



ROBERTS BANK TERMINAL 2 PROJECT ENVIRONMENTAL IMPACT STATEMENT EXECUTIVE SUMMARY

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About the Executive Summary

This Executive Summary provides the key findings of the Environmental Impact Statement (EIS) for the proposed Roberts Bank Terminal 2 Project. It is presented in two parts: Part 1 provides an overview of the EIS and Part 2 includes a summary of results from the assessments carried out for intermediate and valued components as well as a summary of environmental management plans.

This Executive Summary fulfills the requirements for a summary of the EIS, per the “Guidelines for the Preparation of an Environmental Impact Statement for the Roberts Bank Terminal 2 Project” (issued January 7, 2014). The EIS and English and French language versions of this Executive Summary can be found on the Canadian Environmental Assessment Agency website at www.ceaa-acee.gc.ca, Reference Number: 80054.

1 INTRODUCTION

The Roberts Bank Terminal 2 Project (the Project) is a proposed new three-berth container terminal at Roberts Bank in Delta, B.C., on Canada's west coast. The Project would provide 2.4 million twenty-foot equivalent units (TEUs) of container capacity.

The Project would meet forecasted growth in container capacity demand. It is a key component of Port Metro Vancouver's Container Capacity Improvement Program (CCIP), a long-term strategy to deliver projects in support of Canada's trade objectives.

The Project would play a vital strategic role in Canada's trade through the Asia-Pacific Gateway and is aligned with federal and provincial government strategies to strengthen Canada's trade links with Asia. Delivery of the Project is consistent with Port Metro Vancouver's mandate under the *Canada Marine Act*.



REQUIREMENT FOR AN ENVIRONMENTAL ASSESSMENT

The Project is undergoing a federal environmental assessment by an independent review panel, under the *Canadian Environmental Assessment Act, 2012*.

The Project is also undergoing an assessment under the British Columbia *Environmental Assessment Act*.

The Project requires other permits and authorizations before it can proceed.

OVERVIEW OF THE ENVIRONMENTAL IMPACT STATEMENT

The Environmental Impact Statement (EIS) has been prepared according to the “Guidelines for the Preparation of an Environmental Impact Statement for the Roberts Bank Terminal 2 Project” (EIS Guidelines), issued by the Canadian Environmental Assessment Agency in January 2014. The EIS Guidelines define the scope of the Project to be assessed and identify the factors to be considered within the EIS.

The purpose of the EIS is to provide information about the Project, to identify potential effects and benefits of the Project, and to describe mitigation measures to reduce potential Project effects.

The EIS consists of the following volumes:

Volume 1 – Introduction and Project Information (Sections 1.0–7.0)

Volume 1 provides an introduction to the Roberts Bank Terminal 2 Project including its context, purpose and objectives. It contains a project overview, a discussion of the geographical setting and a project description. It also introduces Port Metro Vancouver as the project proponent, a summary of alternative means of carrying out the Project, the environmental assessment and permitting process for the Project, and the extensive engagement and consultation process that Port Metro Vancouver has undertaken with regulators, Aboriginal groups, local government and the public.

Volume 2 – Effects Assessment Methods and Physical Setting (Sections 8.0–9.0)

Volume 2 describes the methods used in the environmental assessment of the Project, including the approach and key steps in selecting valued components, identifying mitigation measures, and assessing potential Project-related changes and effects and cumulative effects. It includes an overview of the physical setting of the Project, describing climate, coastal conditions and geotechnical considerations in the vicinity of the Project. The volume contains assessments of physical intermediate components: air quality, noise and vibration, light, coastal geomorphology, surficial geology and marine sediment, marine water quality, and underwater noise.

Volume 3 – Biophysical Effects Assessments (Sections 10.0–17.0)

Volume 3 includes an overview of the Project’s marine and terrestrial setting, and effects assessments for the marine biophysical valued components: marine vegetation, marine invertebrates, marine fish, marine mammals, coastal birds, and ongoing productivity of commercial, recreational and Aboriginal fisheries. The volume also includes the approach to mitigating potential Project-related effects to these valued components.

Volume 4 – Socio-Economic Effects Assessments (Sections 18.0–28.0)

Volume 4 includes an overview of the Project's economic and social setting and an assessment of the intermediate component of population. The volume includes the effects assessments for socio-economic valued components: labour market, economic development, marine commercial use, local government finances, services and infrastructure, outdoor recreation, visual resources, and land and water use. It also contains the assessments of human health, and archaeological and heritage resources.

Volume 5 – Environmental Management, Aboriginal Rights and Interests, Conclusions and Summaries (Sections 29.0–35.0)

Volume 5 includes assessments regarding accidents or malfunctions, the effects of the environment on the Project, and potential effects on the current use of lands and resources for traditional purposes by Aboriginal people and the ability of Aboriginal people to exercise their asserted or established Aboriginal and treaty rights and related interests. It also includes summaries of the changes and effects on the environment and proposed mitigation, outlines Port Metro Vancouver's approach to environmental management, monitoring and follow-up, and describes the benefits of the Project to Canadians.

Field studies at Roberts Bank



2 THE ENVIRONMENTAL ASSESSMENT PROCESS

The environmental assessment process for the Roberts Bank Terminal 2 Project is anticipated to take two to three years. There will be multiple opportunities for public comment throughout the process.

Port Metro Vancouver submitted a Project Description to the Canadian Environmental Assessment Agency and the British Columbia Environmental Assessment Office in September 2013. Following a review of the Project Description, it was determined that the Project is reviewable under the *Canadian Environmental Assessment Act, 2012* and the British Columbia *Environmental Assessment Act*. The information presented in the EIS is intended to satisfy both federal and provincial environmental assessment requirements.

FEDERAL ENVIRONMENTAL ASSESSMENT

On January 7, 2014, the Minister of the Environment, who is responsible for the Canadian Environmental Assessment Agency (CEA Agency) referred the Project to an independent review panel, the most rigorous form of environmental assessment in Canada.

Following a public comment period, the final EIS Guidelines were issued on January 7, 2014, setting out the information Port Metro Vancouver must provide in the EIS.

The key steps and timelines for the federal environmental assessment process are summarized below.



Federal environmental assessment process for the proposed Roberts Bank Terminal 2 Project

PROVINCIAL ENVIRONMENTAL ASSESSMENT

On December 19, 2014, the B.C. Minister of Environment issued an order under section 14 of the British Columbia *Environmental Assessment Act*, establishing the Province's procedures and methods for conducting the environmental assessment for the Project.

The Minister ordered that:

- The scope of the Project is as defined by the Canadian Environmental Assessment Agency in the EIS Guidelines;
- The scope of the assessment must include factors established by the federal Minister and potential adverse environmental, economic, social, heritage and health effects, including cumulative effects, and practicable means to mitigate such potential adverse environmental effects, and potential adverse effects on Aboriginal groups;
- The B.C. Environmental Assessment Office will principally rely on the environmental assessment to be conducted by the federal review panel, and on consultation conducted by the Canadian Environmental Assessment Agency with Aboriginal groups whose interests are potentially affected by the Project; and
- The Environmental Assessment Office must make a recommendation to the B.C. Minister within 30 days of receiving notice of the decision from the federal Minister.

GUIDING PRINCIPLES

The development of the EIS was guided by four principles outlined in the EIS Guidelines:

1. **Use of environmental assessment as a planning tool** to ensure the Project is considered in a careful and precautionary manner in order to avoid or mitigate potential adverse effects, and to encourage the promotion of sustainable development;
2. **Provision of opportunities for meaningful public participation** that engage interested parties and provide a clear understanding of the proposed Project as early as possible in the review process;
3. **Engagement with Aboriginal people and groups** that may be affected by the Project or that have asserted or established Aboriginal and treaty rights and related interests in the Project area; and
4. **Application of a precautionary approach** to demonstrate how Port Metro Vancouver has examined and carefully planned all aspects of the Project.

3 PORT METRO VANCOUVER (THE PROPONENT)

The Vancouver Fraser Port Authority, doing business as Port Metro Vancouver, is a port authority created pursuant to the *Canada Marine Act* and is accountable to the federal Minister of Transport. The purpose of the *Canada Marine Act*, and Port Metro Vancouver's mandate, includes:

- Promoting the success of Canadian ports to contribute to the competitiveness, growth and prosperity of the Canadian economy;
- Ensuring marine transportation services satisfy the needs of users at a reasonable cost;
- Providing a high level of safety and environmental protection; and
- Managing marine infrastructure in a commercial manner, taking into account input from users and the community.

Port Metro Vancouver is a non-shareholder, financially self-sufficient corporation managing Canada's largest port.

Port Metro Vancouver is committed to the safe, efficient and environmentally responsible movement of goods and passengers through the port. Its mission is to lead the growth of Canada's Pacific Gateway in a manner that enhances the well-being of all Canadians and inspires national pride. Port Metro Vancouver's vision is to be recognized as a world-class gateway by efficiently and sustainably connecting Canada with the global economy, inspiring support from its customers and from communities locally and across the nation.

Collectively, Port Metro Vancouver, port terminals, shippers and other stakeholders help Canadian businesses export their goods and products, such as grain, coal, potash, pulp, oil and lumber, to markets around the world. Similarly, the port provides an entry point for imports, including construction and manufacturing inputs, agricultural products and consumer goods, including electronics, clothing, furniture and automobiles.

The port has long been the hub of one of North America's most important economic corridors. Including indirect and induced effects, the total benefits of ongoing operations at businesses related to Port Metro Vancouver across Canada are:

- 98,800 jobs;
- \$6.1 billion in wages; and
- \$9.7 billion in direct gross domestic product across Canada.

Each day, the port handles approximately a half billion dollars of cargo (\$187 billion a year, based on 2014 cargo volumes), which represents one-fifth of Canada's total foreign trade in goods by volume. In addition, Port Metro Vancouver supports Canadian trade by facilitating the building of port-related infrastructure necessary to connect Canada's markets to trading economies around the world, particularly those in the Asia-Pacific region.

Port Metro Vancouver is Canada's largest port, enabling Canadian businesses to deliver their goods and products to markets around the world while providing Canadian consumers and manufacturers with access to goods and products from the global marketplace.



Port Metro Vancouver's jurisdiction

Port Metro Vancouver's territorial jurisdiction includes the federal and other lands that it manages, together with the navigable waters over which it has navigation jurisdiction. Port Metro Vancouver's jurisdiction covers hundreds of kilometres of shoreline and extends from Point Roberts at the Canada/ U.S.A. border through Burrard Inlet to Port Moody and Indian Arm, and from the mouth of the Fraser River, eastward to the Fraser Valley, north along the Pitt River to Pitt Lake, and includes the north and middle arms of the Fraser River.

This jurisdiction borders 16 Metro Vancouver municipalities and one treaty First Nation, the Tsawwassen First Nation, and intersects the traditional territories of several Aboriginal groups. Working with a broad range of regulatory stakeholders, including municipalities and provincial and federal agencies, Port Metro Vancouver develops and implements effective marine safety rules and procedures and maintains a 24-hour operations centre.



Port Metro Vancouver has created a suite of industry-leading programs to promote a healthy ecosystem, minimize environmental impacts from port operations and grow a sustainable gateway. These programs include:

- **Air Action Program**, which focuses on reducing air emissions from ocean-going vessels, cargo handling equipment, and rail and truck sectors;
- **Energy Action Program**, which focuses on promoting energy conservation and the use of reliable, clean energy across port operations;
- **Habitat Enhancement Program**, which focuses on creating and enhancing fish and wildlife habitat;
- **Noise Monitoring Program**, which allows Port Metro Vancouver to obtain and record existing noise levels and to identify where operational improvements might be possible to help reduce noise; and
- **Enhancing Cetacean Habitat and Observation (ECHO) Program**, a collaborative research and management initiative to coordinate the efforts and resources of multiple interests to better understand and manage the potential threats to at-risk marine mammal species that may arise from commercial vessel activities throughout the southern coast of B.C.

More information about Port Metro Vancouver's environmental initiatives and programs can be found at portmetrovancover.com.



4 RATIONALE FOR THE PROJECT

PURPOSE OF THE PROJECT

Port Metro Vancouver proposes to build the Roberts Bank Terminal 2 Project to meet increasing demand for containerized trade on the west coast of Canada and to continue to maximize the potential economic and competitive benefits of the port.

WEST COAST CONTAINER TRAFFIC FORECASTS

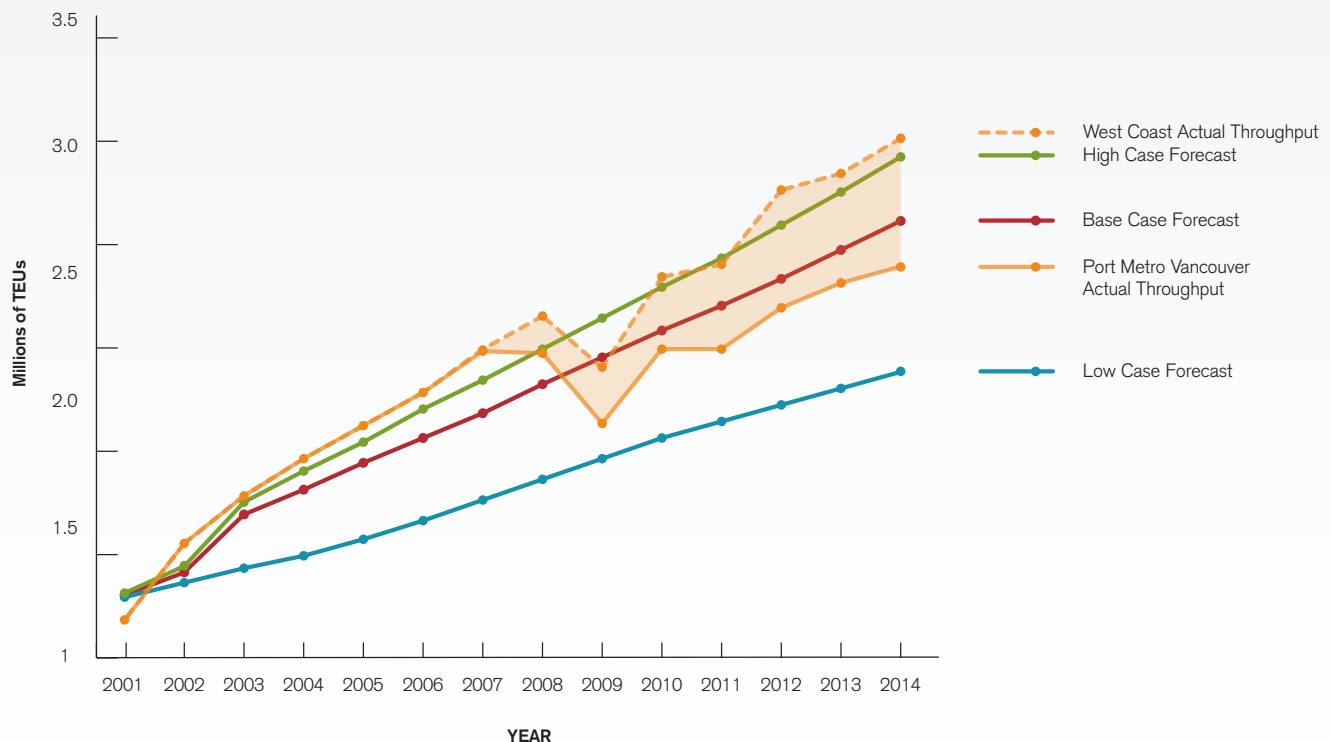
In 2001, Ocean Shipping Consultants, internationally recognized experts in global transportation economics and logistics, forecasted low case, base case and high case container traffic scenarios for Canada's west coast.

The figure below demonstrates the robustness and accuracy of the forecasts. Actual west coast container traffic remains closely aligned with, and has in many years exceeded, the high case forecast, with the exception of the decrease in container volumes that occurred in 2009 in association with the global financial crisis.

In 2014, container terminals on Canada's west coast handled a total of 3.5 million TEUs, of which terminals within Port Metro Vancouver's jurisdiction handled 2.9 million TEUs.

While improvements to existing infrastructure will help alleviate capacity constraints in the short term, the Roberts Bank Terminal 2 Project is required to meet longer term forecasted container demand.

Canadian West Coast Container Traffic: Forecast (2001) and Actual Traffic Throughput



Note: Based on source data presented by Ocean Shipping Consultants, 2013. The Fairview Container Terminal (Port of Prince Rupert) opened in 2007. From 2007 onwards, the dotted line showing West Coast Actual Throughput includes Port Metro Vancouver and Port of Prince Rupert.

Annual forecasts undertaken since 2011 show demand for container traffic on Canada's west coast is expected to keep growing. These forecasts consider many factors that influence container traffic demand, including:

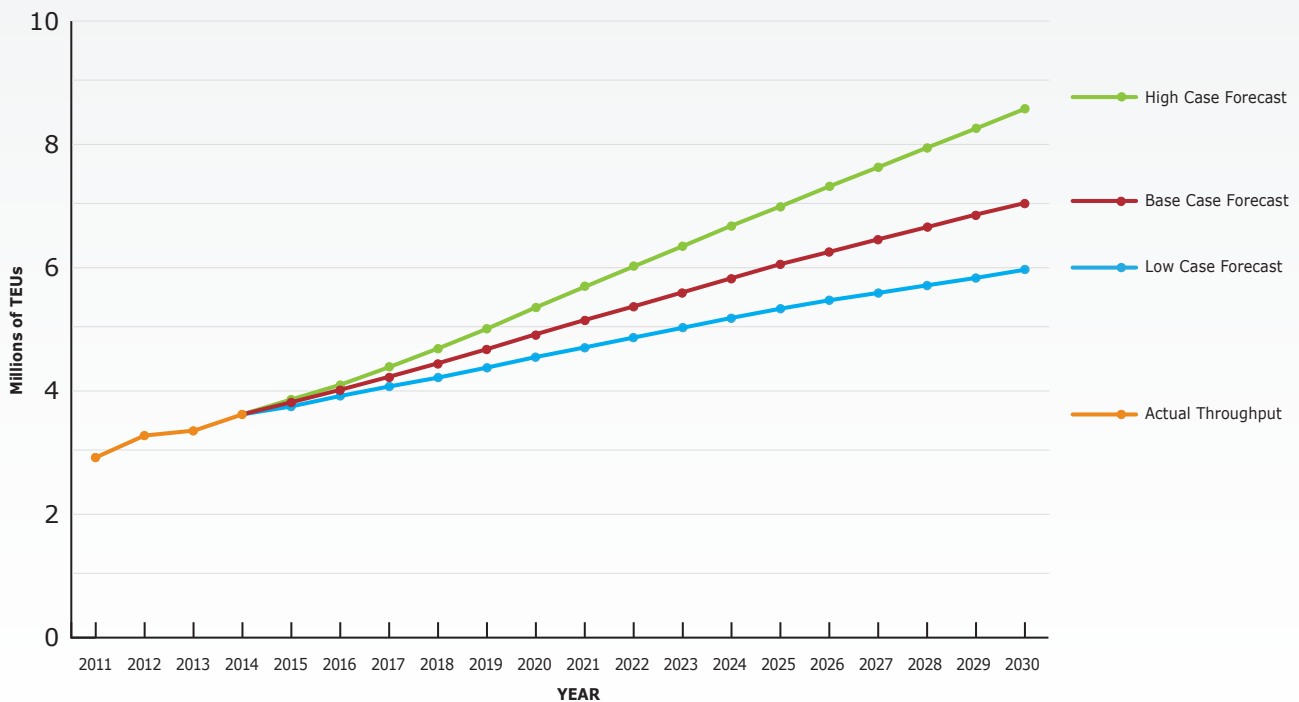
- GDP growth;
- World demand for Canadian resources;
- Increased consumer demand for trade with Asia;
- Widening of the Panama Canal;
- Planned container terminal expansion at the Port of Prince Rupert;
- Macroeconomic trends in North America;
- North American container port demand;
- Competitive developments at other ports;

- Trends in container shipping; and
- Port Metro Vancouver's competitive position, compared to other North American ports.

Under the base case outlined in a 2014 forecast undertaken by Ocean Shipping Consultants, container traffic on Canada's west coast is predicted to grow at an average of 4.5 per cent per year to over 6.0 million TEUs by 2025 and 7.0 million TEUs by 2030.

Port Metro Vancouver remains a highly competitive option for import and export container volumes moving forward. Considering the base case, terminals within Port Metro Vancouver's jurisdiction are projected to be handling almost 5.0 million TEUs per year by 2025.

Canadian West Coast Container Traffic: Forecast (2014)



Source: Ocean Shipping Consultants, 2014

ALTERNATIVE LOCATIONS FOR INCREASING CONTAINER CAPACITY IN B.C.

As part of Project planning, Port Metro Vancouver identified and considered options for increasing container capacity in B.C. to meet forecasted demand.

Potential alternatives were reviewed to determine their technical and economic feasibility. The following table summarizes the review of alternative locations.

ALTERNATIVE	LOCATIONS CONSIDERED	CONCLUSIONS
Increase capacity and efficiency at existing container terminals within Port Metro Vancouver's jurisdiction	Increase capacity at Deltaport Terminal	Incremental capacity and efficiency increases are planned or underway at Deltaport Terminal and Centerm. These projects will help meet short-term container demand to the early 2020s, but will not meet forecasted longer term requirements.
	Increase capacity at Centerm	
	Increase capacity at Vanterm	Land tenures on properties adjacent to Vanterm will be in place until at least the late 2020s. If improvements at Vanterm were feasible at that time, they would require the conversion of adjacent facilities and would not provide increased capacity until sometime after 2030.
	Increase capacity at Fraser Surrey Docks	Some container ships, such as the largest ships visiting Deltaport Terminal, Centerm and Vanterm, cannot be accommodated in the Fraser River channel due to draught requirements and the length of ships (inability to turn around in the river). Fraser Surrey Docks is not expected to be a major source of container capacity to meet demand beyond 2018.

A new terminal at Roberts Bank is the only technically and financially feasible option to provide the necessary long-term container capacity on the west coast of Canada.

ALTERNATIVE	LOCATIONS CONSIDERED	CONCLUSIONS
Convert existing terminals or properties within Port Metro Vancouver's jurisdiction to handle containers	Convert Lynnterm terminal to handle containers	Conversion of this terminal to handle containers is not technically or financially feasible: road constraints limit the ability of Lynnterm to accommodate container truck traffic, and conversion to containers would conflict with other priorities for this terminal (i.e., handling bulk commodities in addition to retaining existing breakbulk handling).
	Develop vacant site at Fraser Richmond properties	Development of this site to provide large-scale container capacity is not technically feasible: road and rail capacity is constrained at the property and larger container ships cannot be accommodated in the Fraser River channel due to draught requirements and the length of ships.
Build a new terminal within Port Metro Vancouver's jurisdiction	Construct a new terminal at Roberts Bank	Roberts Bank is an established trade corridor that is well positioned to accommodate future growth in containerized trade, as it provides connections to an existing road and rail network and deep water capable of handling large container ships.
Other west coast alternatives outside of Port Metro Vancouver's jurisdiction (Not feasible for Port Metro Vancouver to undertake)	Increase capacity at Fairview Container Terminal within the jurisdiction of the Prince Rupert Port Authority	Planned expansions at the Fairview Container Terminal in Prince Rupert will help meet short-term container demand to the early 2020s, but will not meet forecasted longer term requirements.

NEED FOR THE ROBERTS BANK TERMINAL 2 PROJECT

The figure below shows recent, current and proposed improvements to increase container capacity within Port Metro Vancouver's jurisdiction, and the planned expansion at the Fairview Container Terminal in Prince Rupert. Even with these developments, Canada's west coast will need additional container capacity by the early to mid-2020s. Port Metro Vancouver's analysis concludes the Roberts Bank Terminal 2 Project is the only viable alternative to provide this capacity.

The Roberts Bank Terminal 2 Project would provide an additional 2.4 million TEUs of container capacity per year. In doing so, it would drive economic growth and increase employment while supporting the ongoing promotion and protection of Canada's trade objectives.

Practical capacity is defined as 85 per cent of maximum capacity.

