO's Section 11 order (August 8, 2017), as required by the Environmental Assessment process. The Section 11 order specifies the scope, procedures, and methods by which the review must be conducted.

## 6.6 COMMUNITY BENEFITS POLICY

Work is underway to develop a new provincial community benefits policy framework. The new policy will be implemented as part of the Project.

## **6.7 PROPERTY**

An initial property strategy has been prepared by the Project's property team. This includes an assessment of the preliminary requirements of both temporary and permanent lands. These requirements will be continually updated as the reference concept is refined.

## **6.8 UTILITIES**

Work is underway to define the requirements for relocation and accommodation of utilities. Discussions have been initiated with the respective agencies including FortisBC, Metro Vancouver, telecommunications, and municipal utilities.

## **6.9 RAILWAYS**

The bridge will be located just upstream of the New Westminster Rail Bridge, which is owned by Public Works and Government Services Canada (PWGSC). The Project team and PWGSC are in discussions to ensure that the integrity of the rail bridge is retained through construction and bridge removal.

The Project team is also in discussions with CN Rail, the operator of the rail bridge, as well as Southern Rail, Canadian Pacific Rail and BNSF. Through these discussions, specific requirements of the railways in relation to the interface with Project construction will be identified.

## PART C – PROCUREMENT DELIVERY MODEL OPTIONS ANALYSIS

Part C presents the analysis and results of the detailed assessment undertaken to determine the optimal approach to procure the Project. This section concludes that the recommended procurement delivery model option for the Project is a Design Build Finance (DBF) procurement approach.

## 7 APPROACH

A detailed assessment of two preferred procurement delivery model options (one Public Sector Comparator (PSC) and one partnership delivery model, called a Shadow Bid (SB)) was undertaken for the Project. The results of this assessment inform the identification of a procurement approach to best meet the Project objectives and provide value to taxpayers. For additional detail on how the preferred procurement delivery model options were selected for this analysis, refer to the *Procurement Options Report*.

The following sections describe the procurement options analysis.

### 7.1 PROCUREMENT OPTIONS IDENTIFICATION

The procurement analysis begins with a discussion of the procurement objectives, followed by a description of different procurement options and considerations under both the traditional public sector procurement approach (Public Sector Comparator or PSC) and alternative approaches. The setting of objectives and considerations was carried out collaboratively and included key members of the Project team.

Seven procurement options were initially identified as feasible for delivering the Project. The assessment of these options is summarized in the *Procurement Options Report*.

The final recommendation was to further evaluate a traditional procurement approach (the PSC) and an alternative procurement approach that included partial private finance (the SB). They are:

- A Design Build (DB) contract; and
- A Design Build Finance (DBF) contract.

The assessment highlighted a single DB contract encompassing design and construction activities as well as removal of the existing bridge, as the preferred public sector comparator.

The DBF model, including partial private finance and encompassing design and construction activities and removal of the existing bridge, was identified as the preferred alternative procurement approach. A long-term contract involving private finance was also considered but was deemed less advantageous in relation to the criteria applied in the procurement options assessment.

### 7.2 PROCUREMENT OPTIONS ANALYSIS OVERVIEW

The two shortlisted procurement options were analyzed and compared using both quantitative and qualitative assessment techniques. The comparative analyses included the following:

- Multiple Criteria Analysis (MCA) – A qualitative evaluation method that compares the relative merits of each option in terms of how well it is expected to address the procurement objectives of the Project and provide value to taxpayers. Details are provided in Section 8.1;
- Risk Analysis – A comprehensive list of risks is identified for each phase of the Project. For procurement options analysis, a select subset of these risks is quantified for each of the

procurement options, highlighting the differences in value and allocation of risk inherent in each approach. This subset of quantified risks is an input to the financial modelling for comparative analysis and also assists in determining an appropriate overall contingency for delivery of the Project. A summary of the *Risk Report* for the project is provided in Section 8.2;

- Financial Modelling – With inputs including the risk valuation, project financing assumptions, timing assumptions and project costs, a financial model is developed to simulate how the Province and a potential contractor would be expected to price the Project under each procurement approach. The financial modelling allows for differences in timing and costs associated with each procurement option to be evaluated and compared. Key financial modelling assumptions are provided in Section 8.3;
- Value for Money (VFM) Calculation – The value for taxpayers' dollars is estimated by comparing the net present cost (NPC, also referred to as net present value, or NPV) of the Project under the public sector procurement versus the alternative. This calculation and interpretation is set out in Section 8.4; and
- Market Sounding – This activity includes a series of interviews held with sponsors and contractors chosen based on their previous involvement with relevant transportation project procurements in Canada and internationally. The results of this activity are summarized in Section 8.5.

## 8 PROCUREMENT OPTIONS ANALYSIS – DB VERSUS DBF

The objective of the procurement options analysis is to identify the optimal approach to procuring the Project in terms of which option offers the greatest value on both a qualitative and quantitative basis. The options analyzed were the DB as the public sector comparator and the DBF as the alternative approach. For clarity in this Business Case, based on the results of the procurement options assessment described above, only the DB and DBF options are compared.

The methodologies and results of the qualitative procurement options analysis undertaken for this Project are presented in this section.

### 8.1 MULTIPLE CRITERIA ANALYSIS

The analytical framework for assessing the relative qualitative merits of each procurement option is based on a multiple criteria analysis (MCA) approach. The qualitative assessment sets out criteria based on the procurement objectives for the Project. Each criterion represents a desired outcome for the Project and is then assessed on the extent to which the procurement option achieves the desired outcome. The assessment criteria applied for the MCA are consistent with the criteria used to evaluate all potential procurement options in the *Procurement Options Report*, but have been amended slightly to de-emphasize long-term procurement objectives since neither the PSC nor the SB are long-term delivery models.

The assessment criteria and associated procurement objectives are summarized below in Table 10.

**Table 10: Qualitative Procurement Options Assessment Criteria**

Assessment Criteria	Description
<b>Stakeholder concerns and commitments are addressed</b>	<i>Consistency and thoroughness in communications and addressing stakeholder commitments.</i>
<b>Key Project risks are managed and mitigated</b>	<i>Key Project risks are allocated to the party best able to manage and mitigate them.</i>
<b>Competition, providing innovation and efficiencies, is maximized</b>	<i>Attractiveness, marketability and bankability of the project opportunity that brings innovation, efficiencies and value to taxpayers.</i>
<b>Corridor service quality and asset performance are maximized</b>	<i>Project objectives related to safety, reliability and access are achieved, construction impacts on traffic are minimized, and the asset performs effectively during operations.</i>
<b>Cost, schedule certainty and affordability are maintained</b>	<i>Project is delivered on time and on budget within fiscal and cash flow constraints.</i>



Assessment Criteria	Description
<b>Ability to implement changes during the life of the asset in the most cost effective manner</b>	<i>Implementation of changes in service scope or future capital investment in the asset can be achieved in the most cost effective and efficient manner.</i>

The selected DB and DBF procurement options were assessed in terms of how well each achieves these assessment criteria.

The following scoring framework was used to indicate the absolute and relative merits of each procurement option in relation to each criterion and expectation of achieving the desired outcomes:

**Table 11: Qualitative Assessment Scoring Framework**

Scale	Assessment	Description
X	Poor	Model fails to meet basic requirements of the Project.
✓	Low	Minimally meets requirements of the Project.
✓✓	Medium	Adequately meets the requirements of the Project.
✓✓✓	High	Provides a highly efficient and effective delivery solution for the Project.

The procurement options ranking summary is provided in Table 12.

**Table 12: Qualitative Assessment Summary**

Qualitative Assessment Criteria	PSC#3 (DB)	SB#2 (DBF)
Stakeholder concerns and commitments are addressed	✓✓✓	✓✓✓
Key Project risks are managed and mitigated	✓✓	✓✓
Competition, providing innovation and efficiencies is maximized	✓✓	✓✓
Corridor service quality and performance are maximized	✓✓	✓✓
Cost, schedule certainty and affordability are maintained	✓	✓✓½
Ability to implement changes during the life of the asset in the most cost effective manner	✓✓✓	✓✓✓

The inclusion of private financing adds third party financial discipline to the Project and increases the likelihood of achieving on-time and on-budget delivery of the overall Project. As a result, DBF performs better than DB in the qualitative assessment.

## **8.2 RISK ANALYSIS**

Project risk is defined as the chance of an event or condition happening which could cause the actual project circumstances to differ from those assumed when forecasting project outcomes or objectives. Risk is an inherent part of any project, and to ensure a successful project outcome, risk must be effectively managed. The identification, allocation, measurement, and treatment of risk each form a key part in quantifying project risk. The ultimate goal is to identify and allocate project risks to the party best able to manage them at a reasonable cost to the project. An efficient or optimal allocation of risk between the Ministry and the contractor will ultimately provide the best value.

The following subsections summarize the process and results of the risk analysis and quantification undertaken for the Project.

### **8.2.1 Risk Approach and Methodology**

A comprehensive assessment of Project-specific risks was conducted in accordance with the Provincial Government's risk management guidance developed in conjunction with the Province's Risk Management Branch (RMB) of the Ministry of Finance. These guidelines are generally consistent with the principles, framework and process described in the ISO 31000:2009 Risk Management Principles and Guidelines.

This risk management guidance takes a systemic approach to risk, estimating the range of potential impacts on a risk-by-risk basis through the Project's planning, procurement, design and construction, and operating phases. Risk analysis is dynamic and should be revisited throughout the lifecycle of the project.

### **8.2.2 Risk Identification and Allocation**

The risk assessment process began with the identification of potential material risks and consequences that could impact the project during any of the stages of the Project's life cycle. This was completed through a series of risk workshops involving members of the project team and a variety of subject matter experts. The goal of the identification phase is to create a comprehensive list of risks which could affect (either positively or negatively), the project outcome. The identified risks were then categorized into either capital or operating risks depending on when they were expected to occur.

Subsequently, each identified risk was evaluated to determine which party (the Ministry or the design-builder) would be responsible under each procurement option. From the perspective of the Ministry, a risk can be transferred, shared, or retained with the private sector. Each specific risk is viewed through the lens of which party is best able to manage or mitigate the risk at the lowest cost. This allocation was completed for both the DB and DBF options and is summarized in Table 13 below.