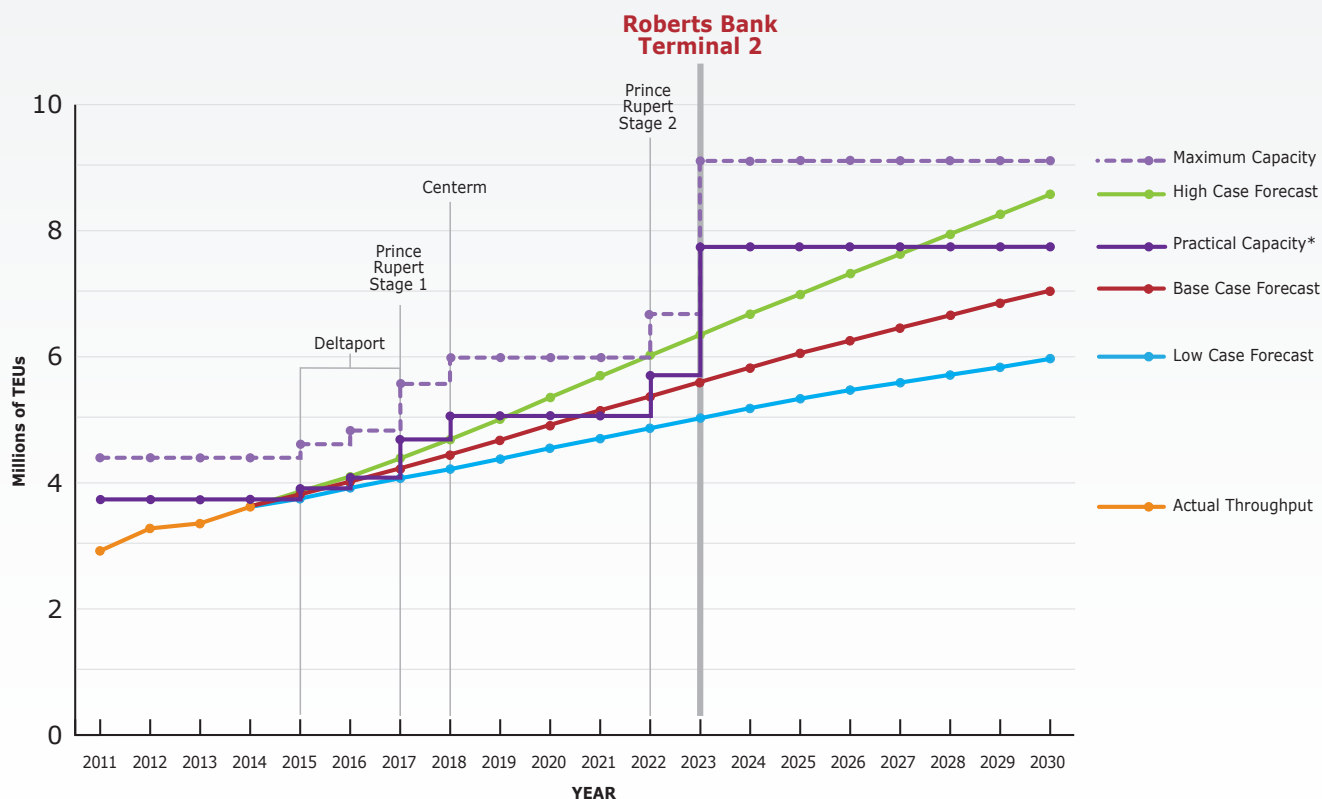
When terminals operate above practical capacity for extended periods of time, inefficiencies, which often occur elsewhere in the transportation chain, cannot be accommodated. Considering the base case for forecast demand, the west coast of Canada will be operating near or above practical capacity at several points until improvements to existing terminals are completed.

Assuming the base case forecast, the full practical capacity of the Project would be required shortly after 2030.

Without the capacity the Project would provide, the west coast of Canada would have insufficient capacity to accommodate forecasted growth in containerized trade. This constraint would lead to inefficiencies in the container supply chain and increased costs to Canadian exporters and consumers.

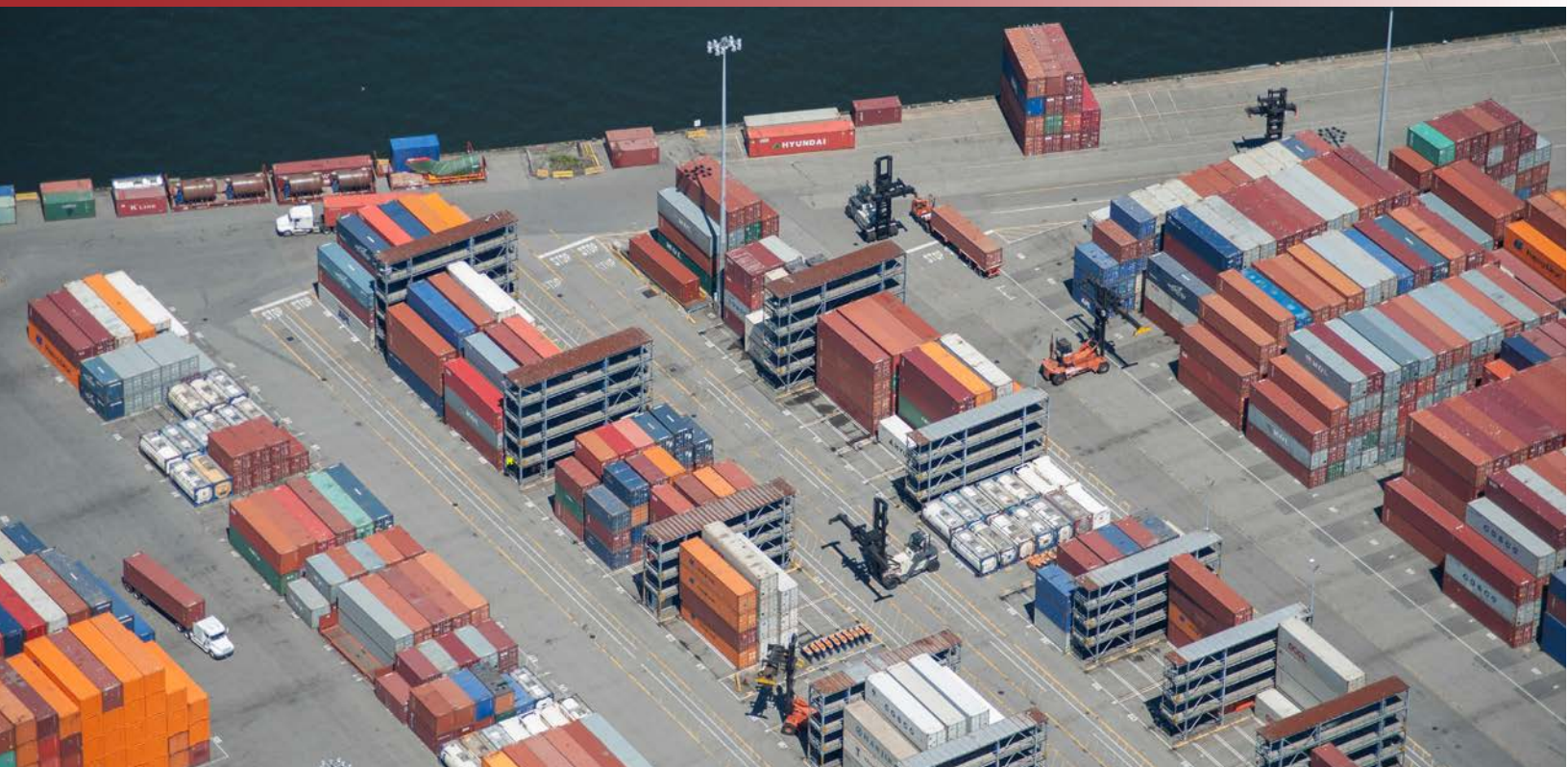
The Roberts Bank Terminal 2 Project would provide an additional 2.4 million TEUs of container capacity per year.

Canadian West Coast Container Traffic: Forecast (2014) and Planned Capacity Increases



Source: Ocean Shipping Consultants, 2014

*Practical capacity is calculated as 85 per cent of maximum capacity.



OBJECTIVES OF THE ROBERTS BANK TERMINAL 2 PROJECT

Port Metro Vancouver has five main objectives with respect to the Project:

1. **Meet demand for containerized trade growth on behalf of Canada and Canadians.** Additional container capacity will be required on Canada's west coast by the early to mid-2020s.
2. **Ensure sustainable development objectives continue to play a key role in the design and operation of the Project – considering environmental, social and economic factors.**
Port Metro Vancouver is committed to maintaining a healthy environment and minimizing the environmental impact of port operations.
3. **Provide economic benefits, including job creation, to the region, British Columbia and Canada.**
The Project will create employment during construction and operation and will facilitate trade.
4. **Improve the efficiency of moving goods at Roberts Bank, including marine traffic and on-terminal operations.** The Project will ensure the continued efficiency of ship-to-shore container movements at Roberts Bank.
5. **Align with federal and provincial strategies to continue to strengthen Canada's Asia-Pacific Gateway.** The Project aligns with Canada's Global Markets Action Plan, the New Building Canada Plan and the Asia-Pacific Gateway and Corridor Initiative. The Project further supports provincial strategies such as The Pacific Gateway Transportation Strategy 2012-2020, the BC Jobs Plan and, most recently, B.C. on the Move: A 10-Year Transportation Plan.

5 PROJECT PROCUREMENT

Port Metro Vancouver has initiated Project procurement, in parallel with the environmental assessment process, to ensure that the capacity provided by the Project can be available when it is required in the mid-2020s. This approach, consistent with large infrastructure projects across Canada, would allow Port Metro Vancouver to have the necessary contracts and funding in place shortly after the conclusion of the environmental assessment process. Subject to environmental permits and approvals and a final investment decision, construction of the Project could begin in 2018 and would take approximately five-and-a-half years to complete.

Port Metro Vancouver is undertaking two separate procurement processes to select a terminal operator and an infrastructure developer:

- **Terminal Operator:** Port Metro Vancouver began the process of selecting a terminal operator in 2013. For a period of up to 40 years, the terminal operator would be responsible for terminal facilities, equipment and ongoing container handling operations. The terminal operator would provide Port Metro Vancouver with lease payments, as well as volume-based fees and charges, the form and amount of which will be one of the key selection criteria in the procurement process.
- **Infrastructure Developer:** The infrastructure developer would be procured through a separate competitive process following the selection of a terminal operator. The infrastructure developer would be responsible for designing, building, financing and maintaining the terminal land and related infrastructure, including the berth structure. Once the Project was operational, and subject to ongoing availability and functioning of the terminal, Port Metro Vancouver would make regular payments to the infrastructure developer over a period of up to 40 years.

This approach was selected to provide Port Metro Vancouver with integrated long-term contracts and financial accountability during Project development and operation.

The Project would be privately funded.

6 PROJECT SETTING

Roberts Bank is part of a dynamic estuary located within the Fraser River delta. Existing port, road and rail infrastructure at Roberts Bank make it an established trade gateway for seagoing ships and a vital part of the Asia-Pacific Gateway. Terminals at Roberts Bank are located adjacent to major transportation corridors, including the new South Fraser Perimeter Road (Highway 17), and the Roberts Bank Rail Corridor, with its recently completed road and rail improvements.

Most of the Project would be constructed on submerged federal lands managed by Port Metro Vancouver. A portion of the terminal would be constructed on submerged provincial Crown lands. Lands owned by the British Columbia Railway Company would be required to accommodate widening of the causeway. Port Metro Vancouver is currently negotiating with the Province to acquire tenure of these lands, in the event of approval of the Project.

Roberts Bank supports a diverse and productive ecosystem, including sandflats and mudflats, eelgrass meadows, estuarine marsh and salt marsh. The area is bordered by agricultural lands and the deep waters of the Strait of Georgia, which support productive commercial, recreational and Aboriginal fisheries for species such as Dungeness crab and Pacific salmon.

The Fraser River delta, including Roberts Bank, supports globally significant populations of migratory and overwintering birds, as well as marine mammals and other wildlife, estuarine and marine vegetation, invertebrates and fish.

Aboriginal peoples have inhabited the Fraser River estuary, including the lands surrounding Roberts Bank, for thousands of years, relying on the intertidal and marine environments for sustenance and well-being. Descendants of the cultural group known as Coast Salish have inhabited, utilized and shaped the cultural history of the Roberts Bank area.

Communities located in proximity to the Project include the Tsawwassen First Nation and, within the Corporation of Delta, the communities of Ladner, Tsawwassen and North Delta. Other municipalities in the region of the Project include the City of Richmond, City of Surrey, City of Langley, Township of Langley and City of White Rock. Communities located in Washington state in proximity to the Project include Point Roberts, Birch Bay and Blaine. The closest permanent residences to the Project are located in the Tsawwassen First Nation community. The Project is located within or near the asserted traditional territories and reserve lands of other Aboriginal groups.



Existing Roberts Bank terminals

7 PROJECT COMPONENTS AND ACTIVITIES

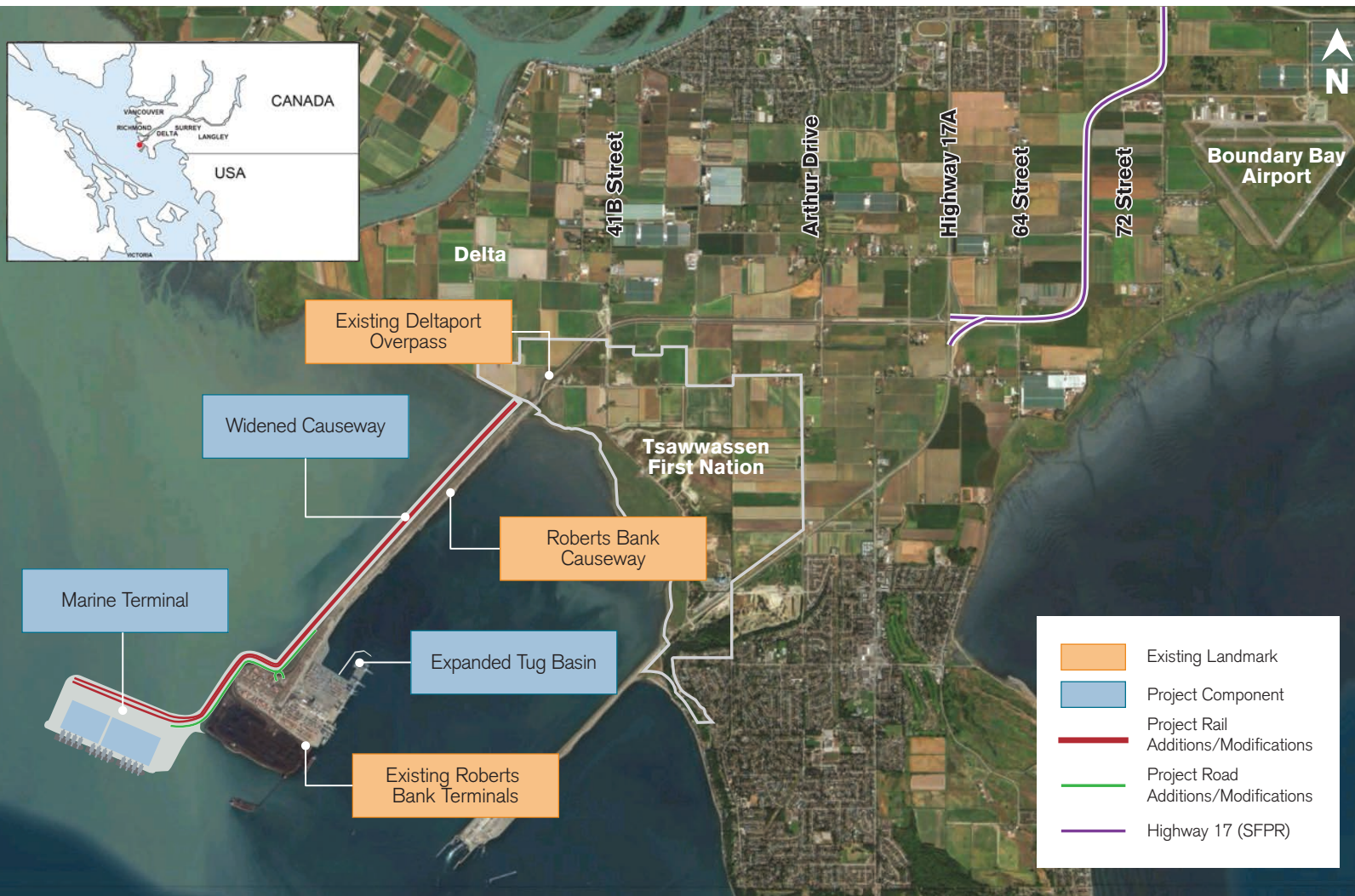
The Project consists of three main components:

1. A new three-berth **marine container terminal**;
2. A **widened causeway** to accommodate additional road and rail infrastructure; and
3. An **expanded tug basin** to accommodate a second tug operations contractor.

A video showing the Project components can be found in the About the Project section of the Project website at portmetrovanancouver.com/RBT2.

Final designs of these components would be produced by the terminal operator and infrastructure developer and would include refinements that may be required as conditions associated with federal and provincial environmental approvals.

The scope of the Project for the purposes of the environmental assessment includes all Project components and physical activities outlined in the EIS Guidelines, including marine, road and rail transportation within Port Metro Vancouver's jurisdiction.



The three-berth marine terminal would accommodate three fully laden container ships and provide connections for shore power.

1. MARINE TERMINAL

The three-berth marine terminal would be located immediately west of the existing Roberts Bank terminals, approximately 5.5 kilometres from the east end of the causeway. The terminal would be rectangular in shape, approximately 1,700 metres long and 700 metres wide, and would support moorage of three container ships on the south side, container storage in the centre and rail intermodal yards on the north side. The total usable above-water area of the marine terminal would be 108 hectares.

The marine terminal would include the following features:

- Berth pocket and marine approach areas with sufficient depth to accommodate the safe navigation of fully laden ultra-large container ships;
- Shore power connections at all three berths in order for ships to plug into land-based electrical power and shut off their diesel engine-powered generators;
- Ship-to-shore gantry cranes and mobile horizontal-transfer equipment;
- Container storage yard and associated container handling cranes;
- Transfer area between container storage yard and trucks;
- Two rail intermodal yards equipped with rail-mounted gantry cranes to transfer containers between railcars and mobile horizontal-transfer equipment;
- A multi-lane truck gate equipped with security and inspection features;

- Site security systems, such as radiation portal monitors, video surveillance, vehicle and cargo inspection system facilities, and perimeter fencing;
- Services and infrastructure, including potable and firefighting water distribution, wastewater and storm-water management systems, a wastewater treatment plant, power and lighting, and terminal equipment fuelling facilities; and
- Support facilities, such as an administration and operations building, maintenance and repair facilities, a longshore break room and a Canada Border Services Agency building.

The development of land for the marine terminal would use material from Project construction dredging, and sand from the annual Fraser River Maintenance Dredging Program, an existing non-Project-related program carried out to maintain the shape and safe depths of Fraser River shipping channels. The sand would be transported to the Project site and stored at a temporary underwater location east of the existing Roberts Bank terminals. Additional required fill material, such as rock, gravel, rip-rap and sand, would be sourced from existing quarries. Fine sediments generated during dredging and soil densification activities would require disposal at sea.

Electrical power for the marine terminal would be provided through the existing BC Hydro transmission line on the Roberts Bank causeway. The power feed to the on-terminal main substation would be via an underground cable transitioning from the existing overhead line distribution point near Deltaport Terminal's Gate 2. No new overhead transmission lines would be required.

2. WIDENED CAUSEWAY

The Roberts Bank causeway would be widened to link existing road and rail networks to the marine terminal and to accommodate additional road and rail infrastructure. Widening would range from zero metres to approximately 140 metres at the widest point.

Construction activities would be undertaken in a staged manner and would rely on aggregate supply from existing quarries and sand from the Fraser River Maintenance Dredging Program.

Road, rail and utility infrastructure such as water and electrical services would be constructed once the land development was complete.

Rail additions and improvements on the widened causeway include:

- Two new lead rail tracks connecting the on-terminal intermodal yards to an on-causeway support and switching yard (T-Yard);
- T-Yard with support, switching and lead rail tracks;
- A new setout yard for mainline locomotives;
- A repair yard for railcars; and
- Two lead tracks that connect the T-Yard to two tie-in points on the existing rail network.

Road additions and improvements on the causeway include:

- An overpass to safely separate road traffic bound for the Project from traffic to the existing terminals;
- A three-lane access road to the terminal that incorporates a vehicle access and control system gate for security; and
- A two-lane gravel emergency access road.

3. EXPANDED TUG BASIN

An expansion of the existing tug basin would accommodate additional tugboats, necessary to efficiently and safely assist in the arrival and departure of ships calling at the new terminal.

The expansion would allow for separate access gangways and pontoon floats, and would include sufficient moorage for the existing and an additional tug operation contractor.

Construction would include dredging and the installation of crest protection rip-rap to protect existing mudflats from scouring during ebbing tides.

The extent of widening along the causeway would vary to minimize the Project footprint while meeting the infrastructure requirements of the Project.

The expanded Roberts Bank tug basin would accommodate additional tugboats to efficiently and safely assist in the arrival and departure of ships calling at the existing and new terminals.

Construction activities would take about five-and-a-half years and would accommodate fisheries closure periods.

CONSTRUCTION ACTIVITIES

Project construction is anticipated to take five-and-a-half years, and is scheduled to start in 2018, subject to environmental approvals, permits, market conditions and a final investment decision to proceed. The construction schedule and work activities would accommodate fisheries closure periods. In addition, stoppages of marine-based work would occur in accordance with a Project Marine Mammal Observation Plan.

Project component construction activities include containment dykes, dredging, soil densification, sand storage and reclamation, and caisson installation and piling, as well as development of buildings, equipment, and road and rail infrastructure.

Temporary construction infrastructure and facilities, necessary for the construction of the new terminal and widened causeway, would be removed once all Project components are complete.

TERMINAL OPERATION

The terminal container handling systems, including maintenance activities, would be operational within six months after completion of construction.

The four main operational activities include:

Container Ship Manoeuvring

It is estimated the new marine terminal would handle up to 260 container ship calls per year at full capacity. Depending on wind and wave conditions, two or three large berthing or escort tugs would manoeuvre a ship into or away from its assigned berth. Line boat tugs may also assist in moving the mooring lines from the container ship to the bollards or mooring dolphin, depending on the ship's assigned berth.

Marine Terminal Operation

The terminal is currently designed to be semi-automated, with ship-to-shore gantry cranes being manually operated. Manual operations would be monitored, and automated equipment would be controlled through terminal operating and computerized automation control systems, which would track container movements into and out of the terminal, as well as container storage locations within the container storage yard, plus control the automated equipment. The degree of automation and type of terminal operating systems would be determined by the terminal operator.

The terminal is designed to operate 24 hours per day throughout the year.

Railway Switching and Container Hauling

Approximately 30 per cent of loaded export containers would be brought to the terminal by rail (via Canadian National Railway or Canadian Pacific Railway), along with empty containers to supply the local export market. Approximately 65 per cent of the imported containers would be moved from the terminal by rail.

There would be four trains per average day, and five trains per peak day, in each direction serving the Project (for a total of eight train movements per average day, or 10 train movements per peak day). Train lengths to and from the Project are expected to be between 8,000 and 12,000 feet (approximately 2,440 and 3,660 metres) long.

Container Movement by Truck

Approximately 70 per cent of loaded export containers would arrive at the terminal by truck. Approximately 35 per cent of the imported containers and approximately half of the empty containers returned by rail would be moved from the terminal by trucks.

On an average day, an estimated 3,700 one-way truck trips would occur at the marine terminal, and up to 5,100 truck trips on a peak operating day, based on an assumed five-day week for truck gate operations.



8 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

The Project design assessed in the EIS is the result of a detailed analysis of various location, orientation, layout and configuration alternatives that minimize potential Project-related effects while enhancing operational efficiencies.

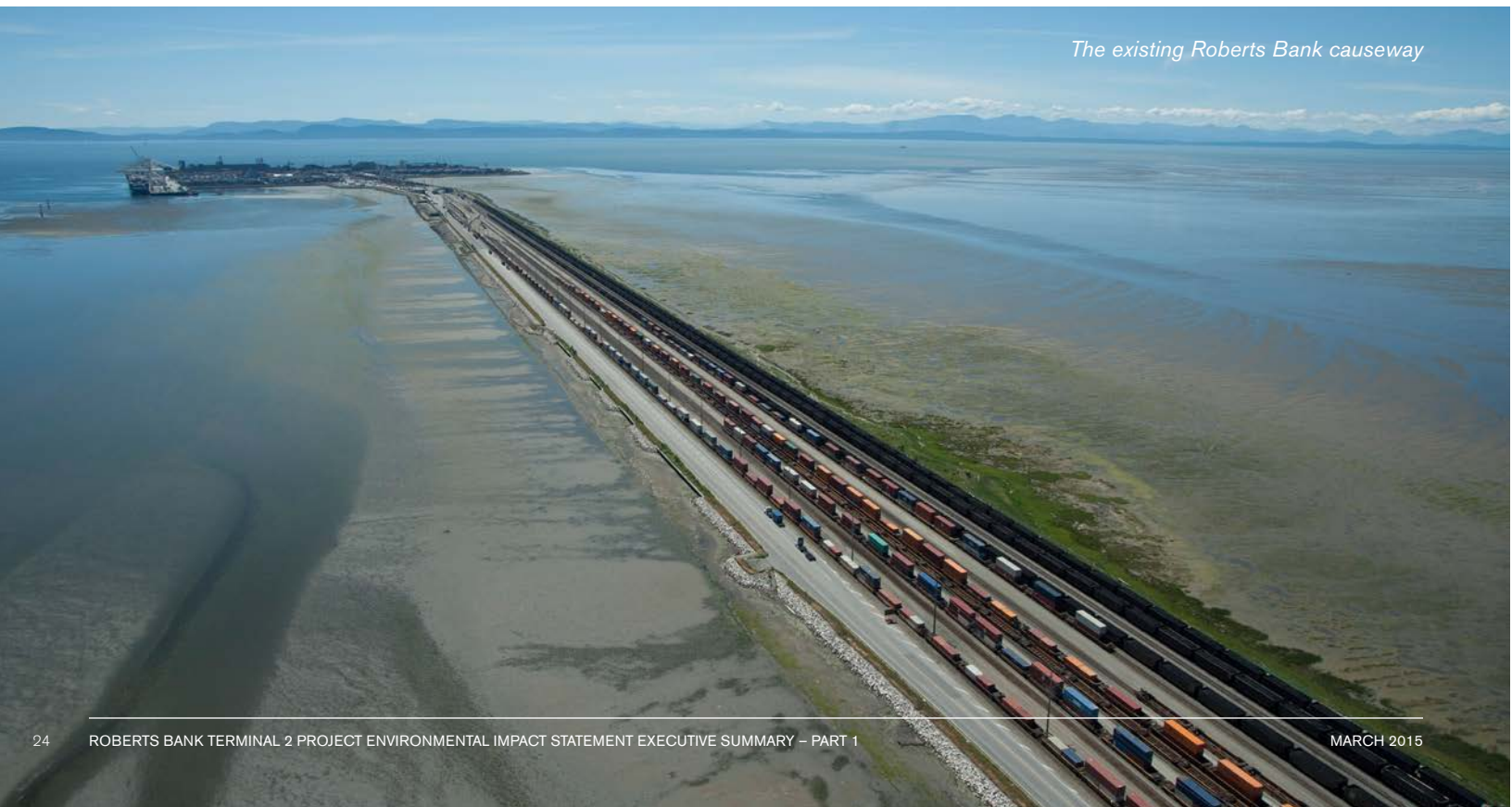
The consideration of alternative design configurations and construction approaches resulted in the preferred Project design presented and assessed in the EIS.

The Project design minimizes potential Project-related effects while enhancing operational efficiencies. As an example, the proposed location of the marine terminal is almost entirely in subtidal waters at Roberts Bank to avoid impacts to sensitive intertidal habitat. This location would also require substantially less dredging and would allow ships to navigate safely without the need of a turning basin.

A number of location, orientation, layout and configuration alternatives were considered and assessed for the marine terminal (including berth pocket and marine approach areas), causeway, rail and road corridors, and the tug basin.

Alternative construction approaches considered include: dredging alternatives and methods; temporary sand storage locations; construction methods for the supporting land, marine terminal, associated three-berth wharf and widened causeway; disposal of sediments; and expansion of the existing tug basin.

The effects of feasible alternatives were considered based on their potential to directly or indirectly affect natural and human environment components. The anticipated effects were considered key factors when comparing and determining preferred means.



The existing Roberts Bank causeway

9 PROJECT BENEFITS

The Project would provide benefits to Canada, B.C. and Metro Vancouver as a result of accommodating increased demand for trade, supporting economic growth, providing employment opportunities during the Project's construction and operation phases, and providing legacy benefits to neighbouring communities.

BENEFITS DURING CONSTRUCTION

During a five-and-a-half-year construction period, the Project would generate significant employment benefits for British Columbia. Project construction would generate an estimated total of 12,719 person-years of direct, indirect and induced employment of B.C. workers.

Project construction would generate a total of 12,719 person-years of direct, indirect and induced employment.

EMPLOYMENT DURING CONSTRUCTION (PERSON-YEARS)			
	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
Direct	4,150	0	4,150
Indirect	3,942	2,322	6,264
Induced	1,632	673	2,305
Total	9,724	2,995	12,719

The construction period would generate approximately \$1 billion in wages, \$1.3 billion in provincial gross domestic product (GDP) and \$3.65 billion in total economic output.

ECONOMIC OUTPUT DEVELOPMENT BENEFITS DURING CONSTRUCTION (\$ MILLIONS)			
	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
LABOUR INCOME			
Direct	494	0	494
Indirect	247	127	374
Induced	83	46	129
Total	824	173	997
GROSS DOMESTIC PRODUCT			
Direct	496	0	496
Indirect	418	198	616
Induced	149	76	225
Total	1,063	274	1,337
ECONOMIC OUTPUT			
Direct	1,945	0	1,945
Indirect	837	507	1,344
Induced	238	123	361
Total	3,020	630	3,650

Government revenues from taxes paid by construction employers, suppliers and Project-associated workers would be approximately \$300 million.

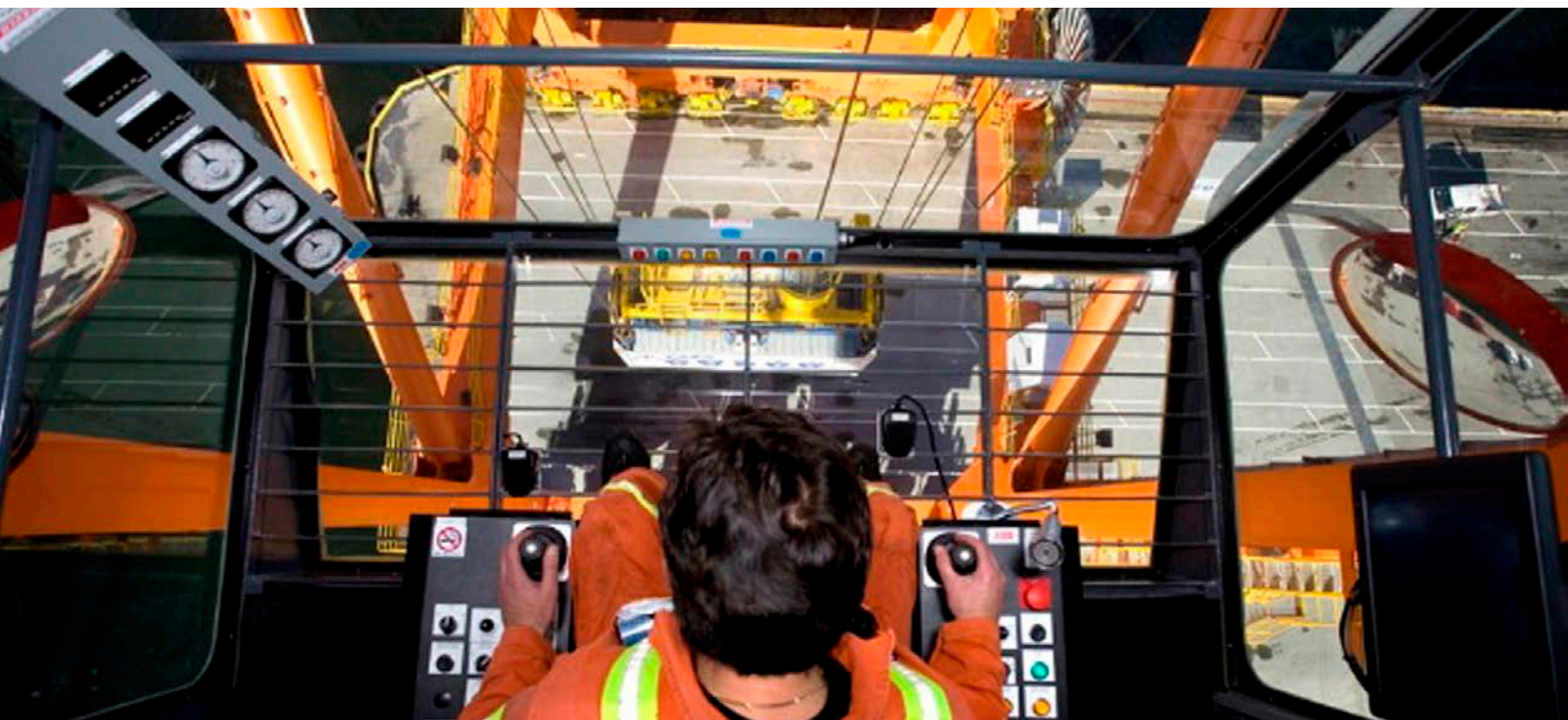
GOVERNMENT REVENUE DURING CONSTRUCTION (\$ MILLIONS)	
Federal Government	127.4
B.C. Government	154.3
Local Government	19.6
Total	301.3

BENEFITS DURING OPERATION

During the operation phase, on-terminal activities would generate an annual total of 1,553 person-years of direct, indirect and induced employment.

EMPLOYMENT DURING OPERATION ¹ (PERSON-YEARS PER YEAR)			
	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
Direct	835	93	928
Indirect	109	5	114
Induced	468	43	511
Total	1,412	141	1,553

¹ On-terminal and off-terminal (outside of the Project scope) activities associated with increased demand for approximately 2 million TEUs per year of containerized trade would support approximately 12,400 direct, indirect and induced person-years of employment and \$813 million in wages annually. Off-terminal activities include services provided by truck drivers, harbour pilots, tugboat operators, the Canada Border Services Agency, railways, transload and distribution facility operations, and container storage yards, and would generate an estimated 6,700 person-years of direct, 3,100 person-years of indirect and 1,050 person-years of induced employment annually, an estimated total of 10,850 person-years.



On-terminal activities during operation would account for approximately \$186 million in wages, \$212 million in provincial GDP and about \$291 million in total economic output each year.²

ECONOMIC OUTPUT DEVELOPMENT BENEFITS DURING OPERATION (\$ MILLIONS PER YEAR)			
	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
LABOUR INCOME			
Direct	138.1	15.3	153.4
Indirect	5.6	0.4	6.0
Induced	25.8	0.4	26.2
Total	169.5	16.1	185.6
GROSS DOMESTIC PRODUCT			
Direct	139.8	15.5	155.3
Indirect	9.2	1.5	10.7
Induced	44.8	0.9	45.7
Total	193.8	17.9	211.7
ECONOMIC OUTPUT			
Direct	184.1	0	184.1
Indirect	31.2	2.2	33.4
Induced	71.3	2.0	73.3
Total	286.6	4.2	290.8

Annual average tax payments to the three levels of government by the terminal operator, infrastructure developer, suppliers and Project-associated workers would be approximately \$42 million.

GOVERNMENT REVENUE DURING OPERATION (\$ MILLIONS PER YEAR)	
Federal Government	22.4
B.C. Government	12.8
Local Government	6.9
Total	42.1

² On-terminal and off-terminal activities would generate an estimated annual average of \$1.22 billion in GDP and \$2.36 billion in total economic output. Off-terminal activities associated with increased demand for approximately 2 million TEUs per year of containerized trade would generate an estimated annual average of \$1.01 billion in GDP and \$2.07 billion in total economic output.

BENEFITS TO ABORIGINAL PEOPLES

In 2004, Port Metro Vancouver entered into a Memorandum of Agreement with the Tsawwassen First Nation. The purpose of the Agreement is to set out the basis for Tsawwassen First Nation to benefit from the Deltaport Third Berth Project and the Roberts Bank Terminal 2 Project and to provide a basis for a mutually beneficial relationship. The Memorandum of Agreement addresses mitigation measures, compensation for potential infringements, business development opportunities and employment opportunities.

Port Metro Vancouver is working with other Aboriginal groups to facilitate access to Project benefits, including training, employment opportunities and Project contracting opportunities.

COMMUNITY LEGACY BENEFITS

On an annual basis, Port Metro Vancouver contributes up to 1 per cent of its net income to support communities through a broad-ranging Community Investment Program. The contributions are based on three pillars:

- **Community Enrichment:**
Port Metro Vancouver embraces inclusion, diversity, cultural and community activity, and convening local residents to participate in experiences that are authentic to a port city and that enhance quality of life.
- **Education and Training:**
Port Metro Vancouver encourages education, awareness and training, and is dedicated to improving access to and quality of educational resources and training opportunities for students in the port's operating areas.
- **Environmental Leadership:**
Port Metro Vancouver promotes environmental stewardship through the advancement of knowledge, and is focused on protection of the natural environment and ecological systems in the port's operating areas.

In the spirit of this long-standing commitment to supporting communities, Port Metro Vancouver began a process to determine the potential for community legacy benefits related to the Project. Since 2011, Port Metro Vancouver has consulted and had discussions with local governments (Delta, Surrey, Richmond, City of Langley, Township of Langley and Tsawwassen First Nation) and the public regarding community legacy benefits that would be provided as part of the Project. The objectives of community legacy benefits are to bring lasting economic and social benefits to communities and the region. Ensuring a local and regional approach to the types of projects and initiatives is critical to their success. Feedback from local governments and the public has indicated community benefits may include the development of transportation infrastructure and recreational facilities such as walking trails and bike paths, a pedestrian overpass to connect a trail, and environmental initiatives.

Community legacy benefits will continue to be the subject of discussions between Port Metro Vancouver, local governments (including Tsawwassen First Nation), Aboriginal groups and the public throughout the development of the Project.

IMPROVED CAPACITY FOR SUSTAINABLE RESOURCE MANAGEMENT

Through the extensive study programs undertaken during preparation of the EIS, Port Metro Vancouver has made important contributions by collecting information that will enhance local and regional capacity to sustainably manage ecosystems associated with Roberts Bank. Information collected and decision-making tools developed by Port Metro Vancouver will benefit the scientific community, resource managers, stewardship organizations, and future planning or assessment processes within the region. In particular, Port Metro Vancouver advanced the scientific understanding related to southern resident killer whales, biofilm and its importance to migratory shorebirds' use of the Fraser River estuary, ecological linkages of sea pens, and ecosystem modelling at Roberts Bank.

10 ENGAGEMENT AND CONSULTATION

Engagement and consultation regarding the Project began in 2011, early in project development and prior to the initiation of the environmental assessment process.

Port Metro Vancouver began a comprehensive engagement and consultation process regarding the Project in 2011, early in project development and prior to the initiation of the environmental assessment process. Since then, Port Metro Vancouver has participated in over 300 meetings regarding the Project.

Port Metro Vancouver engagement and consultation is in addition to opportunities to provide input regarding the Project to the Canadian Environmental Assessment Agency as part of the environmental assessment process.

Engagement and consultation activities with government agencies, technical experts, Aboriginal groups, local government and the public were designed to obtain the benefit of their expertise, experience, and traditional and community knowledge. Several of the engagement and consultation activities undertaken go beyond the consultation requirements associated with federal and provincial environmental assessment processes and include:

- Establishing a Technical Advisory Group process in 2012 to engage and consult with leaders in the technical and scientific community to provide guidance on key topic areas;
- Initiating a Working Group process in 2014 that convened a multi-stakeholder group to share study methodology and information to be included in the EIS;
- Conducting a thorough and comprehensive engagement and consultation program with Aboriginal groups that started in 2011;

- Initiating a Local Government Engagement and Outreach Program in 2012 with several municipalities to facilitate information exchange;
- Participating in the Port Community Liaison Committee–Delta (PCLC), a forum that brings together municipal, First Nations, industry, Port Metro Vancouver and community interests to discuss port-related issues in Delta;
- Conducting a multi-round Port Metro Vancouver-led public consultation process between 2011 and 2014 to gather input to assist with the development of the Project and the EIS; and
- Opening a community office in Delta in October 2014 as a place for community members to speak with Port Metro Vancouver staff about the Project and port operations.

The input Port Metro Vancouver received through these and other engagement and consultation activities has been considered in the development of this EIS, and is documented in issues and interest tables appended to the EIS. Port Metro Vancouver appreciates input received from the broad range of individuals and organizations that have participated in the engagement and consultation program to date.

Port Metro Vancouver will continue engagement and consultation throughout the Panel review phase and, should the Project proceed, into the construction and operation phases.

REGULATORY ENGAGEMENT AND CONSULTATION

Port Metro Vancouver's regulatory engagement and consultation activities undertaken during project planning and EIS development included:

- Early regulatory engagement with provincial and federal regulators to introduce the proposed Project, to review regulatory procedures and processes, to discuss issues that might arise during Project planning, construction and operation, and to receive feedback on technical work plans supporting impact assessment studies;
- A Technical Advisory Group process focused on four topics: coastal geomorphology, productive capacity, biofilm and shorebirds, and southern resident killer whales; the Technical Advisory Group process sought input from leading technical experts from within regulatory agencies, academia and non-governmental organizations regarding the assessment of potential Project-related effects and the development of effective, technically and economically feasible mitigation strategies;
- Federal and provincial engagement on the Project Description to address relevant Project-related regulations and to ensure Port Metro Vancouver's Project Description would meet the Canadian Environmental Assessment Agency's and the B.C. Environmental Assessment Office's requirements prior to formal submission;
- The Roberts Bank Terminal 2 Project Working Group Process to provide a forum to meet collectively with representatives from federal, provincial, local and regional governments, and Aboriginal groups; the focus of the Working Group meetings was to provide an opportunity for Port Metro Vancouver to present its proposed assessment approach, and to receive questions and feedback from Working Group members on the proposed approach;
- Federal authority and agency engagement focusing on gaining clarity regarding, or a greater understanding of, the expectations of individual federal departments with respect to specific sections of the final EIS Guidelines, including species-at-risk considerations, air quality, and Fisheries and Oceans Canada's Fisheries Protection Program;
- Provincial agency engagement; and
- Trans-boundary agency engagement with the U.S. Environmental Protection Agency and the Washington State Department of Ecology.

In developing the EIS, Port Metro Vancouver has considered the advice and recommendations provided by the federal and provincial governments.



Port Metro Vancouver began engagement regarding the Project with Aboriginal groups in 2011, and will continue engaging Aboriginal groups throughout the environmental assessment process, and into construction and operation, should the Project proceed.

ABORIGINAL GROUP ENGAGEMENT AND CONSULTATION

Port Metro Vancouver recognizes the importance of appropriately and effectively engaging with the various Aboriginal groups that have asserted or established Aboriginal and treaty rights and related interests that may be affected by the Project. The Project is adjacent to the Tsawwassen First Nation community.

Port Metro Vancouver commenced Project-related engagement with numerous Aboriginal groups in 2011, which culminated in rounds of EIS-specific workshops in 2014. The EIS Guidelines identify the following Aboriginal groups whose rights and interests may be affected by the Project:

- Tsawwassen First Nation;
- Musqueam First Nation;
- Semiahmoo First Nation;
- Tsleil-Waututh Nation;
- Stz'uminus First Nation;
- Cowichan Tribes;
- Halalt First Nation;
- Lake Cowichan First Nation;
- Lyackson First Nation;
- Penelakut Tribe;
- Métis Nation British Columbia;
- Stó:lō Tribal Council (Seabird Island First Nation, Scowlitz First Nation, Soowahlie Band, Kwaw'Kwaw'Apilt First Nation, Kwantlen First Nation, Shxw'ow'hamel First Nation, Chawathil First Nation, Cheam Indian Band); and
- Stó:lō Nation (Aitchelitz First Nation, Leq'a:mel First Nation, Matsqui First Nation, Popkum First Nation, Skawahlook First Nation, Skowkale First Nation, Shxwha:y Village, Squiala First Nation, Sumas First Nation, Tzeachten First Nation, Yakweakwioose Band).

In addition, Port Metro Vancouver has engaged with the Hwlitsum First Nation.

Port Metro Vancouver has continued to engage with Aboriginal groups in accordance with direction from the Canadian Environmental Assessment Agency.

In support of Project planning and information gathering, Port Metro Vancouver provided funding to ensure Aboriginal groups could participate in the Project's consultation processes. Additional agreements were also initiated to support the development of studies regarding the current use of lands and resources for traditional purposes.

Port Metro Vancouver has also consulted with Aboriginal groups regarding Project components and activities, the potential effects of the Project, selection of valued components, proposed mitigation, and potential changes to the environment related to the Project. Through the course of the consultation process, Aboriginal groups have identified interests and raised issues that Port Metro Vancouver has subsequently considered. Should the Project proceed to construction and operation, Port Metro Vancouver intends to continue engagement and consultation activities with Aboriginal groups.

Issues and interests raised by Aboriginal groups, prior to EIS submission, are summarized in tables found in the EIS, along with Port Metro Vancouver's responses.

LOCAL GOVERNMENT AND PUBLIC ENGAGEMENT AND CONSULTATION

Since 2011, Port Metro Vancouver has undertaken comprehensive information sharing and consultation about the Project with local governments and the public. Of the more than 300 meetings that Port Metro Vancouver has participated in regarding the Project, more than 100 were with communities, local government and businesses through the Local and Regional Government Outreach and Engagement Program, Port Metro Vancouver-led consultation and community outreach activities.

Local and Regional Government Outreach and Engagement Program

Port Metro Vancouver's Local and Regional Government Outreach and Engagement Program provided focused engagement with local and regional governments regarding the Project:

- The **Local Government Elected Roundtable**, established in 2012, provides a forum for Port Metro Vancouver and elected officials to discuss community interests, issues and benefits related to the Project. The committee includes representatives from the Corporation of Delta, City of Langley, Township of Langley, City of Richmond, City of Surrey, Metro Vancouver's Transportation Committee, Tsawwassen First Nation and Port Metro Vancouver.
- The **Local Government Technical Liaison Committees** facilitate regular communications between Project staff and staff from the Corporation of Delta, City of Langley, Township of Langley, City of Richmond and City of Surrey. These meetings allow members of the committees to share technical information, issues and interests regarding the Project.

Port Metro Vancouver undertook four rounds of consultation regarding the Project between 2011 and 2014, which included 34 small group meetings and open houses, and more than 800 participant interactions such as attending meetings, submitting feedback online or providing written submissions.

Multi-Round Public Consultation Process

Since 2011, Port Metro Vancouver has led four rounds of public consultation regarding the Project.

Through this consultation process, Port Metro Vancouver has sought input regarding how participants wanted to be consulted and what potential topics should be addressed. Resulting topics included: elements of Project design, topics of environmental studies, potential Project effects, and draft environmental mitigation concepts. Input from each consultation round was summarized. Port Metro Vancouver then responded to and documented how public input had been considered. Consultation materials, including discussion guides, consultation summary reports and consideration memos, are available at portmetrovancover.com/RBT2.

Additionally, information has been distributed in a variety of ways to ensure local government and the public are aware of the Project. These include the Port Community Liaison Committee—Delta, an electronic subscription service providing regular notifications regarding technical and environmental field studies, the development and distribution of a Project video and information sheets about Project topics frequently raised by members of the public, and the opening of the Delta Community Office.