**Table 13: Summary Risk Allocation Matrix**

Type of Risk	DB		DBF	
	Design-Builder	Ministry	Design-Builder	Ministry
Design	✓		✓	
Construction	✓		✓	
Financing		✓	✓	✓
Operations		✓		✓
Regular Maintenance		✓		✓
Major Life Cycle/ Rehabilitation		✓		✓
Force Majeure/Relief Events	✓	✓	✓	✓
Scope Changes by the Ministry		✓		✓

### 8.2.3 Quantified Risks

During risk quantification, selected risks are valued to ensure sufficient risk reserve is included in the project's total budget. This risk adjustment included within the project budget must account for both transferred risks (which the contractor will include within its bid) and retained risks (which will form part of the Ministry's project reserve). If a risk is transferred, it is quantified from the perspective of the contractor and what the Project Team estimates would be included in a reasonable and competitive financial proposal. If a risk is retained, it is quantified from the perspective of the Ministry and the cost impact the risk would have on the Project.

Risks were selected for quantification based on materiality, ability to quantify, risk rating, and consideration of past precedent projects. Best, worst and most likely outcomes, including both cost and probability were quantified for both procurement options to estimate an expected value for each quantified risk. Once the expected values were calculated, these impacts were then grouped by the phase in which they are likely to occur (pre-contract execution, design/construction or operations) and ultimately incorporated into the financial model as described below.

### 8.2.4 Incorporation into Financial Analysis

For each procurement model, an amount of transferred and retained risk was added as a cost item to the financial model as a contractor or Ministry cost. In this analysis, the 67<sup>th</sup> percentile of total risk was added to the model to reflect a prudent level of risk aversion given the stage of Project planning and number of unknowns related to the Project. Selecting the 67<sup>th</sup> percentile is equivalent to saying that the Project has sufficient risk money included in the budget approximately two of out every three times.

### 8.2.5 Summary of Risk Analysis Results

The results of the risk analysis are provided in Table 14, which presents probabilistic values for the selected key risks under both procurement options.

**Table 14: Summary of Risk Values**  
(NPC \$ Millions at 67<sup>th</sup> percentile, discounted at 4.8%) (DB vs. DBF)

Financial Model Risk	DB	DBF
<b>Capital Risk</b>		
Value of the Retained Risk held by the Ministry		
Value of the Transferred Risk included in the private sector's cost		
<b>Total</b>		

In general, the DBF model is considered more effective in transferring risk, and therefore the same risk transfer can be achieved at a lower cost than in the DB model. This effectiveness is realized through the inclusion of private finance at-risk during the construction phase of the project. Key risks that are better managed under the DBF model impact the schedule performance of the contractor over the term of the DBF contract.

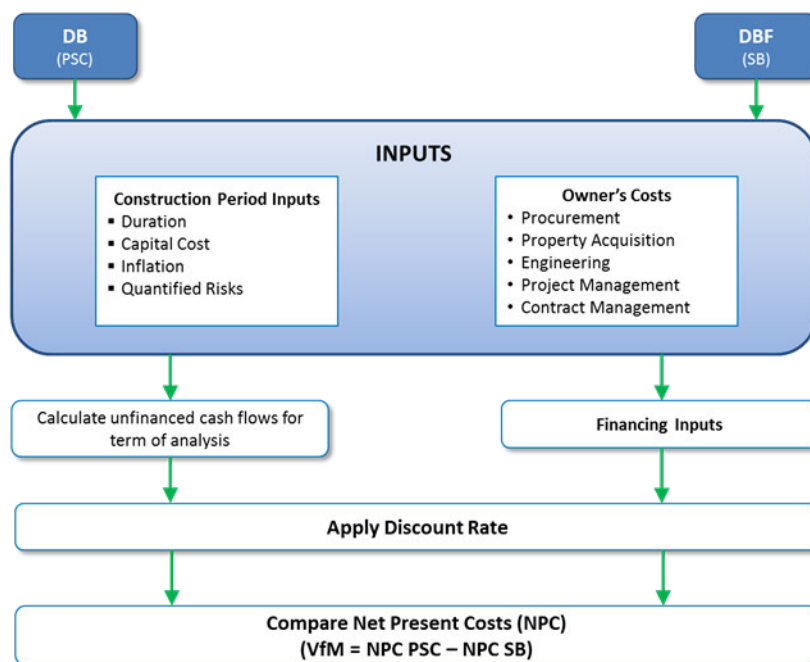
## 8.3 FINANCIAL MODELLING

Financial modelling of the Project was undertaken with a methodology consistent with that used on previous projects. Further details on this methodology are provided in the document *Methodology for Quantitative Procurement Options Analysis Discussion Paper, April 2014*, available at <http://www.partnershipsbcc.ca/publications/resources>.

The value for money (VFM) analysis involves a detailed, quantitative analysis that compares the preferred alternative approach (also referred to as a Shadow Bid, or SB) to the preferred traditional procurement method (PSC).

Value for money is expressed quantitatively as the difference in net present cost between the PSC and the proposed SB option. The financial modelling methodology is summarized in Figure 9 below.