Port Metro Vancouver regularly responds to public enquiries regarding the Project through a dedicated phone line, email, mailing address, an online forum, and in person at the Delta Community Office. Since 2011, Port Metro Vancouver has received and responded to 106 enquiries.

The EIS includes tables summarizing issues and interests raised by local government and the public through consultation and public enquiries, and how Port Metro Vancouver has considered the input.

Port Metro Vancouver will continue to provide updated information regarding the Project throughout, and following, the environmental assessment process. Should the Project proceed to construction, a communications plan would be developed to ensure local government and the public are aware of construction activities.



11 CONCLUSIONS OF THE ENVIRONMENTAL IMPACT STATEMENT

Port Metro Vancouver proposes to build the Roberts Bank Terminal 2 Project, a new three-berth container terminal at Roberts Bank in Delta, British Columbia. The development of the Project is intended to meet forecasted growth in container capacity demand and is consistent with Port Metro Vancouver's mandate under the *Canada Marine Act* to facilitate international trade to support the growth of the Canadian economy while providing a high level of environmental protection. The Project would be privately funded.

Demand for containerized trade through Canada's west coast is growing, primarily as a result of Canadian resource exports, and consumer goods and manufacturing inputs imported from Asia. Even with recent, current and planned improvements to existing infrastructure undertaken by Port Metro Vancouver and its tenants and terminals, and planned capacity increases in Prince Rupert, independent forecasts show that more container capacity will be required by the early to mid-2020s. Following an extensive analysis of alternative locations and means of providing additional container capacity, both within and outside its jurisdiction, Port Metro Vancouver concludes the Project is the only technically and financially feasible option to serve the long-term growth of Canada's import and export markets.

The 2.4 million twenty-foot equivalent units of container capacity the Project would provide would ensure Canadian exporters are able to get their products to markets around the world, and that Canadian consumers and businesses

have access to imported consumer goods and manufacturing inputs.

The construction and operation of the Project itself would provide significant benefits through employment, economic development, government revenues and community benefits. Construction activities would create 4,150 person-years of direct employment, worth \$494 million in wages, and a further 8,569 person-years of indirect and induced employment, worth \$503 million in wages. Once in operation, the Project would support 928 long-term jobs on the terminal, worth \$153 million in wages each year, and another 625 indirect and induced jobs in terminal support industries, worth another \$32 million in wages annually. In addition, both construction and operation would generate significant revenues for businesses in British Columbia, primarily in Metro Vancouver. The Project would contribute \$1.3 billion in provincial gross domestic product during construction, and approximately \$212 million per year during operation. Port Metro Vancouver continues to engage with local governments and the public regarding potential community legacy benefits intended to bring lasting economic and social benefits to local communities.

The Roberts Bank Terminal 2 Project involves the development of land and construction of a marine terminal adjacent to the existing Deltaport Terminal and Westshore Terminals, widening of the existing Roberts Bank causeway and expansion of the existing Roberts Bank tug basin.

The development of a large infrastructure project requires substantial time from planning to operation. At the time of the submission of this environmental impact statement, Port Metro Vancouver has been developing and studying the Project for more than four years. The environmental assessment process is anticipated to take a further two to three years. Subject to regulatory approvals, permits and a final investment decision, construction would begin in 2018 and would take approximately five-and-a-half years to complete. This would allow the Project to be operational by the mid-2020s, when its capacity will be required.

Consistent with Port Metro Vancouver's mandate to support the growth of the Canadian economy while providing for a high level of safety and environmental protection, the Roberts Bank Terminal 2 Project has been designed to minimize impacts to the environment and surrounding communities. As an example, the proposed location of the marine terminal is almost entirely in subtidal waters at Roberts Bank to avoid impacts to sensitive intertidal habitat.

Since 2011, Port Metro Vancouver has conducted extensive engagement and consultation with regulators, Aboriginal groups, local government and the public regarding the proposed Roberts Bank Terminal 2 Project. From 2011 to 2014, Port Metro Vancouver hosted or participated in more than 300 meetings and provided a variety of methods for interested parties to learn about and provide feedback regarding the Project. Port Metro Vancouver-led local government engagement and public and Aboriginal consultation activities began early in Project development and prior to the start of the environmental assessment process.

Input received from regulators, Aboriginal groups, local government and the public has been considered and incorporated, along with technical and financial information, in the planning and design of the Project, in the assessment of potential effects and in the development of mitigation measures. Engagement with Aboriginal groups facilitated understanding of potential Project-related effects on Aboriginal communities, activities and other interests, and integration of Aboriginal traditional knowledge into the environmental assessment.

Extensive studies were undertaken between 2011 and 2014 to complement a wealth of previously available scientific information. The studies completed as part of this environmental assessment have filled information gaps that will benefit the scientific community, resource managers, stewardship organizations, and future planning or assessment processes within the region.

As described in Part 2 of this Executive Summary, the environmental assessment for the Roberts Bank Terminal 2 Project was undertaken to assess potential environmental, economic, social, heritage and health effects of the Project, including cumulative effects. The assessment focused on how the Project would change eight intermediate components of the physical and human environment, and how the Project would affect 16 valued components, either directly or through changes to the intermediate components.

The conclusion of the comprehensive environmental assessment conducted by Port Metro Vancouver is that, after the implementation of mitigation, the Roberts Bank Terminal 2 Project is not expected to result in any significant adverse residual effects on any of the 16 valued components. In addition, no cumulative effects are anticipated, with the exception of a cumulative effect to southern resident killer whales. Due to their endangered status and a lack of recovery of the population, Port Metro Vancouver has assumed that southern resident killer whales have already been significantly adversely affected and therefore cumulative effects are expected to remain significant. More detail is provided in the summary of the assessment of marine mammals.

As a result of extensive studies and assessment, Port Metro Vancouver is confident potential adverse effects can be fully or partially avoided or reduced through Project design and the implementation of environmental management programs. Where Project-related effects cannot be fully avoided or reduced, offsetting measures, such as the creation and enhancement of habitat, will be applied. A robust monitoring and follow-up program will be implemented to assess the effectiveness of mitigation measures.

Given the conclusion the Project is not likely to cause significant adverse environmental effects, and the benefits of the Project to British Columbia and Canada, Port Metro Vancouver believes the Project should be approved to proceed.





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ROBERTS BANK TERMINAL 2 PROJECT ENVIRONMENTAL IMPACT STATEMENT EXECUTIVE SUMMARY

PART 2: SUMMARY OF FINDINGS

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PART 2: SUMMARY OF FINDINGS

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12 ENVIRONMENTAL ASSESSMENT METHODOLOGY

This section of the Executive Summary provides a summary of the methodology used to assess potential effects of the Roberts Bank Terminal 2 Project.

The Environmental Impact Statement (EIS) for the proposed Roberts Bank Terminal 2 Project (the Project) identifies and assesses potential changes to the natural and human environment resulting from the construction and operation of the Project. The methodology for the environmental assessment is based on guidance materials issued by the Canadian Environmental Assessment Agency and the British Columbia Environmental Assessment Office, including the EIS Guidelines.

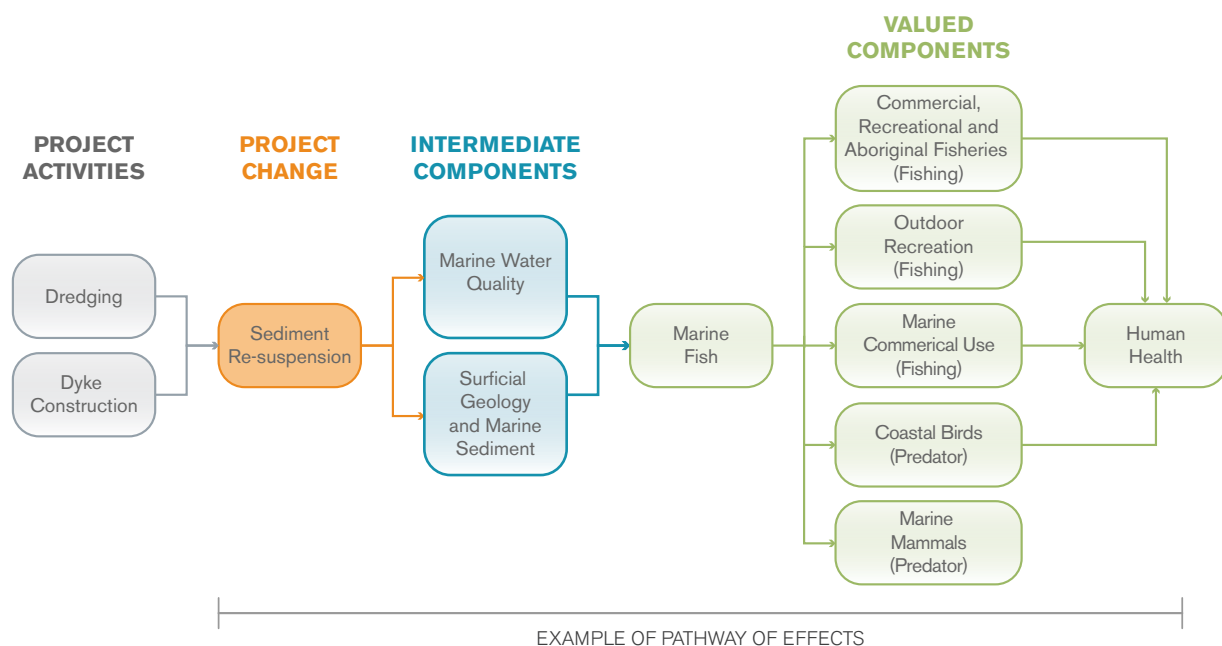
As set out in Part 1, the scope of the Project for the purposes of the environmental assessment includes all Project components and physical activities outlined in the EIS Guidelines. The scope of the assessment includes the effects of Project components and activities on the environment, including those that may extend beyond the scope of the Project.

ISSUES SCOPING

The first step in the environmental assessment methodology includes issues scoping. This process informs the identification and selection of important attributes of the natural and human environment that may be affected by the Project and have been identified to be of concern by the proponent, government agencies, Aboriginal groups or the public.

Based on Port Metro Vancouver's past experience with development at Roberts Bank, input from technical experts, and engagement and consultation with regulators, Aboriginal groups, local government and the public, attributes called intermediate components and valued components were identified.

The graphic below illustrates an example of a pathway of effects. It shows how Project activities may interact with, and result in a change to, an intermediate component, which can then result in an effect on a valued component through the pathway of effects.



Intermediate Components

Intermediate components are components of the physical or human environment that can be changed by the Project and then subsequently potentially result in an effect on a valued component.

The eight **intermediate components** identified for the Project are:

- Air Quality
- Noise and Vibration
- Light
- Coastal Geomorphology
- Surficial Geology and Marine Sediment
- Marine Water Quality
- Underwater Noise
- Population

Valued Components and Sub-Components

Valued components are the focus of the environmental assessment for the purposes of evaluating Project-related effects. In the case of some valued components, sub-components were identified to help structure and streamline the assessment. For example, for biophysical valued components, sub-component species or groups were chosen for their ability to represent species that use comparable habitat types, species that serve similar ecological functions or species that could otherwise be similarly affected by the Project.

Consideration was given to sub-components of specific importance to regulatory agencies, Aboriginal groups and the public, as identified through community knowledge and Aboriginal traditional knowledge, during engagement and consultation, and assessment planning.

The table below outlines the 16 **valued components** identified for the Project, and their **sub-components**, where applicable.

Valued Component	Sub-Components
Marine Vegetation	<ul style="list-style-type: none"> • Eelgrass • Intertidal Marsh • Macroalgae • Biomat • Biofilm
Marine Invertebrates	<ul style="list-style-type: none"> • Infaunal and Epifaunal Invertebrate Communities • Bivalve Shellfish • Dungeness Crabs • Orange Sea Pens
Marine Fish	<ul style="list-style-type: none"> • Pacific Salmon • Reef Fish • Forage Fish • Flatfish • Demersal Fish
Marine Mammals	<ul style="list-style-type: none"> • Toothed Whales • Baleen Whales • Seals and Sea Lions
Coastal Birds	<ul style="list-style-type: none"> • Shorebirds • Waterfowl • Herons • Diving Birds • Raptors • Gulls and Terns • Passerines

Valued Component	Sub-Components
Ongoing Productivity of Commercial, Recreational and Aboriginal Fisheries	<ul style="list-style-type: none"> • Pacific salmon • Groundfish • Forage Fish • Crabs
Labour Market	<ul style="list-style-type: none"> • None
Economic Development	<ul style="list-style-type: none"> • None
Local Government Finances	<ul style="list-style-type: none"> • None
Services and Infrastructure	<ul style="list-style-type: none"> • Housing • Emergency and Health Services • Municipal Infrastructure
Marine Commercial Use	<ul style="list-style-type: none"> • Seafood Harvesting • Marine Fish Harvesting • Guided Sport Fishing • Marine-Based Tourism
Outdoor Recreation	<ul style="list-style-type: none"> • Recreational Boating and Windsport Activities • Recreational Marine Fish and Seafood Harvesting • Recreational Hunting • Other Land-Based Outdoor Recreation
Land and Water Use	<ul style="list-style-type: none"> • None
Visual Resources	<ul style="list-style-type: none"> • Daytime Visual Resources • Nighttime Visual Resources
Human Health	<ul style="list-style-type: none"> • Exposure to Air Emissions • Exposure to Noise and Vibration • Exposure to Shellfish Contamination • Stress and Annoyance • Employment and Income • Food Security • Health Inequity
Archaeological and Heritage Resources	<ul style="list-style-type: none"> • None

Other Effects Assessments

In addition to the assessment of intermediate and valued components, Port Metro Vancouver undertook three other effects assessments for the Project.

The three other effects assessments are:

- Accidents or Malfunctions
- Effects of the Environment on the Project
- Potential or Established Aboriginal and Treaty Rights and Related Interests, Including Current Use of Lands and Resources for Traditional Purposes

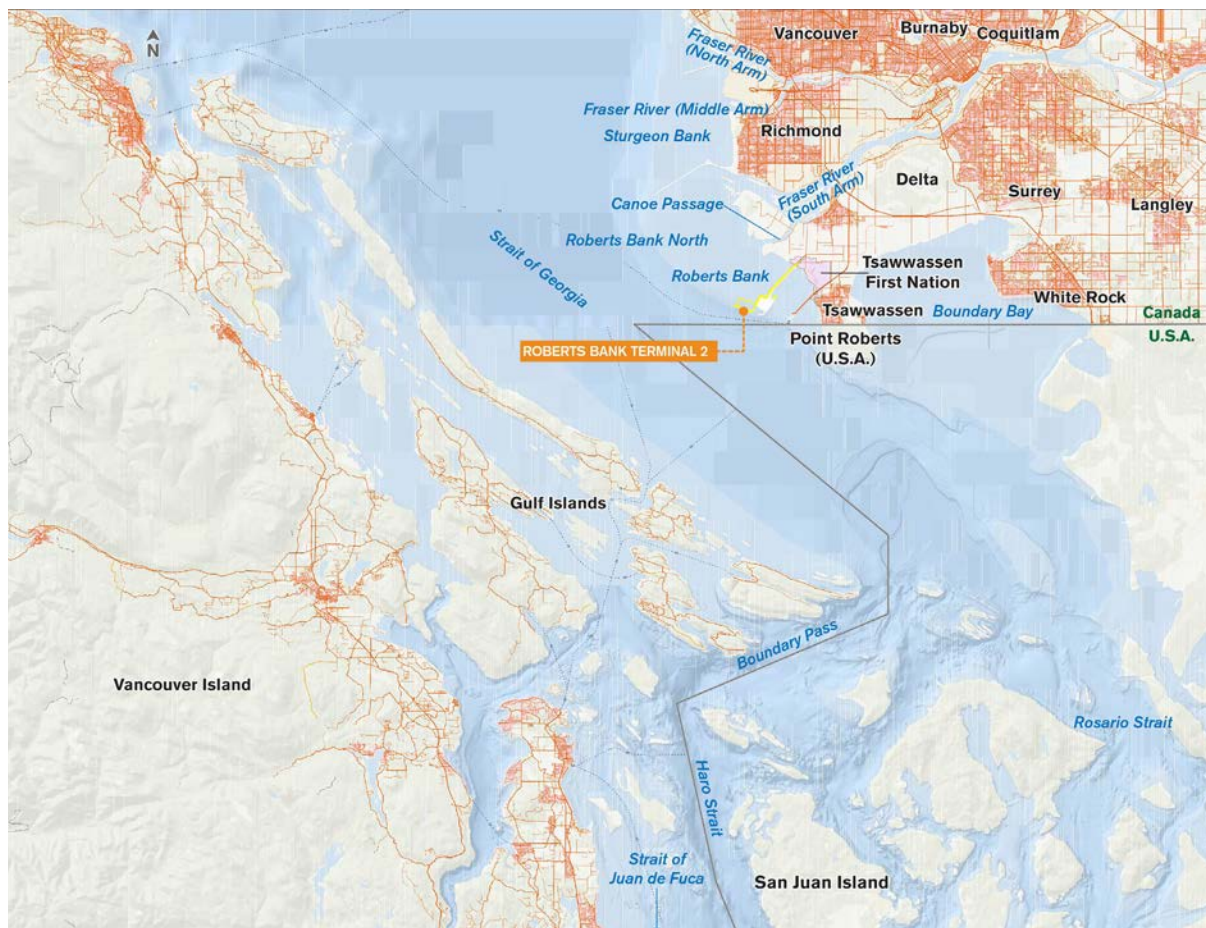
ESTABLISHMENT OF ASSESSMENT BOUNDARIES

Once intermediate components and valued components were identified, assessment boundaries were established or identified for each component.

The two primary assessment boundaries³ are:

- **Temporal assessment boundaries** encompass the periods during which the Project is expected to interact with intermediate and valued components via effects pathways. These boundaries were determined based on the timing and duration of the Project, including the major phases of construction and operation (including maintenance activities). Temporal characteristics, such as species-specific life cycle characteristics (e.g., breeding, nesting, rearing, overwintering), were also considered to understand when and for how long each valued component may interact with and potentially be affected by the Project.
- **Spatial assessment boundaries** include both local and regional assessment areas:
 - The **local assessment area** includes the area within which the Project components and activities would interact with and potentially have an effect on a valued component or intermediate component.
 - The **regional assessment area** provides the regional context for the assessment of potential Project-related effects within the local assessment area, and, for most valued components, encompasses the area within which cumulative effects are expected to occur.

The map below identifies locations that are referenced in the descriptions of spatial boundaries throughout the assessment summaries.



³ In addition to temporal and spatial boundaries, the assessment includes the consideration of administrative and technical boundaries that may apply to some valued components.

DESCRIPTION OF EXISTING OR EXPECTED CONDITIONS

Descriptions of existing pre-Project conditions relevant to each intermediate component and valued component were developed based on existing information, field studies, data analysis and modelling. The description of existing conditions considered how intermediate components and valued components have been already affected by other projects and activities that have been carried out.

Expected conditions were also determined where substantial changes are expected to occur to an intermediate component or a valued component in the future prior to Project construction or operation, such as from changes in industry practices driven by regulatory requirements or as a result of other projects or activities underway or anticipated to be completed prior to the Project commencing.

IDENTIFICATION OF INTERACTIONS AND POTENTIAL PROJECT EFFECTS

Potential effects of the proposed Project were identified by considering how Project components and activities may interact with and result in a change to an intermediate component or in an effect to a valued component. The assessment is focused on measurable potential adverse effects and these are outlined in this Executive Summary. Throughout this Executive Summary, there are references to negligible effects, which are defined as those that are unmeasurable or undetectable in the context of the specific component. Effects rated as minor or moderate refer to the potential consequence on the component.

MITIGATION MEASURES TO AVOID, REDUCE OR OFFSET POTENTIAL ADVERSE EFFECTS

Where it was determined that potential adverse effects could occur, technically and economically feasible mitigation measures to avoid, reduce or offset potential adverse effects to an acceptable level have been proposed. The design and implementation of proposed mitigation measures considers past experience, guidelines, standard practices, and input received from regulators, Aboriginal groups, local government and the public.

RESIDUAL EFFECTS

Potential Project-related effects on valued components that may persist after the implementation of mitigation measures are called residual effects. The EIS identifies and characterizes Project-related residual effects and the context within which they occur, and determines whether those effects are likely to cause a significant adverse environmental effect. The determination of significance is specific to each valued component and the EIS presents the rationale for the significance thresholds applied.

CUMULATIVE EFFECTS ASSESSMENT

Where Project-related changes to an intermediate component were expected, the potential for those changes to combine cumulatively with changes caused by other future projects and activities was assessed. Similarly, where measurable residual effects to a valued component have been predicted to result from the Project, a cumulative effects assessment was conducted to determine whether Project-related residual effects are likely to interact cumulatively with the effects of other certain and reasonably foreseeable projects and activities.

Where the Project was predicted to contribute to cumulative effects, additional mitigation measures were considered. Port Metro Vancouver then determined the significance and likelihood of any adverse residual cumulative effects following the implementation of mitigation measures.

13 BIOPHYSICAL SETTING

This section of the Executive Summary provides an overview of the biophysical setting in the vicinity of the Project.

Roberts Bank is part of the Fraser River estuary and consists of complex intertidal and subtidal habitats that provide important feeding, roosting and overwintering sites for resident and migratory birds, as well as productive feeding and rearing habitat for Pacific salmon and other fish species. The intertidal eelgrass beds of Roberts Bank provide nursery habitat for juvenile Dungeness crabs, while adult crabs, which support commercial, recreational and Aboriginal fisheries, inhabit shallow intertidal to deep subtidal waters. Several species of marine mammals, including the endangered southern resident killer whale, occasionally occur at Roberts Bank.

Over time, awareness of the global ecological significance of the Fraser River estuary for fish and wildlife has increased. The environmental values and sensitivity of the area, including Sturgeon Bank, Roberts Bank, Boundary Bay, Fraser River and upland areas, have been formally recognized by regional, provincial, federal and international conservation-related designations. These include designated areas in the vicinity of the Project, such as the provincial Roberts Bank Wildlife Management Area, the Fraser River Estuary Western Hemisphere Shorebird Reserve, the Fraser River Estuary Important Bird Area and critical habitat for southern resident killer whales.

The environmental conditions at Roberts Bank are dynamic, and physical processes, such as winds, waves, twice-daily tidal cycles and currents, influence this estuarine ecosystem. The marine environment at Roberts Bank is also influenced by the freshwater discharges from the Fraser River, the largest river draining to the west coast of Canada. Sediments carried in the fresh water discharged by the Fraser River spread as a plume out into the Strait of Georgia, reaching as far as the Gulf Islands.

The combination of nutritionally rich water from the Strait of Georgia and the freshwater and sediment inputs from the Fraser River has led to the development of a productive estuarine ecosystem that includes a high intertidal marsh zone, an intertidal zone and a subtidal zone.

HIGH INTERTIDAL MARSH ZONE

Marsh habitats at Roberts Bank provide important breeding and foraging habitat for numerous bird species, including great blue heron, snow goose, American bittern, red-winged blackbird and marsh wren. Townsend's vole, abundant in these habitats, represents an important prey for great blue herons and resident and wintering raptor species, including barn owl, short-eared owl, red-tailed hawk and northern harrier.

INTERTIDAL ZONE

At Roberts Bank, the intertidal zone (from a 0-metre depth to the high-water level) supports macroalgae (seaweed), biofilm (a thin dense layer of microscopic photosynthetic algae and bacteria), biomat (blue-green algae and diatoms), eelgrass beds and intertidal marshes. These intertidal habitats in turn support infaunal invertebrate species, including marine worms and small crustaceans. Marine invertebrates play a key ecological role in the estuary and intertidal zone, primarily as prey for numerous species of shellfish, crustaceans, fish and birds.

Intertidal habitats throughout the estuary, including Roberts Bank, are also important for juvenile salmon, primarily chum salmon and pink salmon, and other fish species. Intertidal eelgrass beds provide habitat for fish rearing and staging, as well as refuge from predators.