**Figure 9: Overview of VFM Approach**



To undertake the quantitative value for money assessment for this Project, a comprehensive risk analysis was conducted and risk-adjusted cash flow models were prepared for the PSC (based on a DB procurement) and the SB (DBF).

In addition, the Province's costs, including project management, were also estimated for each procurement option. The financial models assume the same Project term in each case, and each option is required to be delivered to the same specifications and performance expectations.

The results of this quantitative comparison between the PSC and the SB, together with the qualitative criteria, are used to determine the procurement method that provides the best overall value for money.

### 8.3.1 Project Financial Assumptions

The SB and PSC were prepared based on an assumption that the design and construction of the new infrastructure and the removal of the existing bridge would start with a contract being awarded in the summer of 2019.

GST is not included in the capital cost estimate. The financial model does not take into account GST movements since it is a working capital item and the value is immaterial to the analysis (for purchases, GST is paid on items and is subsequently refunded; for billings, GST is collected and then remitted).

The SB assumes that the private sector will finance \$300 million of the capital costs during the construction period. The \$300 million in private finance is invested in the Project early to provide sufficient security in the form of unfunded value in the ground in the event construction challenges are encountered prior to substantial completion. This value is established based on the additional costs to the Ministry of procuring a contract to complete the infrastructure should the design-builder encounter

a large enough risk to leave the Project. The \$300 million is repaid at completion. Private financing drawn and utilized ahead of public sector contributions provides adequate protection for base case construction period risks, based upon an analysis of significant risks.

The following table shows the project financing assumptions used in the SB model. These assumptions have been developed through discussions with the Project advisors and input from the B.C. Ministry of Finance.

**Table 15: Project Financial Assumptions Used in the Shadow Bid Model**

Assumption	Shadow Bid (DBF)
<b>Financing Assumptions</b>	
Debt/Equity Ratio	100:0 upon construction completion
Timing of Private Finance	At a rate of 90% of private partner expenditure until the total amount of private finance is reached
Total Amount of Private Finance	\$300 million
<b>Debt Type and Amount</b>	
Type	Construction Term Debt
Amount	\$300 million
Bond Base Interest Rate	2.06%
Interest Rate Spread	150 bps
All-in rate	3.56%
Debt Arrangement Fee	1.50%
Interest Earned on Cash Balances	1.00%

### 8.3.2 Capital Costs

The estimated cost of the Project, including planning, construction, existing bridge removal, Project Co., and private financing (excluding owner IDC) is in the order of \$1,335 million (nominal) under the SB. This includes costs for the construction period of approximately four years. Under the PSC, the total cost of the Project is \$1,327 million (nominal). The project budget breakdown is as follows:

**Table 16: Total Project Cost**

Project Costs \$M (nominal)	PSC	Shadow Bid
Construction (including owner's costs)		
Bid Development		
SPV During Construction		
Proponent's IDC		
<b>Total Project Costs</b>	<b>\$1,327</b>	<b>\$1,335</b>

### 8.3.3 Discount Rate

The discount rate reflects the time value of money for the Ministry. Discounting enables nominal project cash flows from the PSC and SB that differ in timing and amount to be discounted back to a common reference date.

The method for determining the discount rate is consistent with the guidance on past projects where a project's pre-tax internal rate of return (Project IRR) of the privately financed procurement model (DBF for this Project) is the appropriate rate.

The Project IRR of the DBF model is 4.8 per cent.

January 1, 2018 is the base date to which the Project's nominal cash flows are discounted.

## 8.4 VALUE FOR MONEY CALCULATION

In financial terms, the value for taxpayers' money is established by calculating and comparing the estimated NPC of a project based on a particular procurement approach to the established NPC based on traditional public-sector procurement. The results of the VFM assessment are summarized in Table 17.



**Table 17: Value for Money**

Public Sector Comparator DB Procurement	NPC (\$M)		Shadow Bid DBF Procurement	NPC (\$M)
Total Construction Cost - DB Contractor			Completion Payment	
Bid Development Cost				
<b>Total Construction and Operation Cost</b>			<b>Total Completion Payment</b>	
Transferred Construction Period Risk				
<b>Total Transferred Risk</b>				
Retained Construction Period Risk			Retained Construction Period Risk	
Owner's Costs (excluding IDC)			Owner's Costs (excluding IDC)	
			Progress Payments	
<b>Total Owner's Cost (excluding IDC)</b>			<b>Total Owner's Cost (excluding IDC)</b>	
<b>Total PSC Cost</b>			<b>Total Shadow Bid Cost</b>	
			<b>Value for Money (\$)</b>	<b>\$41</b>
			<b>Value for Money (%)</b>	<b>3.57%</b>

**Figure 10: Value for Money Graph**

#### 8.4.1 Value for Money – Sensitivity Analysis

To assess the VFM's sensitivity to the discount rate, the financial model was recalculated for the increase and decrease of the discount rate by one per cent.

**Table 18: Discount Rates Used in VFM Sensitivity Analysis**

Discount Rate	VFM
5.8% (Base Discount Rate + 1%)	\$48M
4.8% (Base Discount Rate)	\$41M
3.8% (Base Discount Rate - 1%)	\$32M
Breakeven Discount Rate	n/a

To assess the VFM's sensitivity to the interest rate, the financial model was re-run for the increase and decrease of the base interest rate by one per cent without changing the Base Discount Rate.

**Table 19: Interest Rates Used in VFM Sensitivity Analysis**

Interest Rate	VFM
4.56% (Base Interest Rate + 1%)	\$29M
3.56% (Base Interest Rate)	\$41M
2.56% (Base Interest Rate - 1%)	\$52M

#### 8.4.2 VFM Updating

The Project team will prepare a new capital cost estimate, risk assessment and VFM analysis refresh whenever significant new information is available regarding the scope, design, stakeholders, funding and risks associated with the Project. The following are points in time when a VFM refresh may be appropriate based on new information.

- Prior to issuing procurement documents, as new information derived from the Project development and advance work is obtained.
- Once a preferred proponent has been selected, taking into account the proponent's technical and financial proposals as well as any preliminary comments they may have provided on the draft Project Agreement.
- Immediately after contract execution based on the signed contract and finalized price for the Project.

At the completion of the competitive selection process, a Project report will be produced describing the selection process, the outcome and the final VFM results.

### 8.5 MARKET SOUNDING

Market sounding is a structured interaction with market participants, undertaken during the planning stages of the Project, to both generate interest in the Project and gather specific feedback on Project attributes and proposed procurement strategy and methodology.

An initial market sounding was undertaken in January 2016. This early market sounding sought feedback on different project delivery models, while exploring a range of technical, commercial and financial considerations. A second market sounding was undertaken in September 2017 to communicate current information to the market about the Project, the expected DBF delivery model, anticipated procurement timing, and to refresh earlier feedback on project-specific issues. Many of the same market participants were contacted again during the second market sounding, along with a few additional firms subsequently identified as potentially interested in the Project.

Comments and feedback provided by all market sounding participants were generally positive and supportive of the Project.

The most recent market sounding confirmed that the expected timing of procurement and implementation does not pose significant obstacles to participation in the competition. While there are a number of large projects currently in or nearing procurement across Canada and in the United States, participants indicated they had adequate capacity to pursue all opportunities.

Through both market soundings, market participants provided valuable feedback that will be considered further in the development of Project documentation and processes. Feedback included views on suggested technical investigative work, mitigation of risks in relation to third parties, traffic management, financing, timelines and the importance of ensuring clarity of expectations generally. There continues to be strong interest in the Project among virtually all market participants interviewed.

The information gathered during both market soundings supported the Project team's anticipated Project planning, technical works, and procurement document development, including conducting geotechnical studies and liaising with utilities and other stakeholders.

## 9 RECOMMENDED PROCUREMENT OPTION

Based on this qualitative and quantitative analysis, a DBF procurement approach, with \$300 million in short-term private financing provided upfront, is recommended for the Project. The analysis shows that the DBF model will most comprehensively:

- Manage and mitigate key project risks;
- Maintain cost and schedule certainty; and
- Provide value for money (expected to be in the range of \$41 million).

## PART D – PROCUREMENT PLAN AND FUNDING

Part D describes the procurement process to implement the Project, based on the DBF preferred procurement model. This section also discusses funding sources and provides a preliminary schedule for implementation.

## 10 PROCUREMENT IMPLEMENTATION PLAN

This section describes the policy and process framework in place to execute the procurement, the resources that have been dedicated, and the governance structure designed to ensure an open, fair and competitive procurement.

### 10.1 RECOMMENDED PROCUREMENT PROCESS

Based on the DBF preferred procurement model selected for the Project, the recommended competitive selection process is a two-stage approach including a request for qualifications (RFQ) followed by a request for proposals (RFP).

#### 10.1.1 Request for Qualifications

The RFQ is the first phase of the selection process. RFQ respondents are expected to demonstrate their experience, qualifications, capacity and capability to undertake the Project. They are evaluated on their experience and technical capability in design, construction, project management, quality management, environmental management and communications management. Based on this evaluation, a shortlist of up to three respondents will be invited to participate as proponents in the RFP phase of the selection process.

#### 10.1.2 Request for Proposals

The second stage of the procurement process is the RFP. The RFP package includes a detailed description of the Project, a draft contract, proposal submission requirements and details relating to how the proposals will be evaluated.

The Project team anticipates implementing an interactive, two-stage RFP evaluation process such that proponents submit a technical proposal, which is evaluated based on the Province's stated performance requirements set out in a draft contract, in advance of their financial proposal. All proponents submitting technical proposals satisfying the RFP requirements will be invited to submit a financial proposal.

Throughout the procurement process, a Fairness Advisor is retained to monitor the selection process and will provide a written report at the conclusion.