The importance of intertidal habitats to birds is widely recognized. Some species, such as the western sandpiper, are dependent on the intertidal habitats of the Fraser River estuary, including Roberts Bank, as one of six key stopover sites along the Pacific Flyway between wintering areas in South America and breeding areas in Alaska. The abundant biofilm communities at Roberts Bank provide high-nutrient food for western sandpipers and other shorebirds during migration.

SUBTIDAL ZONE

The Strait of Georgia supports a diversity of fish species, including Pacific salmon, Pacific herring, rockfish, lingcod, sand lance and flatfish. Adult chinook salmon are of particular importance as prey for southern resident killer whales.

Orange sea pens, a type of soft coral, are found in sandy bottom habitats in subtidal areas at Roberts Bank. The presence of sea pens increases habitat complexity, benefiting fish and other macroinvertebrate species, including Dungeness crab.

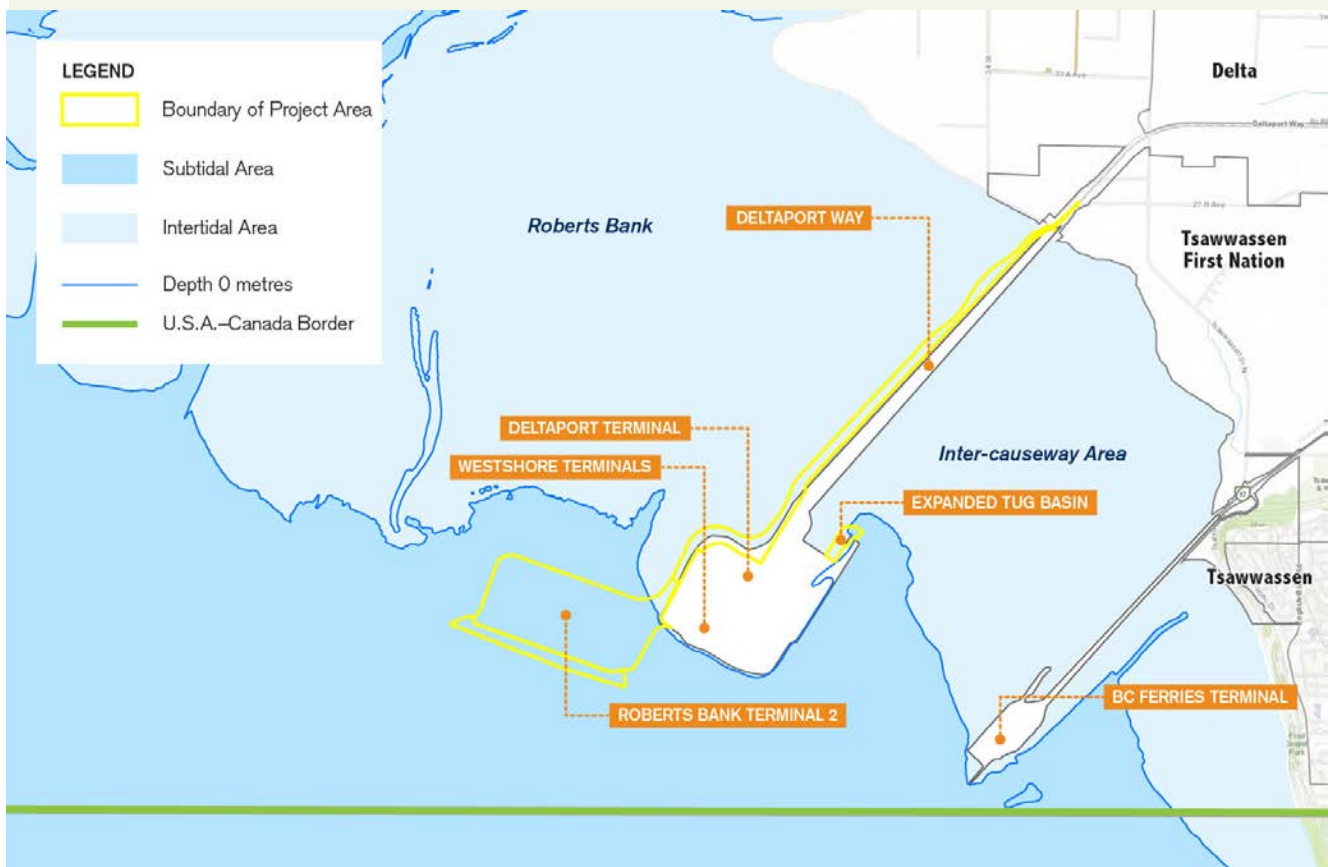
Diving birds are common in the Strait of Georgia, particularly in winter. Species that occur in the vicinity of the Project include surf scoter, bufflehead, western grebe, scaup species and pelagic cormorant.

Dungeness crab, a common species at Roberts Bank, sustains commercial, recreational and Aboriginal fisheries, and is of cultural value to Aboriginal groups. Dungeness crabs live out their entire life cycles at Roberts Bank.

Optimized Project Design – Avoiding Effects To Intertidal Habitat

Preliminary planning studies for the Project conducted from 2003 to 2004 considered a number of alternative locations for the terminal within the intertidal zone, closer to shore and adjacent to the existing causeway. Discussions with regulatory agencies identified a preference to minimize Project footprint-related effects to higher value intertidal habitat.

In 2011, Port Metro Vancouver conducted planning workshops to identify trade-offs among the conceptual layout alternatives. Extensive geotechnical studies were initiated to better understand the feasibility of locating the terminal at the proposed location in subtidal habitat. As shown on the map below, the optimized design of the terminal assessed in the EIS is located almost entirely in subtidal waters to avoid effects to sensitive intertidal habitat and to reduce the amount of dredging required.



14 SUMMARY OF RESULTS: INTERMEDIATE COMPONENTS

This section of the Executive Summary provides a summary of findings for the intermediate components assessed as part of the environmental assessment for the proposed Roberts Bank Terminal 2 Project. No determination of significance is made for intermediate components because changes to intermediate components are carried forward into the assessment of valued components.

The grey **Assessment Highlights** box at the top of each section provides a summary of the assessment of the intermediate component. The remainder of each section includes information regarding the scope of assessment, existing conditions and key findings.

For more detail regarding the assessments and results, please see the EIS section noted in brackets. These sections can be found in Volumes 2 and 4 of the EIS.

AIR QUALITY (EIS SECTION 9.2)

ASSESSMENT HIGHLIGHTS

- Air quality will improve in the future, with or without the Project, as a result of improvements in engine technologies and the use of cleaner fuels.
- Project construction activities are predicted to cause a small increase in air contaminant concentrations.
- Levels of criteria air contaminants (i.e., carbon monoxide, nitrogen oxides, sulphur dioxide, particulate matter, and ground-level ozone) and trace organic contaminants (i.e., formaldehyde and other contaminants related to fuel combustion) are predicted to be below air quality criteria on land during both Project construction and operation, with limited exceptions.
- Project activities are expected to have a negligible effect on future ozone levels.
- Project activities are expected to increase greenhouse gas emissions (i.e., carbon dioxide, methane, and nitrous oxide), as would expected increases in activity levels at the existing Roberts Bank terminals.
- Although Project activities would emit black carbon, black carbon is expected to decrease in the future with the Project due to equipment fleet turnover at existing Roberts Bank terminals to newer engines that meet more stringent emission standards for particulate matter.
- The implementation of shore power is expected to decrease predicted future emissions during Project operation.
- Cumulative changes in air quality resulting from Project activities and operation of other certain and reasonably foreseeable projects and activities are predicted to be small, relative to expected future ambient air quality levels without these inputs.

AIR QUALITY

Intermediate Component Overview

An assessment was carried out to predict potential changes in air quality as a result of the Project.

The results of the air quality assessment were used in the assessments of human health and current use of land and resources for traditional purposes.

Scope of Assessment

The assessment modelled Project-related emission sources during the construction phase, and fuel combustion during the construction and operation phases, and compared them to modelled existing conditions and future expected conditions without the Project.

Air contaminants that were considered in the assessment included:

- Criteria air contaminants (i.e., carbon monoxide, nitrogen oxides, sulphur dioxide, particulate matter and ground-level ozone);
- Trace organic contaminants (i.e., formaldehyde and other contaminants related to fuel combustion);
- Greenhouse gases; and
- Climate-forcing particulate matter (black carbon).

Hypothetical maximum emission scenarios were used to conservatively estimate existing conditions and potential changes from the Project. Shore power is included in the Project design and would be available for ships to use while at berth. Estimated emissions and predicted ambient concentrations did not account for the benefits of shore power, which is expected to further decrease future emissions. The predicted concentrations of contaminants are therefore conservative (i.e., worst-case).

The focus of the assessment included locations on land where people may be exposed to contaminants and also included areas over water. The local study area was a 19 kilometre by 16 kilometre area and captured the extent to which the Project would have an influence on air quality. Meteorological modelling was carried out over a larger (26 kilometre by 24 kilometre) area to support the predictions of Project-related and cumulative changes to air quality.

Existing Conditions

The description of existing conditions considered emissions from marine vessels, trains, trucks, vehicles and equipment from the existing Westshore Terminals, Deltaport Terminal and BC Ferries terminal, while emissions from industrial, commercial and residential sources within Delta were represented through measured air quality levels in Tsawwassen. A general trend of decreasing concentrations of contaminants has been observed and is expected to continue in the Lower Fraser Valley for some criteria air contaminants, as well as for some trace organic contaminants. Air quality within Delta is generally good as compared with other locations in the Metro Vancouver region.

AIR QUALITY

Key Findings

Generally, air quality is expected to improve in the future, either with or without the Project, as a result of improvements in engine technologies and the use of cleaner fuels.

Criteria Air Contaminants

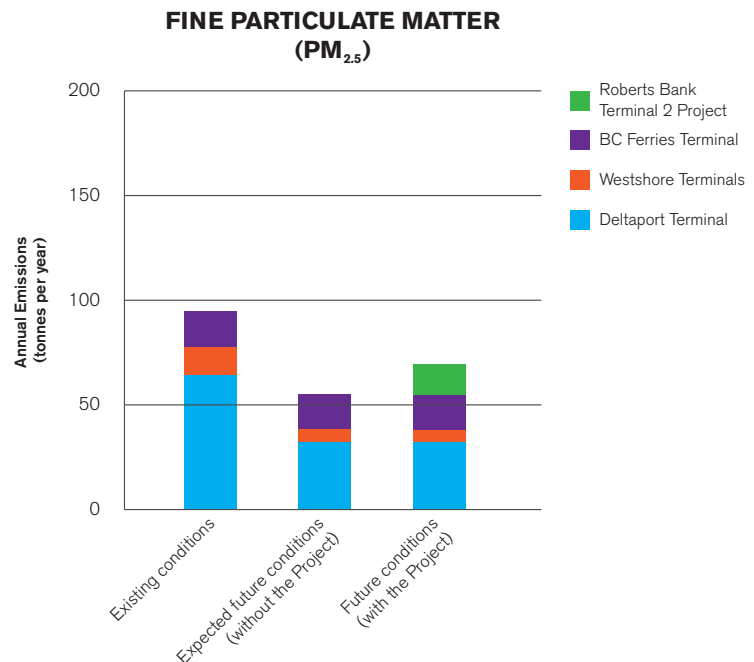
- Construction activities are predicted to cause a minor negative change in air quality, primarily associated with particulate matter in areas over water in the vicinity of construction works.
- During operation:
 - Concentrations of criteria air contaminants are expected to decrease relative to existing conditions, though they would be higher with the Project than without the Project (see graph to the right for an example for fine particulate matter).
 - Future ambient air concentrations are predicted to be below air quality criteria on land, including populated areas, with the exception of one-hour average concentrations for nitrogen dioxide in the immediate vicinity of the Roberts Bank terminals.
- Project activities are expected to have a negligible (i.e., too small to be measurable) effect on future ozone levels.

Trace Organic Contaminants

- Small increases in emissions are predicted for benzene, acetaldehyde and formaldehyde associated with Project operations relative to expected conditions without the Project.
- Levels of trace organic contaminants are not predicted to exceed air quality criteria at locations on land.

Greenhouse Gases

- Greenhouse gases are expected to increase in the future as a result of Project activities and increased activity at existing terminals.



Black Carbon

- Although Project activities would emit black carbon, black carbon is expected to decrease in the future with the Project, due to equipment fleet turnover at existing terminals to newer engines that meet more stringent emission standards for particulate matter.

The overall assessment is considered to provide a conservative evaluation of potential changes in air quality resulting from the Project. The implementation of shore power is expected to decrease predicted future emissions during Project operation.

The combination of Project-related emissions with emissions from other certain and reasonably foreseeable projects and activities is expected to make a small incremental contribution to overall air quality levels. Future cumulative ambient air quality concentrations are predicted to be below air quality criteria on land, including populated areas.

NOISE AND VIBRATION (EIS SECTION 9.3)

ASSESSMENT HIGHLIGHTS

- Project-related changes in annual average noise levels in communities near the Project are expected to be minor and, for the most part, not perceptible.
- Some changes in noise conditions that could be perceptible include:
 - Increased noise during periods of peak construction activity.
 - The number of intermittent noises related to cargo handling and train shunting during operation would increase, but the noise levels perceived from shore would be the same or lower than noise levels from the existing Roberts Bank terminals, since the new marine terminal would be located further from shore.
 - Increased noise in marine areas is expected to be perceptible close to the terminal.
- The Project in combination with other certain and reasonably foreseeable projects and activities is expected to result in minimal incremental cumulative changes to noise in areas close to road and rail corridors.
- The construction and operation of the marine terminal and causeway is not expected to result in perceptible increases in levels of ground-borne vibration.

Intermediate Component Overview

The noise and vibration assessment examined potential changes in noise and vibration as a result of the Project.

The results of the noise and vibration assessment were used in the assessments of coastal birds, marine commercial use, outdoor recreation, human health, and current use of land and resources for traditional purposes.

Scope of Assessment

The assessment considered Project-related sources of noise and vibration, including construction equipment, berthing and unberthing of container ships, tugboats, ships at berth, container handling activities, and movement of trains and trucks on the terminal and causeway. The assessment focused on continuous noise, low frequency noise, transient and impulsive noise, and ground-borne vibration.

The assessment included an upland study area, which was informed by a survey of residents near the Project regarding noise and vibration issues, and a marine study area.

- The upland study area included locations within the Corporation of Delta, within Tsawwassen First Nation lands, and in Point Roberts, Washington within 5 kilometres of the Roberts Bank terminals and within 2 kilometres of the east end of the causeway.
- The marine study area included all above-water areas within 10 kilometres of the centre of the proposed terminal.

NOISE AND VIBRATION

Existing Conditions

The description of existing conditions considered sources of noise and vibration, including the existing Roberts Bank terminals, BC Ferries terminal and road and rail traffic within the upland study area. Existing noise levels are typical of suburban areas, and noise within the upland study area comes from many diverse sources, including the following:

- Activity at Roberts Bank terminals and BC Ferries terminal;
- Road and rail traffic on the Roberts Bank causeway;
- Road and rail traffic on routes within the study area (including Highway 17 and Deltaport Way);
- Construction activities on Tsawwassen First Nation land;
- Farming activities;
- Aircraft;
- Marine vessels;
- Local activities; and
- Natural sounds (e.g., wildlife, wind).

No single source tends to dominate these noise environments; noises from all of these sources contribute in varying degrees to the overall average daily noise levels.

Key Findings

In the upland study area, Project-related increases in average annual noise levels are, for the most part, expected to be minor and not perceptible, with the following exceptions:

- During certain months, construction activities are anticipated to result in perceptible increases in noise.
- The number of intermittent noises related to cargo handling and train shunting during operation would increase, but the noise levels perceived from shore would be the same or lower than noise levels from the existing Roberts Bank terminals, since the new marine terminal would be located further from shore.

In the marine study area, noise levels during construction and operation would vary depending on the distance from the terminal, ranging from increases of 13 A-weighted decibels (dBA) within 1 kilometre away from the terminal, to no increase 10 kilometres away from the terminal, with the largest increases predicted to occur at locations within 1 kilometre of the marine terminal.

The construction and operation of the Project is not expected to result in perceptible increases in levels of ground-borne vibration.

It is expected that there would be minimal incremental cumulative changes in noise levels as a result of the combination of Project-related noise and with additional road and rail activity on the expanded causeway and on the upland road and rail corridors within the study area.

LIGHT (EIS SECTION 9.4)

ASSESSMENT HIGHLIGHTS

- Overall, the Project is not expected to change the general light environment of the Lower Mainland and the Gulf Islands, and no measurable incremental cumulative changes related to light are expected.
- Project-related lighting is expected to result in a minimal increase in light trespass levels.
- Increases in sky glow levels are expected, but are not anticipated to result in a noticeable change from existing conditions.

Intermediate Component Overview

An assessment was conducted of potential changes in light resulting from the Project.

The results of the light assessment informed the assessments of marine fish, coastal birds, visual resources, human health, and current use of land and resources for traditional purposes.

Scope of Assessment

The assessment focused on two aspects of light:

- Light trespass, the amount of light that strays from its intended purpose onto neighbouring areas; and
- Sky glow, the unwanted illumination of the night sky that affects the visibility of stars.

The study area included 12 locations in the area surrounding the existing Roberts Bank terminals, located on the mainland, on three of the Gulf Islands and in Point Roberts, Washington. The locations are between 0.5 and 37 kilometres away from the Project.

Existing Conditions

Existing conditions considered a variety of sources of light including the existing Roberts Bank terminals, the BC Ferries terminal, nearby greenhouses, and road lighting. Existing light trespass levels are characteristic of typical rural industrial or residential areas. Existing sky glow levels varied among locations and varied from levels characteristic of residential areas to levels characteristic of urban areas, with high nighttime activity closer to the terminals.

Key Findings

Overall, the Project is not expected to change the light environment in terms of light trespass, except in areas immediately adjacent to the terminal.

Minimal changes in sky glow are also expected, resulting in a change in the light environment at one location on Galiano Island. These changes are not expected to result in a noticeable change in the visibility of stars.

No measurable incremental cumulative changes related to changes in light are anticipated to result from the Project in combination with other projects and activities.

COASTAL GEOMORPHOLOGY (EIS SECTION 9.5)

ASSESSMENT HIGHLIGHTS

- Changes to coastal geomorphology are not expected from Project activities, but are related to the terminal footprint itself, which would interact with tidal currents and wind-generated waves.
- The Project layout and configuration has been modified to minimize the potential for a number of adverse changes to geomorphology during construction and operation. An example is locating the terminal almost entirely within the subtidal zone of Roberts Bank.
- The Project is expected to result in localized changes to coastal geomorphology resulting from the terminal footprint.
- The Project is not expected to result in incremental cumulative changes to coastal geomorphology.

Intermediate Component Overview

Coastal geomorphology considers the physical processes such as waves and currents that change or maintain the physical environment of coastal areas. An assessment was undertaken to determine potential changes to coastal geomorphology as a result of the Project.

The results of the coastal geomorphology assessment were considered in the assessments of surficial geology and marine sediment, marine water quality, marine vegetation, marine invertebrates, marine fish, marine mammals, coastal birds, archaeological and heritage resources, and the ongoing productivity of commercial, recreational and Aboriginal fisheries.

Scope of Assessment

The assessment determined the potential effects of changes to natural processes from the Project footprint in subtidal and intertidal areas. Studies were informed by dialogue with the Coastal Geomorphology Technical Advisory Group, and incorporated historical data (e.g., literature review of previous studies, airphoto interpretation), site observations and measurements, analyses and numerical modelling of waves, tidal currents and sediment transport.

The local study area included Roberts Bank from the shore to -60-metre chart datum depth. The assessment was supported by modelling of flow discharges from the Fraser River, and of tidal and wind information in the Strait of Juan de Fuca and the Strait of Georgia.

Existing Conditions

The physical environment of Roberts Bank is highly variable due to natural processes. Existing conditions considered physical processes, such as winds, waves and currents, discharges from the Fraser River and past developments, including the Roberts Bank and BC Ferries causeways. Past experience at Roberts Bank has indicated the intertidal flats are sensitive to disturbance.

COASTAL GEOMORPHOLOGY

Key Findings

The Project layout and configuration have been modified to minimize the potential for a number of adverse changes to geomorphology during Project construction and operation. An example is locating the terminal almost entirely within the subtidal zone at Roberts Bank.

Changes to coastal geomorphology are not expected from terminal development activities, but are related to the terminal footprint itself. The footprint would interact with tidal currents and wind-generated waves, resulting in localized alterations to sediment transport, sediment erosion and deposition, and freshwater and marine water flow exchange in the construction and operation phases.

During causeway construction, drainage channels are expected to form on the intertidal flats adjacent to the causeway. This change would occur during construction only, and it is temporary and reversible. Port Metro Vancouver would ensure the study and management of potential channel formation during the construction phase, and changes would be incorporated in detail design as required.

Changes from the expansion of the tug basin include the conversion of local tidal flats to subtidal waters. Although the formation of additional tidal channels is not anticipated, a small increase in the size of an existing channel is likely.

No incremental cumulative changes in coastal geomorphology are anticipated to result from the Project in combination with other projects and activities.

SURFICIAL GEOLOGY AND MARINE SEDIMENT (EIS SECTION 9.6)

ASSESSMENT HIGHLIGHTS

- There are no Project-related inputs of contaminants, and changes in sediment contaminant levels through sediment re-suspension or disposal are not expected.
- Construction activities are expected to cause minimal or no changes relative to natural variability.
- The Project is expected to result in changes to surficial geology and marine sediment. As a result of the terminal footprint, localized changes in sediment erosion and deposition are predicted, and are expected to be minimal relative to existing natural variability.
- The Project is not expected to result in incremental cumulative changes to surficial geology and marine sediment.

Intermediate Component Overview

Surficial geology and marine sediment considers the physical and chemical characteristics of sediment that influence the estuarine ecosystem. An assessment was carried out to determine changes to surficial geology and marine sediment as a result of terminal footprint-related changes and Project construction activities, including dredging, disposal at sea and vibro-densification.

The results of the surficial geology and marine sediment assessment were considered in the assessments of marine water quality, marine vegetation, marine invertebrates, marine fish, marine mammals, coastal birds, and the ongoing productivity of commercial, recreational and Aboriginal fisheries.

Scope of Assessment

The assessment focused on the types and distribution of sediment on the sea floor to determine how Project-related changes could potentially influence the estuarine ecosystem. Studies focused on a number of sediment parameters, including acidity or basicity (pH), moisture, total organic carbon, grain size, metals and metalloids, plant-available nutrients, total sulphides, contaminants of concern and coal content.

Modelling was undertaken to predict future changes to marine sediments, including sediment deposition and grain size distribution from Project construction activities and Project footprint-related effects.

The local study area included intertidal and subtidal zones at Roberts Bank to encompass the maximum extent of where the Project has the potential to change sediment re-suspension, deposition and erosion. Intertidal areas at Roberts Bank North, Sturgeon Bank and Boundary Bay were also included in the assessment to provide estuary-wide context.

Existing Conditions

Existing physical and chemical characteristics of surficial marine sediment were determined for sediment deposition rate, grain size distribution, total organic carbon, metals and anions, nutrients, contaminants and coal particulates. Current seabed sediment characteristics reflect the combined influences of sediment contribution from the Fraser River, sediment transport associated with tidal currents, waves and seabed slope. Overall, sediment quality within the study area is within the range of levels expected in an estuarine environment and without local contamination sources.

SURFICIAL GEOLOGY AND MARINE SEDIMENT

Key Findings

Changes to surficial geology and marine sediment during Project construction activities are expected to be minimal or undetectable relative to natural variability. Changes in sediment contaminant levels are not expected.

The terminal footprint is predicted to alter tidal currents and interactions with Fraser River waters. Initially, it is predicted to cause seabed erosion and sediment deposition near the terminal. Subsequently, it is predicted to increase fine sediment deposition on portions of the tidal flat within the range of existing natural variability.

No incremental cumulative changes in surficial geology and marine sediment quality are anticipated to result from the Project in combination with other projects and activities.

MARINE WATER QUALITY (EIS SECTION 9.7)

ASSESSMENT HIGHLIGHTS

- Construction activities are not expected to alter water contaminant or nutrient levels, pH, dissolved oxygen, or temperature.
- Increases in total suspended solids levels from construction activities are expected to be temporary and minimal relative to existing natural variability.
- The Project is expected to result in changes to marine water quality. As a result of the terminal footprint, localized changes in salinity and turbidity are predicted in the intertidal zone, but within the natural ranges currently experienced.
- The Project is not expected to result in incremental cumulative changes to marine water quality.

Intermediate Component Overview

Marine water quality considers the physical and chemical characteristics of waters that influence the estuarine ecosystem. An assessment was carried out to determine potential changes to marine water quality as a result of terminal footprint-related changes and Project construction activities, including dredging, disposal at sea and vibro-densification.

The results of the marine water quality assessment were considered in the assessments of marine vegetation, marine invertebrates, marine fish, marine mammals, coastal birds, and the ongoing productivity of commercial, recreational and Aboriginal fisheries.

Scope of Assessment

Studies were undertaken to determine existing conditions for several water quality parameters, including temperature, acidity or basicity (pH), dissolved oxygen, conductivity, salinity, oxidation reduction potential, total dissolved solids, total suspended solids, turbidity, water hardness, nutrients and metals.

Modelling was undertaken to predict future changes to water quality from Project construction activities and Project footprint-related effects.

The local study area included intertidal and subtidal zones at Roberts Bank, to encompass the maximum extent of where the Project has the potential to change water quality. Intertidal areas at Roberts Bank North, Sturgeon Bank and Boundary Bay were also incorporated into the assessment to provide estuary-wide context.

Existing Conditions

Existing conditions were determined for the parameters studied, and considered factors that influence the natural variation of water quality, including varying seasonal and annual Fraser River discharges, twice-daily tidal cycles, tidal currents, and wind-generated waves. Overall, water quality within the study area is of good quality, within the range of levels expected in an estuarine environment and without local contamination sources.

MARINE WATER QUALITY

Key Findings

Project construction and operation activities are not expected to alter water contaminant or nutrient levels, pH, dissolved oxygen, or temperature.

Increases in total suspended solids levels from activities associated with terminal development, causeway widening and expansion of the tug basin are expected to be temporary and negligible or minimal, relative to existing natural variability.

As a result of the terminal footprint and anticipated changes in the distribution of fresh water from the Fraser River and marine water from the Strait of Georgia, localized changes in salinity and turbidity are predicted. These changes are anticipated to be within the natural range currently experienced on the intertidal flats.

Stormwater and treated wastewater effluent and discharge during Project operation would be managed according to standard management practices and regulations. Operation activities are not expected to adversely affect marine water quality.

No incremental cumulative changes in marine water quality are anticipated to result from the Project in combination with other projects and activities.

UNDERWATER NOISE (EIS SECTION 9.8)

ASSESSMENT HIGHLIGHTS

- Existing underwater noise levels at all locations in the local study area and regional study area were dominated by human-generated sounds, primarily from vessel traffic, including ferries, large commercial vessels, small private boats, whale-watching vessels and depth sounders (i.e., fish finders, side scan sonar).
- Construction activities that will produce underwater noise include pile-driving, vibro-densification, dredging and use of support vessels.
- Activities during Project operation, including movement of container ships and tugboats associated with approach and departure, and berthing and unberthing, will produce underwater noise.
- Overall, average underwater noise predicted for the future with the addition of Project construction and operation activities is expected to be comparable to average existing levels of underwater noise due to existing high levels, but will at times exceed existing conditions.
- The cumulative change in underwater noise levels due to the Project in combination with expected future commercial vessel traffic within the Roberts Bank and the regional area is expected to make a small contribution to underwater noise levels within the regional area relative to existing commercial vessel traffic.

Intermediate Component Overview

Underwater noise considers the level of underwater sound in the marine environment. An assessment was undertaken to determine potential changes in the acoustic environment as a result of the Project.

The results of the underwater noise assessment were considered in the assessments of marine fish, marine mammals and coastal birds.

Scope of Assessment

The assessment focused on Project construction and operation activities that would produce underwater noise. Studies were informed by discussions with the Southern Resident Killer Whale Technical Advisory Group.

The local study area encompassed the area where Project-related underwater noise may change existing conditions, including the Strait of Georgia.

The regional study area includes southern resident killer whale critical habitat, which extends south to the western end of the Strait of Juan de Fuca, plus the adjacent United States critical habitat, excluding Puget Sound.

Existing levels of underwater noise in the study areas were measured with hydrophones and predicted with models. Underwater noise in the future from commercial vessel traffic, both with and without the Project, and from other reasonably foreseeable projects and activities that will be carried out, was predicted in summer and winter in the study areas through modelling. Project activities, such as dredging, pile-driving, vibro-densification, and movements of support vessels during construction, and movements of container ships and tugboats associated with terminal approach and departure, and berthing and unberthing during operation were considered. Small vessel traffic, including commercial whale-watching traffic, was not included in predictions of underwater noise.

UNDERWATER NOISE

Existing Conditions

Ocean noise is generated from natural processes, such as wind, waves and rain, as well as human activities. Human activities that contribute to underwater noise in the study areas include movements of ferries, fishing vessels, container ships, bulk cargo ships, tugboats, small private boats and depth sounders. Existing underwater noise levels are higher near Westshore Terminals, Deltaport Terminal and the BC Ferries terminal, and near ferry routes and shipping lanes in the Strait of Georgia and Haro Strait. Underwater noise levels at Roberts Bank increase during the day and decrease at night, due to human activity. Underwater noise levels are higher in winter compared to summer, due to colder water temperatures.

Key Findings

The overall assessment is considered to provide a conservative evaluation of potential changes in the acoustic environment resulting from the Project. Underwater noise levels during construction are predicted to be comparable on average to existing levels measured at Roberts Bank, with the exception of some periods when certain activities, such as dredging, pile-driving, vibro-densification, or construction support vessel movement, would occur.

Overall, average underwater noise from Project construction and operation activities is expected to be comparable to average existing levels of underwater noise, due to existing high levels, but would at times exceed existing conditions. Underwater noise related to conservative levels of Project commercial vessel movements is predicted to increase over existing underwater noise levels for approximately 3 per cent of a year for vessel berthing and unberthing, and for approximately 2 per cent of a year for vessel approach and departure.

Future cumulative increases in commercial vessel traffic in the region are expected to make a relatively small incremental contribution to overall underwater noise levels. This prediction reflects the already-dominant contribution of vessel traffic noise to the acoustic environment.

POPULATION (EIS SECTION 18.4)

ASSESSMENT HIGHLIGHTS

- The Project is not expected to alter the overall population growth trend in Metro Vancouver during the construction and operation phases.
- Small amounts of in-migration to Metro Vancouver during the construction phase are expected.

Intermediate Component Overview

A population assessment was carried out to determine whether the Project would result in an in-migration of workers into the local area, which could potentially result in demands on community infrastructure and services, and increased costs to local government.

The results of the population assessment were used in the assessments of local government finances, services and infrastructure, and human health.

Scope of Assessment

The population assessment examined the existing labour force in Metro Vancouver and other parts of the Lower Mainland to determine whether sufficient and qualified local labour was available to meet Project needs during the construction and operation phases.

The study area and existing conditions encompassed the population of Metro Vancouver, with a focus on potential changes to the populations of the Corporation of Delta and Tsawwassen First Nation.

Key Findings

The Project is not expected to alter the overall population growth trend in Metro Vancouver during the construction and operation phases.

The construction phase is expected to attract small amounts of temporary and permanent in-migration. The Project is not expected to directly change the population of Metro Vancouver during the operation phase.

15 SUMMARY OF RESULTS: VALUED COMPONENTS

This section of the Executive Summary provides a summary of findings for the 16 valued components assessed as part of the environmental assessment for the proposed Roberts Bank Terminal 2 Project.

The grey **Assessment Highlights** box at the top of each section provides an overview of the assessment of the valued component. The remainder of each section includes information regarding the scope of assessment, the assessment area, existing conditions, potential effects, mitigation measures and key findings.

For more detail regarding the effects assessments and results, please see the EIS section noted in brackets. Marine biophysical valued components can be found in Volume 3 of the EIS and socio-economic valued components can be found in Volume 4.

Assessing Ecosystem Productivity

Port Metro Vancouver used an ecosystem-based approach to assess Project-related effects to the productivity of marine biophysical valued components. Modelling of ecosystem productivity was one of several tools used to inform effects assessments.

Productivity is a measure of the amount of plant and animal biological material (or biomass) produced within an area over a given amount of time. A predator-prey food web for the Roberts Bank ecosystem was developed to represent the linkages and interactions between marine vegetation, invertebrates, fish, mammals and coastal bird species that influence the productivity of the ecosystem.

The model was also used to predict the productivity of proposed on-site habitat that would be created to offset expected Project-related effects on the productivity of marine biophysical valued components.

MARINE VEGETATION (EIS SECTION 11.0)

ASSESSMENT HIGHLIGHTS

- Overall, net productivity of marine vegetation is expected to increase with the Project, without mitigation, and would be further increased with the implementation of environmental management plans and the creation of habitat.
- Predicted decreases in productivity for macroalgae (seaweed) resulting from direct mortality during Project construction can be mitigated through the incorporation of rocky shoreline in the terminal and causeway perimeter and through the creation of subtidal rock reef habitat.
- The composition of the species within the biofilm community varies between seasons under existing conditions. With the Project, biofilm composition is expected to change temporarily during freshet in response to decreases in salinity, and return to existing conditions outside of the annual freshet period.
- The Project is not expected to result in any significant adverse residual effects to marine vegetation.
- The Project is not expected to result in any incremental adverse cumulative effects to marine vegetation.

Valued Component Overview

Marine vegetation provides habitat and food for invertebrates, fish and birds, and is an indicator of ecosystem health. An assessment was undertaken to determine the potential effects of the Project on the productivity of marine vegetation.

The results of the marine vegetation assessment were considered in the assessments of marine invertebrates, marine fish, marine mammals, coastal birds, human health, and current use of land and resources for traditional purposes.

Scope of Assessment

The assessment of marine vegetation focused on five sub-components:

- Eelgrass, including native and non-native species;
- Intertidal marsh, such as bulrush and pickleweed species;
- Macroalgae, commonly known as seaweed;
- Biomat, a mat-type layer consisting of blue-green algae and diatoms; and
- Biofilm, a thin dense layer of microscopic photosynthetic algae and bacteria that is an important source of food for western sandpiper and other shorebirds during migration.

Studies were informed by engagement with the Shorebirds-Biofilm Technical Advisory Group and regulatory agencies. In response to technical advisory group input, Port Metro Vancouver initiated field, desktop and modelling studies designed to address known data gaps, particularly around biofilm at Roberts Bank. Biofilm studies are limited in North America, and studies conducted at Roberts Bank from 2012 to 2014 have increased knowledge in key areas, including biofilm growth, seasonal variability and resilience.

Anticipated Project-related changes to marine vegetation were assessed by considering potential changes to the productivity of the five sub-components resulting from direct loss or mortality from the terminal and causeway footprint, altered water quality, (i.e., changes in salinity and total suspended sediment) and changes in sediment erosion and deposition.

MARINE VEGETATION

Changes in productivity were evaluated based on a combination of literature reviews, empirical field studies conducted from 2012 to 2014 and predictive modelling, including an ecosystem-based model.

In addition, as the extent of freshwater influence at Roberts Bank is predicted to change as a result of the Project, potential changes to marine and freshwater-influenced biofilm community composition were also assessed.

The local assessment area included Roberts Bank, and the regional assessment area included Roberts Bank, Roberts Bank North, the lower Fraser River, Canoe Passage and Boundary Bay.

Existing Conditions

Existing conditions were characterized for representative species for each of eelgrass, intertidal marsh, macroalgae, biomat and biofilm. Existing conditions for marine vegetation are influenced by previous developments including the development of the Roberts Bank and BC Ferries terminals, the dynamic natural environment and species that forage on marine vegetation.

Under existing conditions, biofilm experiences a wide range of seasonally variable estuarine conditions, such as changes in water quality in the spring during freshet, which influence the growth and composition of the community assemblage. Biofilm is resilient, however, and returns to a highly productive state once optimal conditions return.

Potential Effects

Interactions between Project components and activities and marine vegetation were considered and the following effects were identified:

- Potential productivity increases for intertidal marsh are expected, while negligible changes are predicted for eelgrass and biomat;
- Potential productivity loss for macroalgae during construction and operation phases as a result of terminal land development, causeway widening and tug basin expansion, and terminal footprint-related losses of subtidal sand habitat and increased sedimentation; and
- Potential changes in biofilm composition in the freshet period during construction and operation as a result of terminal footprint-related changes to marine and fresh water mixing, resulting in temporary salinity changes.

Mitigation Measures

Measures to avoid, reduce or offset potential effects include:

- Placement of terminal in subtidal waters;
- Reduced footprint of causeway widening;
- Rounded northwest terminal corner to reduce scour;
- Incorporation of rocky shoreline in terminal perimeter;
- Implementation of construction and operation environmental management plans related to maintaining water and sediment quality, as described on pages 121 and 122 of this Executive Summary; and
- Creation of on-site subtidal reef habitat to offset potential productivity losses to macroalgae.

MARINE VEGETATION

Key Findings

Overall, net productivity of marine vegetation is expected to increase with the Project, without mitigation, and would be further increased with the implementation of environmental management plans and the creation of habitat. The overall productivity increase is due to sheltering of the intertidal zone shoreward of the terminal, which would optimize physical conditions for marine vegetation.

During Project construction and operation, changes in productivity of eelgrass, biofilm and biomat are predicted to be negligible (i.e., not measurable or detectable), while increases in productivity of intertidal marsh are expected. Productivity of rockweed, a macroalgae, is predicted to decrease during construction and operation. This decrease can be mitigated through the creation of on-site subtidal rock reef habitat.

The Project is expected to temporarily influence community composition of biofilm during freshet from terminal footprint-related changes in salinity, but is expected to return to existing conditions outside of the annual freshet period.

The assessment concludes there are no significant adverse residual effects from the Project to marine vegetation, as it would continue to maintain its existing ecological functions. The Project is not expected to result in any incremental adverse cumulative effects to marine vegetation.

MARINE INVERTEBRATES (EIS SECTION 12.0)

ASSESSMENT HIGHLIGHTS

- Overall, a minor decrease in the net productivity of marine invertebrates (animals that lack a spinal column) is expected.
- A productivity increase of infaunal and epifaunal invertebrates (e.g., marine worms and small crustaceans) is expected.
- Productivity decreases for bivalve shellfish (e.g., clams and cockles), Dungeness crabs, and orange sea pens (a soft coral) as a result of permanent loss of subtidal sand habitat associated with the terminal footprint can be partially mitigated through the implementation of environmental management plans (including salvaging and transplanting) and the creation of on-site habitat.
- The Project is not expected to result in any significant adverse residual effects to marine invertebrates.
- The Project is not expected to result in any incremental adverse cumulative effects to marine invertebrates.

Valued Component Overview

Marine invertebrates provide food and habitat for other invertebrates and fish, and food for birds, marine mammals and people. An assessment was undertaken to determine the effects of the Project on marine invertebrates.

The results of the marine invertebrates assessment were considered in the assessments of marine fish, marine mammals, coastal birds, marine commercial use, outdoor recreation, human health, current use of land and resources for traditional purposes, and the ongoing productivity of commercial, recreational and Aboriginal fisheries.

Scope of Assessment

The assessment of marine invertebrates focused on four sub-components:

- Infaunal and epifaunal invertebrate communities that reside within or on bottom substrates, respectively (e.g., marine worms and small crustaceans);
- Bivalve shellfish, such as clams, cockles, mussels and oysters;
- Dungeness crabs; and
- Orange sea pens.

Studies were informed by discussions with the Shorebirds-Biofilm Technical Advisory Group, and regulatory agencies.

Anticipated Project-related changes to marine invertebrates were assessed by considering potential changes in productivity and distribution to the four sub-components. In addition, because infaunal and epifaunal invertebrates form community assemblages, diversity and abundance were considered for this sub-component. Abundance, density and suitable habitat area were also considered for Dungeness crabs and orange sea pens, and contaminant levels were considered for Dungeness crabs and bivalve shellfish because they are targeted in fisheries for human consumption.

Extensive studies on marine invertebrates have been completed over the past 30 years and field studies conducted between 2012 and 2014 focused on gaining a better understanding of habitat preferences, soft tissue contaminant concentrations and existing productivity.

The local assessment area included Roberts Bank, and the regional assessment area included Roberts Bank, Roberts Bank North, Sturgeon Bank and Boundary Bay.

MARINE INVERTEBRATES

Existing Conditions

Existing conditions were characterized for representative species for each of infaunal and epifaunal invertebrates, bivalve shellfish, Dungeness crabs and orange sea pens. Marine invertebrate communities are highly variable, both spatially and temporally, primarily due to naturally ranging environmental factors.

Infaunal and epifaunal invertebrates at Roberts Bank are diverse, healthy and well-established. Several groups of bivalves at Roberts Bank, including clams, cockles, oysters and mussels, are commercially valuable or culturally important to Aboriginal peoples, but shellfish harvesting is prohibited by Biotxin and Sanitary Closures imposed by Fisheries and Oceans Canada. Predation by a variety of marine invertebrate, marine fish and bird species is a major source of adult bivalve shellfish mortality. Dungeness crabs are widely distributed at Roberts Bank; the major source of mortality of juveniles is predation by numerous marine bird and fish species, while the major source of adult mortality is due to fisheries, which harvest over 90 per cent of legal-sized male crabs in the Fraser River estuary. Orange sea pens are densely aggregated within the terminal footprint.

Potential Effects

Interactions between Project components and activities and marine invertebrates were considered and the following adverse effect was identified:

- Potential productivity loss for bivalve shellfish, Dungeness crab and orange sea pens during construction and operation phases as a result of terminal land development, causeway widening and tug basin expansion activities, and terminal footprint-related changes in habitat quality and losses of subtidal sand habitat.

Mitigation Measures

Measures to avoid, reduce or offset the potential effect include:

- Placement of terminal in subtidal waters;
- Reduced footprint of causeway widening;

- Rounded northwest terminal corner to reduce scour;
- Incorporation of rocky shoreline in terminal perimeter;
- Implementation of construction and operation environmental management plans related to construction work windows, crab salvages, orange sea pen transplants, and maintaining water and sediment quality, as described on pages 121 and 122 of this Executive Summary; and
- Creation of habitat including eelgrass, intertidal marsh, mudflat and sandy gravel beach.

Key Findings

During construction and operation, the Project is expected to result in a net decrease in marine invertebrate productivity, both before and after mitigation is implemented. Increases in productivity of infaunal and epifaunal invertebrate communities and decreases in productivity for bivalve shellfish, Dungeness crab and orange sea pens are predicted. Short-term productivity losses are due to direct mortality and losses of available habitat within the Project footprint.

Productivity decreases can be partially mitigated through the implementation of environmental management plans, including crab salvages and transplanting of orange sea pens, and through the creation of eelgrass, intertidal marsh, mudflat and sandy gravel beach habitats.

While the Project is predicted to cause losses of productivity of bivalve shellfish, Dungeness crabs and orange sea pens, the scale of change is minor in the context of natural variability and would not compromise the population integrity or ecological function. The assessment concludes there are no significant adverse residual effects from the Project to marine invertebrates. The Project is not expected to result in any incremental adverse cumulative effects to marine invertebrates.

MARINE FISH (EIS SECTION 13.0)

ASSESSMENT HIGHLIGHTS

- Overall, marine fish are expected to experience a minor decrease in productivity with the Project.
- Minor decreases in productivity resulting from direct mortality and disturbance from underwater noise during Project construction, and permanent loss of subtidal sand habitat associated with the terminal footprint, can be partially mitigated through the implementation of environmental management plans and the creation of habitat.
- Residual effects are anticipated for flatfish and forage fish as a result of subtidal sand habitat loss and underwater noise.
- The Project is not expected to result in any significant adverse residual effects to marine fish.
- The Project is not expected to result in measurable incremental adverse cumulative effects to marine fish.

Valued Component Overview

Marine fish influence the structure and function of ecosystems, contribute to overall ecosystem health and are of high social, cultural and commercial value. An assessment was undertaken to determine the effects of the Project on the productivity of marine fish.

The results of the marine fish assessment were considered in the assessments of marine mammals, coastal birds, marine commercial use, outdoor recreation, human health, current use of land and resources for traditional purposes, and the ongoing productivity of commercial, recreational and Aboriginal fisheries.

Scope of Assessment

The assessment of marine fish focused on five sub-components:

- Pacific salmon, represented by chinook and chum;
- Reef fish, represented by lingcod and rockfish species;
- Forage fish, represented by Pacific sand lance, surf smelt, Pacific herring and shiner perch;
- Flatfish, represented by English sole and starry flounder; and
- Demersal fish (fish living near or on the seabed), represented by threespine stickleback and Pacific staghorn sculpin.

Chinook and chum salmon were chosen as representative species for Pacific salmon, which includes all five salmon species, including sockeye. While salmon are of important social, cultural and Aboriginal importance, and contribute to commercial, recreational and Aboriginal fisheries, sockeye were not chosen as a representative species as they tend to pass through the estuary quickly. Any Project-related effects to chinook and chum are expected to be greater than effects to sockeye, and therefore, these species provide a conservative assessment for other salmon species.

Anticipated Project-related changes to marine fish were assessed by considering potential changes to productivity, density, underwater sound levels (to determine potential harm and behavioural responses) and water and sediment quality for the five sub-components. In addition, for Pacific sand lance, the area of suitable subtidal burying habitat was considered.

MARINE FISH

Marine fish in the Roberts Bank area have been studied since the late 1970s. Field studies conducted from 2012 to 2014 focused on characterizing existing conditions, including seasonal variability of fish presence and habitat use.

The local assessment area included Roberts Bank, and the regional assessment area included the Fraser River estuary from Boundary Bay to Sturgeon Bank, as well as the Fraser River North and Main arms and main stem to Hope.

Existing Conditions

Existing conditions were characterized for each of the five sub-components. Existing conditions for marine fish are influenced by previous developments and current activities at Roberts Bank, including the development of the Roberts Bank and BC Ferries terminals, fishing pressure on species such as Pacific salmon, the dynamic natural environment, availability and quality of habitat, and availability of prey.

Chinook, chum and pink salmon are typically the most abundant species found at Roberts Bank. Roberts Bank provides refuge habitats for juvenile salmon, particularly during ebbing tides. Fraser River stream-type chinook stocks are declining.

At Roberts Bank, artificial reefs offer habitat for lingcod, and copper and quillback rockfish. Populations are low and fisheries restrictions have been implemented and marine reserves created to allow for recovery of rockfish populations.

Numerous forage fish species use nearshore shallow habitats in the inter-causeway area, particularly in the summer, although some species are found year-round at Roberts Bank. Many flatfish species have been documented in the intertidal and subtidal areas at Roberts Bank, mainly as juveniles, suggesting that Roberts Bank is important for rearing for these species.

Numerous demersal fish species are found in abundance at Roberts Bank. The most common species, threespine stickleback and Pacific staghorn sculpin, are encountered in intertidal and subtidal waters.

Potential Effects

Interactions between Project components and activities and marine fish were considered and the following adverse effect was identified:

- Potential productivity loss during construction and operation phases as a result of terminal land development, causeway widening and tug basin expansion activities, light and underwater noise during construction, and terminal footprint-related changes in habitat quality and losses of suitable subtidal sand habitat.

Mitigation Measures

Measures to avoid, reduce or offset the potential effect include:

- Placement of terminal in subtidal waters;
- Reduced footprint of causeway widening;
- Rounded northwest terminal corner to reduce scour;
- Incorporation of rocky shoreline in terminal perimeter;
- Alignment of construction activities to avoid fisheries-sensitive windows for juvenile salmon;
- Implementation of construction and operation environmental management plans related to fish salvages, underwater noise, light, and maintaining water and sediment quality, as described on pages 121 and 122 of this Executive Summary; and
- Creation of habitat including eelgrass, intertidal marsh, mudflat and sandy gravel beach.