#### 10.1.3 Post-Procurement Contract Administration

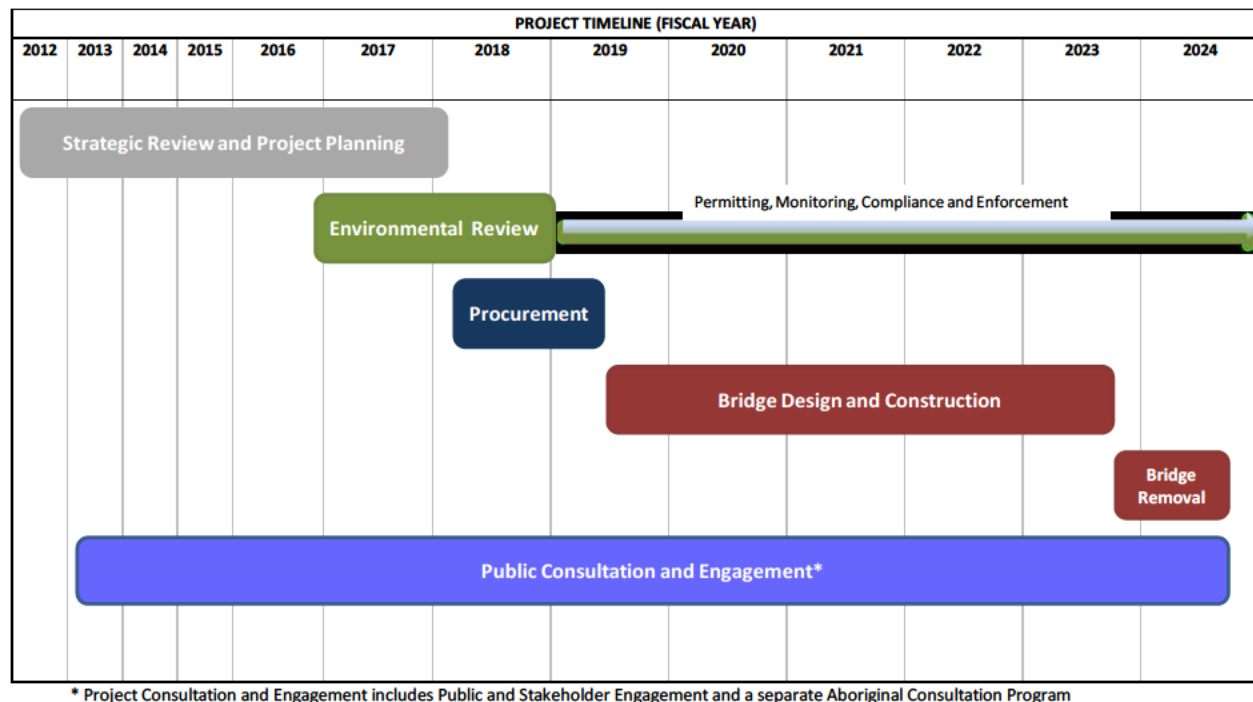
The Province's implementation team will protect the Province's interests and ensure the Project is designed and constructed in accordance with the contract requirements.

### 10.2 PROJECT SCHEDULE

This schedule represents key activities and milestones critical to advancing the Project through to construction.



**Figure 11: Project Schedule**



Highlights of the schedule are as follows:

- Consultation is a critical component of the EA process with Aboriginal groups, the public, and stakeholders participating in the period leading up to and during the application review period.
- RFQ issuance is planned for spring 2018 with a proponent shortlist expected by summer 2018.
- The RFP is planned for issuance in summer 2018, with a preferred proponent expected to be selected and a contract awarded by summer 2019.
- Based on the current schedule, it is anticipated that contractor mobilization will begin in 2019, with the design of the bridge and approach structures continuing following award. The bridge opening is scheduled for 2023.
- Removal of the existing bridge structure will occur after the new bridge is in service.

### 10.3 PROJECT GOVERNANCE

A Project Board (the Board) will be established to provide guidance and oversight to the project delivery team. The Board's objective is to provide sound project governance through appropriate oversight of material aspects of the Project; informed and timely decision making; effective risk management; and sound financial management and transparency.

### 10.3.1 Procurement Governance Structure

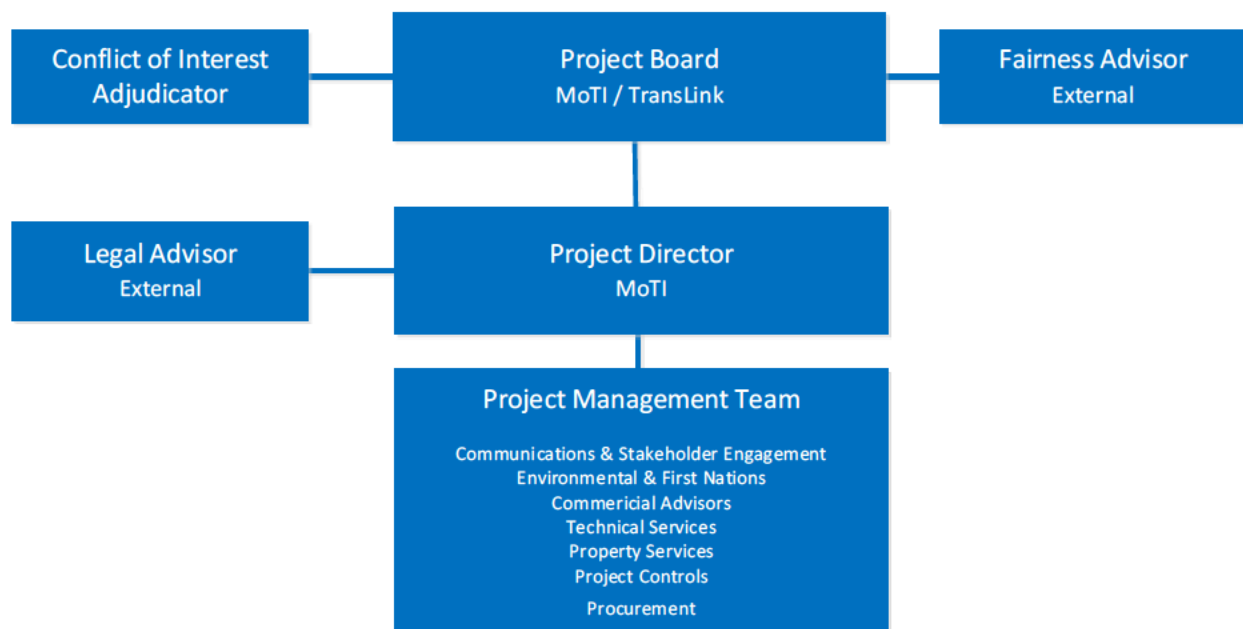
The Project will be delivered by the Province. The Board will ensure the Project complies with decisions and direction of government and will provide guidance with respect to significant events during project procurement and delivery.