MARINE FISH

Key Findings

Overall, marine fish are expected to experience a minor decrease in productivity in the future with the Project.

Minor decreases in productivity are anticipated during the construction and operation phases for all marine fish sub-components, with the exceptions of negligible changes in productivity for certain species including adult chinook and chum salmon (representative species for sockeye and other Pacific salmon species) and lingcod, and an increase in productivity for shiner perch during the operation phase.

Productivity decreases can be partially mitigated through the implementation of environmental management plans and the creation of habitat. Residual effects are anticipated for flatfish and forage fish as a result of permanent loss of subtidal sand habitat associated with the terminal footprint and disturbance from underwater noise.

The assessment concludes there are no significant adverse effects from the Project, as marine fish productivity or long-term integrity would not be compromised. The Project is not expected to result in measurable incremental adverse cumulative effects to marine fish.

MARINE MAMMALS (EIS SECTION 14.0)

ASSESSMENT HIGHLIGHTS

- With the implementation of proposed mitigation measures, potential Project-related adverse effects on marine mammals from Project construction and operation activities and terminal footprint-related changes will be avoided or reduced, except for potential adverse effects from underwater noise produced during operations.
- Project-related adverse residual effects from underwater noise during operations to marine mammals are expected to be not significant.
- The Project is not anticipated to adversely affect the features of southern resident killer whale critical habitat when needed for their life functions.
- The Project will not limit the survival or population recovery of southern resident killer whales.
- Cumulative effects to baleen whales, seals and sea lions, and toothed whales other than southern resident killer whales, are expected to be not significant.
- Due to their Endangered status and lack of recovery of the population, southern resident killer whales are assumed to be already significantly adversely affected; therefore, cumulative effects to southern resident killer whales are expected to remain significant.

Valued Component Overview

Marine mammals are top predators in the Strait of Georgia marine ecosystem, the focus of a substantial wildlife viewing and ecotourism industry, and culturally valued by the public and Aboriginal groups. An assessment was undertaken to determine the potential effects of the Project on marine mammals.

The results of the marine mammal assessment were considered in the assessments of marine commercial use, human health, and current use of land and resources for traditional purposes.

Scope of Assessment

The assessment of marine mammals focused on three sub-components:

- Toothed whales, represented by southern resident killer whales;
- Baleen whales, represented by North Pacific humpback whales; and
- Seals and sea lions, represented by Steller sea lions.

In order to be conservative, the species with the highest conservation designation was chosen as the representative species for each sub-component.

The assessment of potential effects of the Project on marine mammals considered the acoustic environment, availability of prey, and water and sediment quality, as well as the potential for vessel strikes. Studies to address known data gaps regarding the southern resident killer whale were informed by discussions with the Southern Resident Killer Whale Technical Advisory Group and regulatory agencies. In response to technical advisory group input, Port Metro Vancouver initiated field, desktop and modelling studies.

The local assessment area extended north and south in the Strait of Georgia from the Project area to the extent of the zone where marine mammals were predicted to hear Project-related underwater noise.

MARINE MAMMALS

In order to provide a full regulatory context, the regional and cumulative effects assessment areas for southern resident killer whales included all Canadian critical habitat, which extends from the southern Strait of Georgia to the western end of the Strait of Juan de Fuca, plus the adjacent United States critical habitat, excluding Puget Sound. For humpback whales and Steller sea lions, the regional and cumulative effects assessment areas included the southern Strait of Georgia, Haro Strait and Rosario Strait.

Existing Conditions

Existing conditions were determined for each of the three representative species.

Southern resident killer whales are listed as Endangered under the *Species at Risk Act* and their critical habitat is protected. They are considered to be at risk due to their small population size (78 individuals as of January 2015), low reproductive rate and potential anthropogenic threats. Southern resident killer whale distribution is closely associated with the presence of salmon, primarily chinook. Southern resident killer whales have been observed in the waters off the mouth of the Fraser River with greater frequency in September to October, although highest activity is observed in Haro Strait.

North Pacific humpback whales are currently listed as Threatened under the *Species at Risk Act*, but are expected to be re-listed as a species of Special Concern because of strong recovery of the population. Humpback whales occur occasionally in the local assessment area.

Steller sea lions are classified as a species of Special Concern under the *Species at Risk Act*, primarily due to concern regarding declines in the population in Alaska, the uncertainty regarding this decline, sensitivity to human disturbance and environmental contaminants. Seals and sea lions are present at Roberts Bank year-round and use both marine and terrestrial sites.

Potential Effects

Interactions between Project components and activities and marine mammals were considered and the following potential adverse effects were identified:

- Changes in acoustic environment as a result of underwater noise from dredging, pile-driving, vibro-densification, and tug and vessel movements during construction, and container ship and tug movements during operation, resulting in potential acoustic injury, behavioural disturbance, or acoustic masking;
- Changes to the availability of prey from changes to fish habitat; and
- Vessel strikes.

Changes in water or sediment quality are not anticipated to have an adverse effect on marine mammals.

Mitigation Measures

Measures to avoid or reduce potential effects include:

- Implementation of construction and operation environmental management plans to reduce effects of underwater noise, as described on pages 121 and 122 of this Executive Summary;
- Offsetting of potential effects to marine fish to address potential effects to prey availability; and
- Continuation of Port Metro Vancouver's Environmental Training Plan for vessel operators to reduce the risk of vessel strikes.

MARINE MAMMALS

Key Findings

Project-related adverse residual effects to marine mammals are expected to be not significant, based on the following:

- Future underwater noise levels with the Project are comparable to levels currently measured at Roberts Bank and mitigation would be implemented to reduce construction-related effects; population modelling predicted no statistical difference in the effects of underwater noise on southern resident killer whale life functions and subsequent population-level effects, between existing conditions and future conditions with the Project, and future conditions with the Project in combination with future certain and foreseeable projects;
- The availability or productivity of Pacific salmon prey (i.e., chinook salmon) is not anticipated to decrease from Project-related reductions in habitat availability; and
- The likelihood of a Project-related container ship, tug or support vessel strike resulting in marine mammal injury or mortality is very low.

Potential effects can be avoided or reduced during construction through the implementation of mitigation measures outlined in environmental management plans. Potential effects from increases in underwater noise during operation are expected to be infrequent compared to existing conditions, and of short-term duration, reversible and low-to-moderate magnitude.

In addition, the Project is not anticipated to have an adverse effect on southern resident killer whale critical habitat features when needed for southern resident killer whale life functions. The Project would not limit the survival or population recovery of southern resident killer whales.

Cumulative effects to baleen whales and seals and sea lions are expected to be not significant. However, due to their Endangered status and lack of recovery of the southern resident killer whale population, Port Metro Vancouver has assumed past activities and projects, including those described in the recovery strategy issued by Fisheries and Oceans Canada (see next page), have had a significant adverse effect on southern resident killer whales. Therefore, the Project, in combination with past projects and activities that have been carried out, and certain and reasonably foreseeable projects that will be carried out, would result in a continued significant cumulative effect to southern resident killer whales.

Southern Resident Killer Whales

Between 1965 and 1973, an estimated 47 southern resident killer whales were captured for aquariums. When live capture ended, the population was estimated at 70 individuals. Since that time the population has experienced periods of growth and decline, and in January 2015 was 78 individuals.

Fisheries and Oceans Canada issued a recovery strategy under the *Species at Risk Act* for both southern and northern resident killer whales in 2008. Live captures, hunting, intentional shooting and acoustic harassment devices are identified as historical threats to killer whales.

The contribution of various factors on the recovery of the southern resident killer whale population are not well understood. Threats that may be affecting population recovery are identified in the recovery strategy as environmental contaminants; reduced prey availability, particularly reduced chinook stocks; and underwater noise, from sources such as military or navigation sonar, ferries, commercial shipping, commercial whale-watching vessels, and recreational vessels.

The recovery strategy identifies critical habitat, which was protected by a ministerial order issued in 2009. The Project occurs within southern resident killer whale critical habitat.

Critical habitat is defined by the features and attributes of the area required by the species for its life functions. The features of southern resident killer whale critical habitat are identified as availability of prey, lack of acoustical disturbance and lack of chemical contamination. The life functions of the southern resident killer whale are foraging, socializing, mating and resting.

In undertaking its assessment of the potential effects of the Project on the southern resident killer whale, Port Metro Vancouver therefore focused on the potential effects that could change the features of critical habitat such that they would not be available when needed for the life functions of southern resident killer whales. The addition of the studies undertaken by Port Metro Vancouver to the body of scientific knowledge on southern resident killer whales are anticipated to meet some of the objectives of the southern resident killer whale draft action plan issued by Fisheries and Oceans Canada in support of the recovery strategy.

The assessment has determined the Project would not have a significant adverse environmental effect on southern resident killer whales, would not affect features of critical habitat when needed for the life functions of southern resident killer whales and would not adversely affect the recovery of the population.

COASTAL BIRDS (EIS SECTION 15.0)

ASSESSMENT HIGHLIGHTS

- Potential Project-related effects to coastal birds include acoustic and visual disturbances during construction, loss of subtidal habitat for diving birds, and mortality of barn owl from vehicle collisions near the rail tie-ins and emergency access road at the east end of the causeway.
- Project-related effects can be fully mitigated through the implementation of environmental management plans and the creation of habitat, except for residual productivity loss associated with loss of subtidal habitat for diving birds.
- The Project is not expected to result in any significant adverse residual effects to coastal birds.
- The Project is not expected to result in measurable incremental adverse cumulative effects to coastal birds.

Valued Component Overview

The Fraser River estuary is an important ecosystem for overwintering and migrating birds, supporting large numbers of numerous species. An assessment was undertaken to determine the effects of the Project on coastal birds.

The results of the coastal birds assessment were considered in the assessments of marine commercial use, outdoor recreation, human health, and current use of land and resources for traditional purposes.

Scope of Assessment

The assessment of coastal birds focused on seven sub-components:

- Shorebirds, represented by Pacific dunlin and western sandpiper;
- Waterfowl, represented by American wigeon and brant;
- Herons, represented by great blue heron;
- Diving birds, represented by surf scoter and western grebe;
- Raptors, represented by bald eagle, barn owl and peregrine falcon;
- Gulls and terns, represented by Caspian tern and glaucous-winged gull; and
- Passerines, also known as songbirds, represented by barn swallow.

Anticipated Project-related changes to coastal birds were assessed by considering potential changes in productivity, abundance, density, species diversity, distribution and suitable habitat area, for the seven sub-components. For some sub-components, foraging opportunity and contaminant levels were also examined.

Coastal birds in the Roberts Bank area have been studied for decades. The assessment was based on a combination of literature review, field studies conducted from 2012 to 2014, and predictive modelling. Field studies focused on factors influencing shorebird use of the area, shorebird diet composition and area, genetic differences, waterbird habitat use and human-related bird mortalities.

The local assessment area included Roberts Bank, and the regional assessment area included Roberts Bank, Roberts Bank North, the Fraser River South Arm Marshes, Sturgeon Bank, Boundary Bay and adjacent agricultural habitat extending 8 kilometres inland.

The cumulative effects assessment area included the regional assessment area plus the Strait of Georgia, Burrard Inlet, and the Fraser River east to the Port Mann Bridge.

COASTAL BIRDS

Existing Conditions

Existing conditions were characterized for the sub-components of shorebirds, waterfowl, herons, diving birds, raptors, gulls and terns, and passerines.

Existing conditions for coastal birds are influenced by previous developments and activities at Roberts Bank including the development of the Roberts Bank and BC Ferries terminals, the dynamic natural environment, availability and quality of habitat, and availability and quality of food resources.

An estimated 1.4 million birds, representing more than 250 species, use Roberts Bank and the Fraser River estuary. Use of the area varies throughout the year, with the greatest abundance occurring during shorebird migratory periods (northward in the spring, and southward in the fall) or during winter. During migration, western sandpiper and Pacific dunlin stop to replenish energy and fat reserves, feeding on biofilm and marine invertebrates found in the area.

Waterfowl are regularly found in the Roberts Bank area and foraging and resting were the primary uses in intertidal and upland areas. Near the Roberts Bank terminals, the abundance of several diving waterbird species such as surf scoters and western grebe was noted to be highest in spring and lowest in summer. Resident, migratory and overwintering raptor species use the Fraser River estuary. Bald eagles, the most common raptor at Roberts Bank, are observed resting, hunting, feeding and preening year-round on intertidal mudflats and port-related infrastructure. Gulls and terns use the intertidal and subtidal habitat for swimming, feeding and resting. Gulls are present throughout the year, while terns are present between April and October. Passerines have been observed foraging over shallow coastal waters. The coastal bird species that spend all or portions of their life within estuaries such as Roberts Bank are well adapted and resilient to a wide range of abiotic conditions, including salinity, sediment grain size and turbidity.

Potential Effects

Interactions between Project components and activities and coastal birds were considered and the following potential adverse effect was identified:

- Potential productivity loss during construction and operation phases as a result of activities for terminal land development, tug basin expansion and causeway widening, terminal footprint-related changes to habitat quality or losses of subtidal habitat, and vehicle collisions.

Mitigation Measures

Measures to avoid, reduce or offset the potential effect include:

- Placement of terminal in subtidal waters;
- Reduced footprint of causeway widening;
- Rounded northwest terminal corner to reduce scour;
- Incorporation of rocky shoreline in terminal perimeter;
- Timing of construction activities to avoid periods when diving birds are abundant in the area (coincides with the Dungeness crab timing window);
- Implementation of construction and operation environmental management plans related to noise, underwater noise, light, traffic management, and maintaining water and sediment quality, as described on pages 121 and 122 of this Executive Summary;
- Creation of habitat including eelgrass, intertidal marsh, mudflat and sandy gravel beach;
- Development and implementation of measures to mitigate effects to barn owls from vehicle collisions, in collaboration with transportation authorities and the Canadian Wildlife Service.

COASTAL BIRDS

Key Findings

Changes in the productive potential of shorebirds, herons, raptors, gulls and terns, and passerines are not anticipated, as changes to key habitats are minimal and primary food sources are predicted to increase.

Decreases to the productivity potential for waterfowl and diving birds are expected to be minor. Effects to waterfowl can be mitigated through the creation of eelgrass, mudflat and intertidal marsh habitats. Effects to diving birds can be partially offset through the creation of on-site eelgrass and subtidal rock reef habitats, which would create habitat for their prey, which include mussels and other invertebrates.

Vehicle collision-related mortalities are anticipated to be very low compared to population size, and are not expected to affect the short- and long-term population viability of coastal birds, with the exception of barn owls. Port Metro Vancouver would work with transportation authorities and the Canadian Wildlife Service to develop and implement measures to mitigate potential effects to barn owls from vehicle collisions.

Overall, the Project is not expected to compromise the productive potential of the local area to support coastal bird productivity, or change to species' viability. The assessment concludes there are no significant adverse residual effects from the Project to coastal birds. The Project is not expected to result in measurable incremental adverse cumulative effects to coastal birds.

ONGOING PRODUCTIVITY OF COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES (EIS SECTION 16.0)

ASSESSMENT HIGHLIGHTS

- All Project-related effects to the ongoing productivity of commercial, recreational and Aboriginal fisheries are expected to be unmeasurable compared to natural variability at the population level for species relevant to these fisheries.
- The Project is not expected to result in any significant adverse residual effects to the ongoing productivity of these fisheries.
- The Project is not expected to contribute to cumulative effects on these fisheries.

Valued Component Overview

Commercial, recreational and Aboriginal fisheries occur in and around Roberts Bank, and target a variety of marine species and are protected under the *Fisheries Act*. An assessment was undertaken to determine the effects of the Project on the ongoing productivity of commercial, recreational and Aboriginal fisheries. These fisheries, and the fish and fish habitats that support them, provide economic, environmental and cultural value to local and regional communities.

The assessment of the ongoing productivity of commercial, recreational and Aboriginal fisheries focuses on Project-related effects on the productivity of species and habitats that support these fisheries. Results of this assessment were considered in the assessments of marine commercial use, outdoor recreation, human health and current use of land and resources for traditional purposes.

Scope of Assessment

The assessment of commercial, recreational and Aboriginal fisheries focused on four sub-components:

- Pacific salmon, represented by chinook and chum species;
- Groundfish, represented by lingcod and rockfish;
- Forage fish, represented by Pacific herring and surf smelt; and
- Crab, represented by Dungeness crab.

Potential changes in productivity in the future with and without the Project were predicted using an ecosystem model, which provided productivity estimates for marine invertebrates and fish species that comprise or support commercial, recreational and Aboriginal fisheries.

The local assessment area included Roberts Bank, and the regional assessment area included Roberts Bank, Roberts Bank North, Sturgeon Bank, Boundary Bay, and the Fraser River downstream of Hope.

Existing Conditions

Existing conditions were determined for each of commercial, recreational and Aboriginal fisheries, including existing stocks of Pacific salmon, groundfish, forage fish and Dungeness crab.

ONGOING PRODUCTIVITY OF COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

Key Findings

All Project construction and operation activities are expected to interact at an undetectable level with the ongoing productivity of commercial, recreational and Aboriginal fisheries.

While decreases in productive potential are anticipated for some species that support commercial, recreational and Aboriginal fisheries based on ecosystem modelling, these decreases represent only a small percentage of average species returns, and are not expected to be measurable compared to natural variability at the population level for species relevant to these fisheries.

Project-related effects, therefore, are not anticipated to compromise the ongoing productivity of commercial, recreational or Aboriginal fisheries, and are expected to be negligible. Therefore, the Project is not expected to contribute to cumulative effects on these fisheries.

MITIGATION FRAMEWORK FOR MARINE BIOPHYSICAL VALUED COMPONENTS (EIS SECTION 17.0)

This section of the Executive Summary describes the mitigation framework for avoiding, reducing or offsetting potential adverse effects to marine biophysical valued components.

In keeping with Port Metro Vancouver's mandate to provide a high level of environmental protection, well-planned mitigation measures based on a thorough understanding of the ecological function of the affected environment are key components to preventing and reducing potential Project effects. For the Project, Port Metro Vancouver has adopted the use of the following mitigation hierarchy to address Project-related effects to marine biophysical valued components:

1. Avoid potential adverse effects;
2. Reduce or minimize potential adverse effects that cannot be avoided; and
3. Offset potential adverse effects that cannot be avoided, minimized or reduced.

This mitigation hierarchy was endorsed by members of the Productive Capacity Technical Advisory Group and is recognized as environmental standard practice in federal policy and other guiding documents. Mitigation measures for potential effects to socio-economic valued components are addressed in subsequent sections of this Executive Summary.

Mitigation measures to address potential impacts to marine biophysical valued components are discussed below. These measures are expected to effectively mitigate adverse environmental effects to marine biophysical valued components as required under the *Canadian Environmental Assessment Act, 2012*, and demonstrate that serious harm can be offset, per requirements for a *Fisheries Act* authorization. In addition, with the proposed on-site offsetting of wetland habitat types, wetland functions at Roberts Bank are not anticipated to be compromised.

Avoidance Measures

Measures have been incorporated into Project design and construction scheduling to avoid potential effects to valued components. As examples, the terminal has been located in subtidal waters to avoid overlap with sensitive intertidal habitats, designed with a rounded corner on the northwest side to reduce effects of sediment scour and deposition, and designed with fish refuge habitat in the concrete caissons that would form the berth face.

Reduction Measures

Not all effects on valued components can be addressed through avoidance measures; therefore, measures are planned to reduce Project-related effects. These approaches include the implementation of standard management practices that have been demonstrated to be effective to address similar effects. Examples of reduction measures include salvages or transplants of marine species to reduce direct mortality and the implementation of environmental management plans.

Offsetting Measures

Offsetting provides a third approach to mitigating adverse effects on marine valued components and is proposed after steps have been taken to avoid and reduce effects. A detailed offsetting plan would be developed through discussions with regulatory agencies as part of the environmental assessment and permitting process.

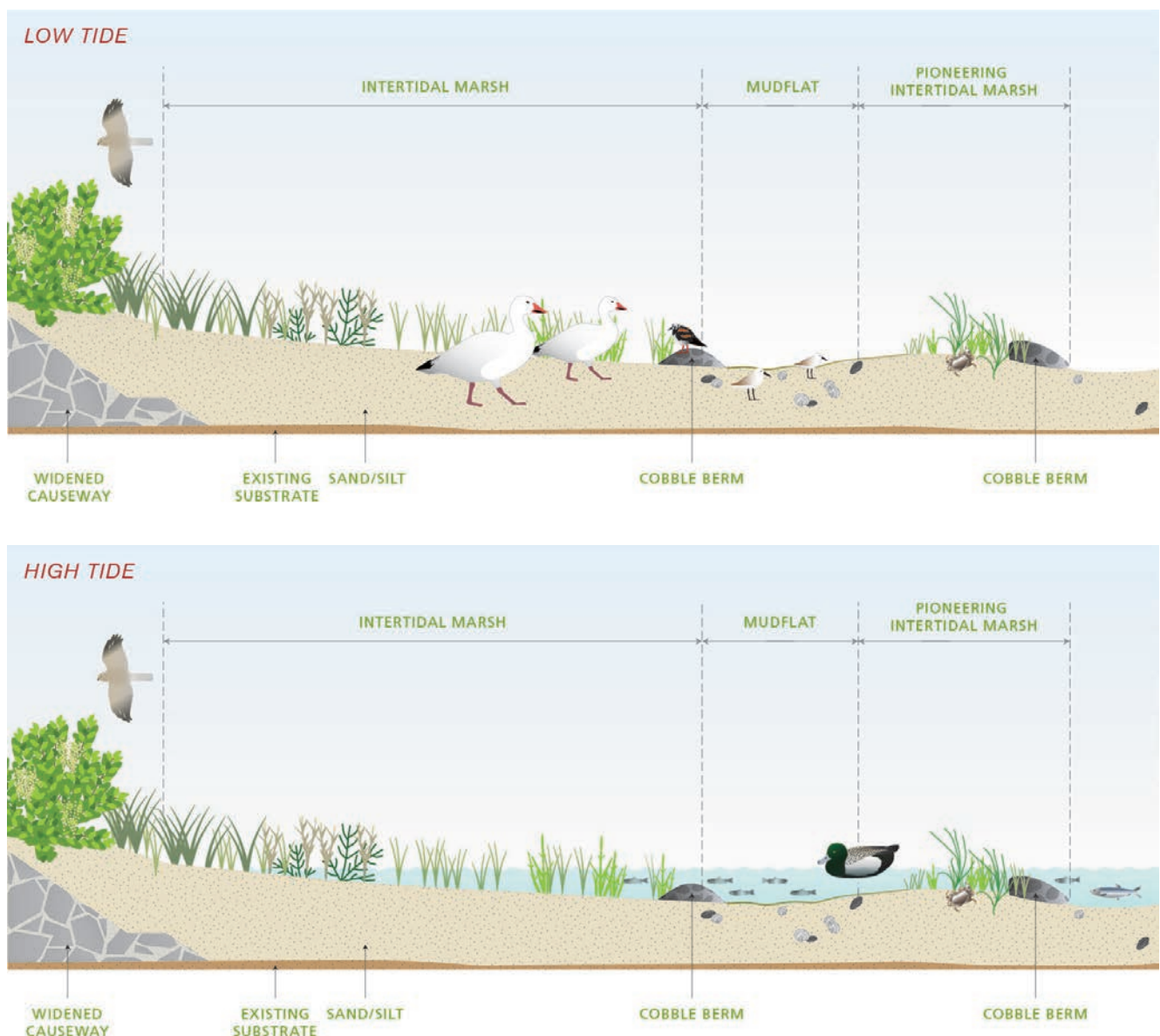
MITIGATION FRAMEWORK FOR MARINE BIOPHYSICAL VALUED COMPONENT

Intertidal marsh:

Important for shoreline stabilization, gas and nutrient regulation, contaminant filtering and nutrient supply, as well as providing structural habitat used for shelter and food by organisms. Some of the species that use intertidal marsh habitat at Roberts Bank include bivalve shellfish, Dungeness crabs, juvenile chinook salmon, shiner perch, sand lance and waterfowl. Approximately 15 hectares of intertidal marsh is proposed along the widened causeway and adjacent to the new terminal.