Key matters for consideration and approval of the Board include:

- RFQ issuance;
- RFQ evaluation and selection of proponents to the RFP stage;
- RFP issuance;
- RFP evaluation and selection of Preferred Proponent;
- Approval to execute the Project Agreement; and
- Decisions on material Project issues.

A high-level governance structure for the Project is shown in Figure 12 below.

**Figure 12: Project Governance Structure**



## 10.4 PROJECT STAKEHOLDER AND PUBLIC COMMUNICATIONS AND CONSULTATION

### 10.4.1 Public Consultation Program

The public consultation and engagement program in support of the project was designed to meet best practices, including providing multiple opportunities and methods for participation, reporting back on the feedback received and outlining how this input was considered by the project team.

Replacement options for the aging Pattullo Bridge have undergone broad and extensive review, and there have been multiple opportunities for public input during the Pattullo Bridge Review Process and the current Pattullo Bridge Replacement Project.

There have been many rounds of consultation on the bridge. Since 2013, there were three rounds of engagement and consultation led by TransLink. There are two rounds led by the BCEAO as part of the environmental assessment of the project. The graphic below outlines opportunities for public input since 2013.

**Figure 13: Public Input Opportunities**

Planning			BC EAO Process	
Pattullo Bridge Review	Community Connections Consultation	Community Connections Phase 2 Consultation	B.C. Environmental Assessment Process	B.C. Environmental Assessment Process
<i>Joint review led by the City of New Westminster, the City of Surrey and TransLink</i>	<i>Led by TransLink</i>	<i>Led by TransLink</i>	<i>Public Comment Period on the draft Application Information Requirements</i>	<i>Public Comment Period on the Application for an EA certificate</i>
<b>Complete</b>	<b>Complete</b>	<b>Complete</b>	<b>Complete</b>	<b>Planned</b>
June 3 – 28, 2013	June 13–July 11, 2016	October 3–31, 2016	June 26–July 27, 2017	Spring 2018

Pro-active community consultation and community relations programs will continue throughout the Project. The Project team will continue to meet with local governments, Aboriginal groups, Metro Vancouver, TransLink, key stakeholder groups and the general public throughout the delivery of the Project.

On-going communications through the community relations program will continue to raise public awareness of the overall benefits of the Project. The Project will update stakeholders and the public on key milestones and events, and respond to inquiries on a timely basis. A key component of the community relations program will include a construction notification program.

## 10.5 ENVIRONMENTAL ASSESSMENT CONSULTATION

### 10.5.1 Advisory Working Group

The following government agencies, municipal and regional agencies, and Aboriginal Groups were invited by EAO and VFPA to become Advisory Working Group members for the Project, and have had the opportunity to review and comment on the draft VC Document:

Provincial Agencies:

- Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRO)
- Ministry of Environment-Climate Action Secretariat

Federal Agencies:

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

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>1</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 are listed in alphabetical order.

- Lake Cowichan First Nation;
- Lyackson First Nation;
- Musqueam Nation;
- Penelakut Tribe;
- Semiahmoo First Nation;
- Squamish Nation;
- Stz'uminus First Nation;
- Tsawwassen First Nation; and
- Tsleil-Waututh Nation.

The environmental, social, economic, heritage, and health components to be assessed as part of the Environmental Assessment Certificate Application (i.e. valued components or VCs), and the process followed in selecting and appropriately defining them, is described in detail in the VC Document.

In addition, a formal public comment period was held in 2017 and a second is planned for 2018 as part of the BCEAO process.

#### **10.5.2 BCEAO Environmental Assessment: Public comment period for the VC Document – June 26 to July 26, 2017**

B.C.'s Environmental Assessment Office (BCEAO) and the Vancouver Fraser Port Authority are coordinating the provincial-federal environmental assessment process for the Project. Prior to submission of an application (Application) for a certificate, BCEAO must first approve Application Information Requirements. Key to the Application Information Requirements is the identification of Valued Components to be studied and the areas within which the studies would occur.

This public comment period conducted by the BCEAO and Vancouver Fraser Port Authority gathered input about the VC Document which will shape the scope and nature of environmental studies required as part of the Application for an Environmental Assessment Certificate (EAC). The EA process examines projects for potentially adverse effects within five key areas: Environment, Economic, Social, Heritage and Health.

This public comment period followed the e-posting of the VC Document. The public and stakeholders had opportunities to attend open houses in Surrey and New Westminster, and to provide written comments to the BCEAO.

#### **10.5.3 Environmental Assessment: Public Comment Period for the Application for EAC**

This later stage of environmental assessment consultation will be more detailed than the initial public comment period and the complete application will be presented for public review.

The public comment period will focus on gathering public feedback regarding environmental effects-assessment studies, including mitigation, compensation related to specific impacts and proposed proponent commitments and assurances.

## 10.6 PERFORMANCE MEASUREMENT

Baselines and performance measures are fundamental to the monitoring and accountability of the Project when assessing whether goals are being achieved. The Project has developed a framework for evaluation that includes specific performance measures for each Project goal as shown in the table below.

**Table 20: Performance Measurements**

Goals	Project Objectives	Targets	Performance Measure
Provide a structurally sound bridge crossing to maintain a critical local and regional connection	Provide a river crossing for all modes that is structurally sound and meets current standards for withstanding seismic and ship impacts	Infrastructure built to current standards, including seismic and ship impact standards.	Design criteria.
	Support local and regional land use plans and economic development	Provide new regional road connections and improve existing regional connections.	Design criteria.
		Increase efficiency of goods movement.	Travel time studies.
Improve safety for all users with modern lane widths, road curvature, centre median and separated pedestrian and cyclist facilities	Provide reliable access and predictable travel times for all modes	Reduce traffic incidents from current levels at the bridge.	Analysis of ICBC incident records.
		Achieve reduced travel times compared with today.	Travel time studies.
	Minimize single-occupancy vehicle use and vehicle kilometers travelled	Improve cyclist and pedestrian facilities on the bridge.	Design criteria.
Improve connectivity, reliability and modal choice while supporting environmental objectives	Move toward the regional goal that by 2040, half of all trips will be by walking, cycling or transit	Increase cyclist and pedestrian traffic on the bridge.	Traffic counts.
	Minimize emissions of greenhouse gases and pollutants	Meet commitments and obligations in the environmental assessment approvals.	Inspection and reporting during construction.
	Minimize impacts to the natural environment		Post-construction review and verification.

Goals	Project Objectives	Targets	Performance Measure
	Support neighbourhood livability by minimizing and mitigating impacts, including during construction	Provide direct connections between the bridge and major routes on both sides of the bridge.	Design criteria.



## 11 FUNDING

The funding analysis in this section sets out the total funding required for the Project under a DBF delivery model including sources, uses and timing. The analysis also describes the Project's financial impact on the Province.

### 11.1 SOURCES OF FUNDS

The total cost of the Project, including procurement, project management, construction, removal of the existing bridge, and interest during construction is estimated at \$1.377 billion. The Project will be funded through Provincial debt. The DBF contractor will provide short-term private financing during construction that will repaid by the Province upon removal of the existing bridge.

**Table 21: Provincial Debt**

(Nominal \$ millions)

Provincial debt	(\$M)
Provincial borrowings (during construction)	\$1,077
Private Finance - DBF contractor (repaid after construction)	\$300
<b>Total Provincial debt (on completion)</b>	<b>\$1,377</b>

#### 11.1.1 Provincial funding

The Province through the BC Transportation Financing Authority (BCTFA) will borrow \$1.077 billion during the construction of the project and will borrow an additional \$300 million after completion of the removal of the existing bridge to repay the private financing of the DBF contractor. Total provincial debt on completion of the project is expected to total \$1.377 billion.

#### 11.1.2 Private Finance – DBF contractor

As described in Section 8.3, the DBF partner is anticipated to finance \$300 million of capital costs during the construction period, to be repaid upon removal of the existing bridge. Analysis was done that determined an optimal level of private finance of \$300 million is required to secure effective risk transfer and provide sufficient security for the Province.

#### 11.1.3 Federal funding

An application for Federal grant funding of approximately \_\_\_\_\_ from the National Trade Corridor Fund has been submitted. As the application is currently under review, the Business Case does not assume any federal funding. If received, federal contributions would reduce the Provincial funding required for the project.

## 11.2 PROJECT CASH FLOWS

The following table summarizes the cash flow required for the project during the procurement and construction and existing bridge removal periods, including interest during construction:

**Table 22: Project Cash Flow During Construction**

(Fiscal Year) (Nominal \$ millions, rounded)

Debt/Capital	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	Total
Total Provincial								1,377

## PART E – RECOMMENDATION

This Business Case demonstrates the need for the Pattullo Bridge Replacement Project to address the numerous transportation challenges with the existing crossing. A new four-lane bridge with improved network connections will meet current seismic and road design standards, provide a safe and reliable crossing for vehicles, pedestrians and cyclists and support transportation and economic development potential in the region.

This Business Case recommends proceeding with the Project at an estimated total cost of \$1.377 billion using the recommended DBF procurement model.