Mudflat:

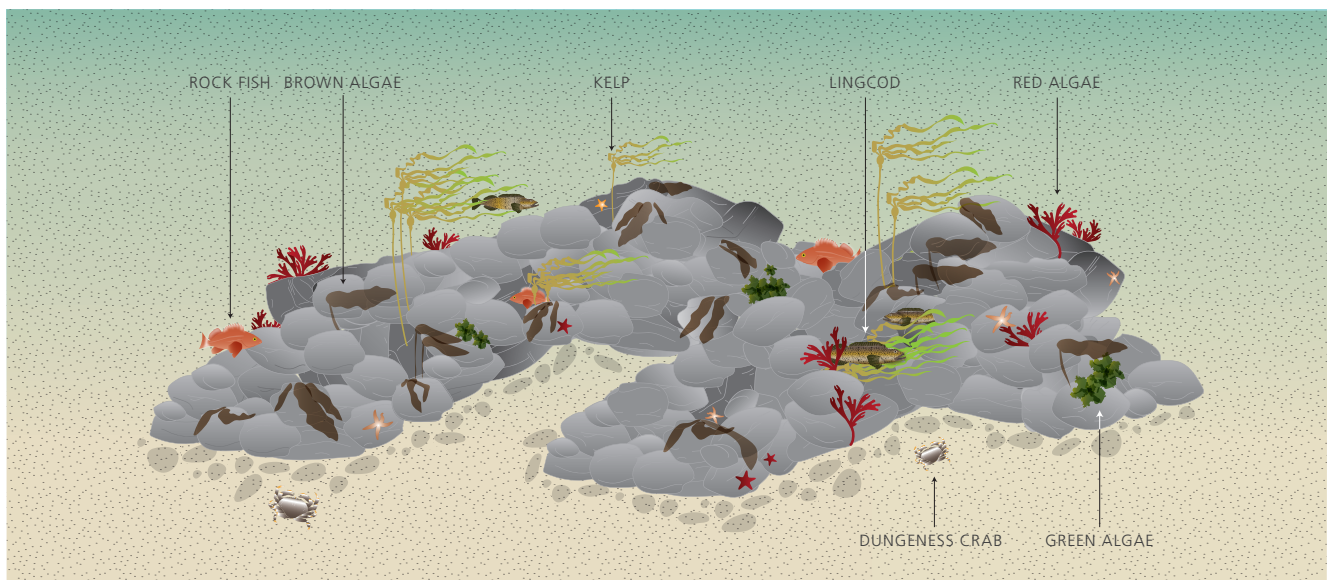
Plays a role in dissipating wave energy, and supports large numbers of birds and fish. Mudflats also support biofilm, an important component of the food web in estuarine and coastal ecosystems. Approximately 4.5 hectares of mudflats are proposed along the widened causeway and adjacent to the new terminal. Biofilm, invertebrates, waterfowl and shorebirds would benefit from this habitat.



MITIGATION FRAMEWORK FOR MARINE BIOPHYSICAL VALUED COMPONENT

Subtidal rock reefs:

Support rockfish populations and assist in meeting fisheries management objectives to alleviate historical declines of regional populations. The creation of approximately 2 hectares of reef habitat would benefit macroalgae vegetation, and provide refuge, feeding and spawning habitat for invertebrates, fish and birds. Subtidal rock reefs would be developed adjacent to, and as extensions of, the productive subtidal rock reefs constructed as part of the Deltaport Third Berth Project.



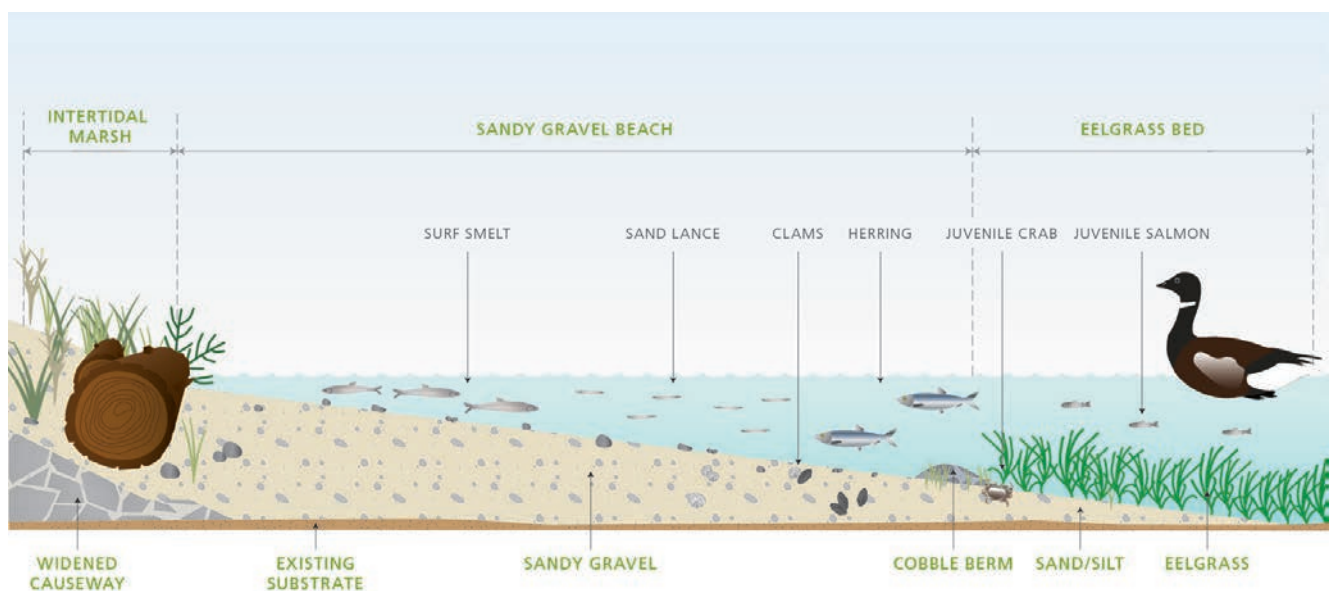
MITIGATION FRAMEWORK FOR MARINE BIOPHYSICAL VALUED COMPONENT

Sandy gravel beach:

Provides spawning area for forage fish including surf smelt, Pacific herring and sand lance. Two sandy gravel beaches, totalling approximately 4.5 hectares, are proposed along the widened causeway. The beaches are intended to provide attachment-type habitat and substrate suitable for marine vegetation and invertebrates, and to benefit some of their predators (e.g., juvenile chinook salmon, waterfowl and American wigeon).

Eelgrass:

Eelgrass beds are highly productive habitats in the Roberts Bank ecosystem, serving numerous critical functions, such as food, shelter and rearing habitat for numerous species. Approximately 3 hectares of native eelgrass would be established through transplants in the inter-causeway area.



Monitoring Program

A monitoring program would be implemented to confirm that offsetting measures meet intended objectives and that they function as designed. For on-site offsetting projects, monitoring would be undertaken to ensure compliance with regulatory requirements and evaluate the performance of each on-site habitat concept.

LABOUR MARKET (EIS SECTION 19.0)

ASSESSMENT HIGHLIGHTS

- The Project is expected to result in the following positive effects on the labour market in Metro Vancouver:
 - During the 5.5-year construction phase:
 - 4,150 person-years of direct employment, worth \$494 million in wages
 - 9,724 person-years of total direct, indirect and induced employment, worth approximately \$824 million in wages
 - During operation:
 - 835 person-years of annual direct employment connected to terminal operations, worth approximately \$138 million in wages annually
 - 1,412 person-years of annual total direct, indirect, and induced employment, worth \$169 million in wages annually
 - A slight lowering of the unemployment rate in Metro Vancouver;
 - A positive effect on the participation rate; and
 - A small boost to median incomes in Delta and Metro Vancouver.
- Training opportunities associated with construction and operation are anticipated to generate positive effects for the Project's direct workforce.
- Positive changes in employment and labour income are anticipated for the Aboriginal population in Metro Vancouver during Project construction and operation.
- The Project is not expected to result in measurable adverse residual effects to the labour market.
- The Project is not expected to result in incremental cumulative effects to the labour market.

Valued Component Overview

Labour market is defined as the exchange of the supply of labour by workers with the demand for labour by employers. Project labour would be supplied by workers with the relevant skills and associated occupational training.

The results of the labour market assessment were considered in the assessments of population, economic development, services and infrastructure and human health.

Scope of Assessment

The labour market assessment considered Project effects on direct, indirect and induced employment.

Direct employment refers to workers involved in on-site construction and on-terminal operation of the Project. Indirect employment is employment at supplier businesses that is supported by direct expenditures on materials, goods and services of the Project, and induced employment refers to employment generated via the household spending of the income of workers employed directly or indirectly through the Project. The assessment also examined potential Project effects on unemployment and labour force participation rates, labour market balance, labour incomes and training opportunities.

The local assessment area was Metro Vancouver and the regional assessment area was British Columbia.

LABOUR MARKET

Existing Conditions

Existing conditions considered labour force occupational structure, availability, growth and median income levels in Metro Vancouver and British Columbia. Existing conditions were also determined for Aboriginal populations in Metro Vancouver and British Columbia. Metro Vancouver's growing labour market is the largest in the province. The median employment income level in Metro Vancouver in 2010 was slightly above the provincial average. Aboriginal workers represent approximately 2 per cent of the Metro Vancouver and Delta labour force.

Potential Effects

Potential Project effects on the labour market include:

- Potential change in employment during construction and operation;
- Potential change in labour income during construction and operation;
- Potential change in training opportunities during construction and operation; and
- Potential change in unemployment and participation rates during construction and operation.

Mitigation Measures

The Project would have positive effects on the labour market. Therefore, no mitigation is necessary.

LABOUR MARKET

Key Findings

Positive effects on the Metro Vancouver and British Columbia labour markets are outlined in the tables below.

EMPLOYMENT DURING FIVE-AND-A-HALF YEAR CONSTRUCTION PERIOD (PERSON-YEARS)			
	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
Direct	4,150	0	4,150
Indirect	3,942	2,322	6,264
Induced	1,632	673	2,305
Total	9,724	2,995	12,719
LABOUR INCOME (\$ MILLIONS)			
Direct	\$494	0	\$494
Indirect	\$247	\$127	\$374
Induced	\$83	\$46	\$129
Total	\$824	\$173	\$997

EMPLOYMENT DURING OPERATION ⁴ (PERSON-YEARS PER YEAR)			
	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
Direct	835	93	928
Indirect	109	5	114
Induced	468	43	511
Total	1,412	141	1,553
LABOUR INCOME (\$ MILLIONS PER YEAR)			
Direct	\$138.1	\$15.3	\$153.4
Indirect	\$5.6	\$0.4	\$6.0
Induced	\$25.8	\$0.4	\$26.2
Total	\$169.5	\$16.1	\$185.6

The majority of employment in both construction and operation phases is expected to be drawn from the Metro Vancouver labour force.

Training opportunities are predicted to generate positive effects during the construction and operation phases for the Project's direct workforce.

Positive changes in employment and labour income are anticipated for the Aboriginal population in Metro Vancouver during Project construction and operation.

The Project is not expected to adversely affect the labour market balance in Metro Vancouver as there is expected to be available and qualified capacity within the large Metro Vancouver labour force. In addition, it is anticipated the Project would source labour primarily from Metro Vancouver and enhance local skills through training.

The Project is expected to result in positive effects to the labour market; therefore, the Project is not expected to result in measurable adverse residual effects. The Project is not expected to result in incremental cumulative effects to the labour market.

⁴ Outside of the boundaries of the Project area (or off-terminal), there would be activities conducted by others in connection with increased demand for approximately 2 million TEUs per year of containerized trade that would generate employment. See page 26 in Part 1 of the Executive Summary for more information.

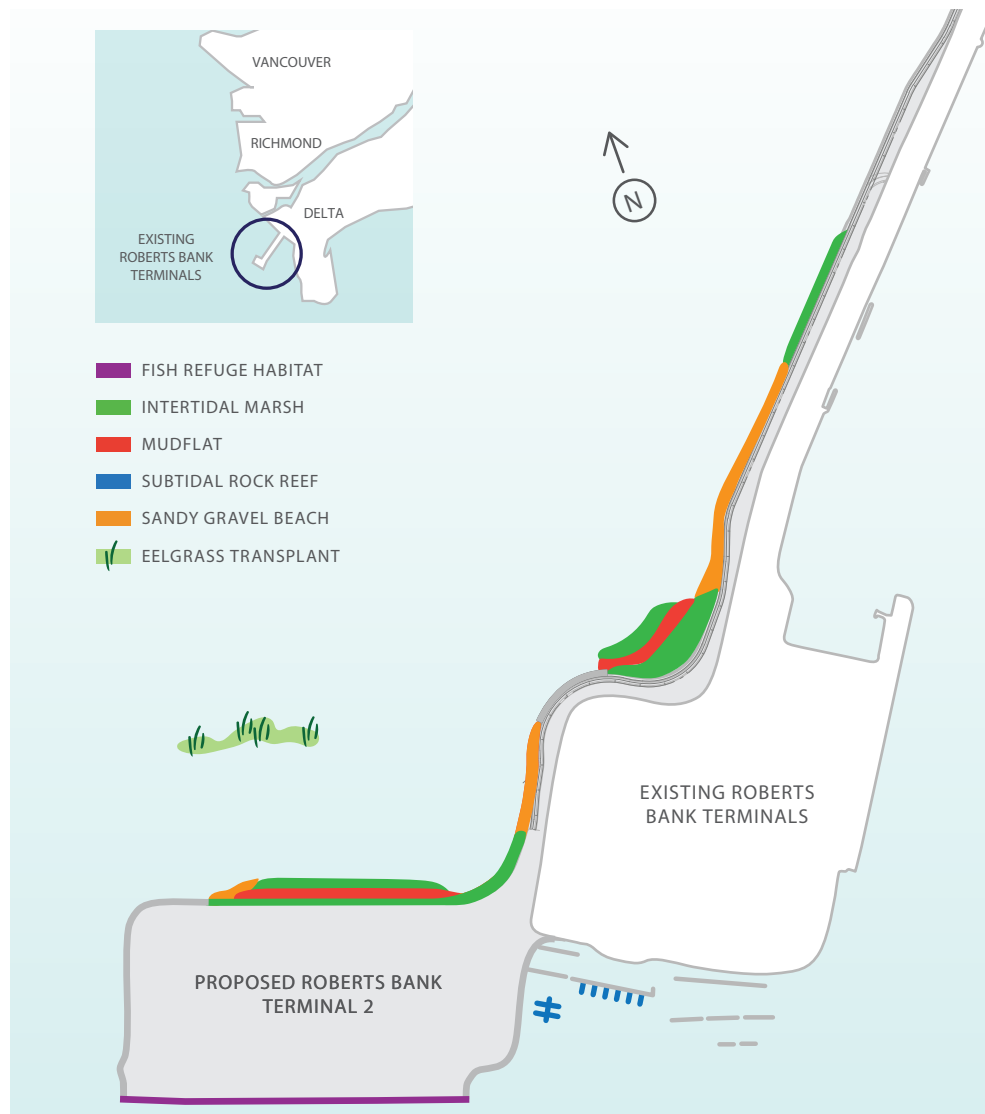
MITIGATION FRAMEWORK FOR MARINE BIOPHYSICAL VALUED COMPONENT

Offsetting measures proposed for the Project focus on the creation and enhancement of on-site habitat that supports Roberts Bank ecosystem species. On-site habitat is intended to soften the perimeter of the Project's shoreline to be more ecologically representative of the existing estuary, to create similar habitat to those that would be affected by the Project, and to create habitat that generally enhances the productivity of the Roberts Bank ecosystem. Port Metro Vancouver has reviewed and evaluated the compensation habitat developed for the Deltaport Third Berth Project, and has included beneficial features for marine vegetation, invertebrate, fish and bird species in the offsetting framework for the Roberts Bank Terminal 2 Project.

The five habitat types considered for on-site offsetting include:

- Intertidal marsh;
- Mudflat;
- Subtidal rock reefs;
- Sandy gravel beach; and
- Eelgrass.

While not all species require offsetting, most species would experience increases to their productive potential or negligible change as a result of proposed on-site offsetting. Proposed locations for on-site offsetting are shown on the overview map below, and a description and conceptual illustration of each can be found over the next few pages.



ECONOMIC DEVELOPMENT (EIS SECTION 20.0)

ASSESSMENT HIGHLIGHTS

- The Project is expected to result in the following positive effects on economic development in Metro Vancouver:
 - During the 5.5-year construction phase:
 - \$837 million in additional gross revenues to businesses in Metro Vancouver
 - \$238 million in induced household spending in Metro Vancouver
 - During operation:
 - \$31 million annually in materials, good and services contracting revenue to the economy of Metro Vancouver
 - \$71 million of annual induced household spending in Metro Vancouver
- The Project is expected to have a negligible effect on sand availability and prices in Metro Vancouver.
- The Project is consistent with economic development strategies in Metro Vancouver's Regional Growth Strategy, the economic development objectives of the Corporation of Delta, and the general directions set out in the Tsawwassen Land Use Plan of the Tsawwassen First Nation.
- The Project is not expected to result in measurable adverse residual effects to economic development.
- The Project is not expected to result in incremental cumulative effects to economic development.

Valued Component Overview

Economic development is defined in the assessment as the change that occurs in an important attribute of the economy that is a major driver of a region's economic well-being. In the context of the Project, expenditures made by the Project would accrue to individuals, local businesses, and contractors and communities, contributing to potential expansion of existing companies (i.e., in size or offered services) and creation of new businesses due to the Project. An assessment was undertaken to determine effects on economic development in Metro Vancouver and British Columbia as a result of the Project.

The results of the economic development assessment were considered in the assessments of local government finances and human health.

Scope of Assessment

The economic development assessment evaluated potential Project-related effects on local and regional economies, and focused on:

- Business revenues associated with the direct supply of materials, goods and services to the Project for construction and operation;
- Business revenues associated with supply of inputs to the businesses that are directly supplying goods and services to the Project;
- Induced revenues for businesses related to household spending by workers employed as a result of the Project;
- Construction aggregate supply and consumption; and
- Consistency with economic development plans.

ECONOMIC DEVELOPMENT

The assessment included modelling of indirect and induced economic effects using the BCStats British Columbia Input-Output Model, which is based on statistical information about the flow of goods and services among various industries in British Columbia, as well as Port Metro Vancouver-supplied direct expenditure and employment estimates and modelling inputs.

The local and regional assessment areas were the economies of Metro Vancouver and British Columbia, respectively.

Existing Conditions

Existing conditions were determined for the economies of Metro Vancouver and British Columbia, including Aboriginal-owned businesses.

Summary of Potential Effects

Potential Project effects on economic development include:

- Potential increase in materials, goods and services contracting revenues during construction and operation for Aboriginal and non-Aboriginal businesses;
- Potential increase in induced revenue during construction and operation; and
- Consistency with economic development plans during operation.

Mitigation Measures

The Project would have positive effects on economic development. Therefore, no mitigation is necessary.

Key Findings

Positive effects on economic development in Metro Vancouver and British Columbia are outlined in the tables below.

ECONOMIC DEVELOPMENT BENEFITS DURING FIVE-AND-A-HALF YEAR CONSTRUCTION PERIOD (\$ MILLIONS)

	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
Additional Gross Revenues to Businesses	\$837	\$507	\$1,344
Induced Household Spending	\$238	\$123	\$361

ECONOMIC DEVELOPMENT BENEFITS DURING OPERATION (\$ MILLIONS PER YEAR)

	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
Additional Gross Revenues to Businesses	\$31.2	\$2.2	\$33.4
Induced Household Spending	\$71.3	\$2.0	\$73.3

ECONOMIC DEVELOPMENT

The Project is expected to result in an increase in materials, goods and services contracting revenues for Aboriginal businesses located in Metro Vancouver.

The assessment considered potential adverse effects of the Project on the local aggregate market. Sand for land development makes up more than two-thirds of the Project's total aggregate requirements. Sand would be sourced through the annual Fraser River dredging program, from materials dredged to create the Project's berth pocket and from other existing suppliers. Project demand for sand is anticipated to have a negligible effect on sand availability and prices in Metro Vancouver. Other aggregate, such as gravel, dyke rock and rip-rap, would be sourced from current and potential expanded production of existing suppliers, and therefore, the potential effects of Project demand on their availability and pricing in Metro Vancouver are considered to be negligible.

The Project is consistent with the economic development strategies in Metro Vancouver's Regional Growth Strategy, the economic development objectives of the Corporation of Delta and the general directions set out in the Tsawwassen Land Use Plan of the Tsawwassen First Nation.

The Project is expected to result in positive effects to economic development; therefore, the Project is not expected to result in measurable adverse residual effects. The Project is not expected to result in incremental cumulative effects to economic development.

LOCAL GOVERNMENT FINANCES (EIS SECTION 22.0)

ASSESSMENT HIGHLIGHTS

- The Project is estimated to result in the following positive effects on local government finances in Metro Vancouver:
 - During the 5.5-year construction phase:
 - \$11.3 million in incremental local government property taxes and fees
 - \$350,000 per year in payments in lieu of taxes by Port Metro Vancouver
 - During operation:
 - \$6.8 million annually in incremental property taxes and fees
- The majority of payments are expected to go to the Corporation of Delta during operation.
- Any potential effect related to local government expenditures is expected to be negligible.
- The Project is not expected to result in measurable adverse residual effects to local government finances.
- The Project is not expected to result in incremental cumulative effects to local government finances.

Valued Component Overview

Local government finances refer to the collective expenditures made, and revenues raised, by municipal and regional district governments. An assessment was undertaken to determine potential Project effects on local government finances.

Scope of Assessment

The local government finances assessment focused on:

- Project-related effects on municipal and regional district government revenues from payments in lieu of taxes (PILT)⁵, municipal and regional district tax, fees and property taxes; and
- Project-related effects on municipal and regional district government expenditures on programs, infrastructure and services.

The local assessment area was Metro Vancouver (governments within its boundaries, including the regional district), with a focus on the Corporation of Delta and Tsawwassen First Nation.

The regional assessment area was also Metro Vancouver.

Existing Conditions

Existing conditions with respect to operating revenues and expenditures for the Corporation of Delta, Metro Vancouver (regional district) and Tsawwassen First Nation were determined, as well as factors influencing local government operating revenues and expenditure requirements.

Summary of Potential Effects

Potential positive Project effects on local government finances include local government revenues from PILT, property tax, municipal and regional district tax, and permit fees generated through the Project.

Mitigation Measures

The Project would have a positive effect on local government finances. Therefore, no mitigation is necessary.

⁵ Port Metro Vancouver makes payments in lieu of taxes (PILT) to municipalities on unoccupied lands, while tenants pay property taxes on properties leased from Port Metro Vancouver.

LOCAL GOVERNMENT FINANCES

Key Findings

Project construction and operation would contribute to local government revenues through property taxes, fees and PILT. During operation, the majority of payments would go to the Corporation of Delta.

A total of \$19.6 million in PILT, property taxes and fees is expected to be paid to municipal and regional governments throughout British Columbia (including Metro Vancouver) during construction, with \$11.3 million paid to local governments in Metro Vancouver. Port Metro Vancouver estimates that it would pay approximately \$350,000 in PILT each year of construction to the Corporation of Delta.

During Project operation, it is anticipated a total of \$6.9 million in incremental property taxes and fee payments would be paid annually throughout British Columbia (including Metro Vancouver), with \$6.8 million within Metro Vancouver and the majority going to the Corporation of Delta. Payments to local governments outside of Metro Vancouver during operation are anticipated to be small, since the major portion of incremental local taxes is attached to the new terminal.

Any effect related to local government expenditures is expected to be negligible, as emergency services and solid waste needs of the Project are projected to be low and within the existing capacities of local services and infrastructure.

The Project is expected to result in positive effects on local government finances; therefore, the Project is not expected to result in measurable adverse residual effects. The Project is not expected to result in incremental cumulative effects to local government finances.

SERVICES AND INFRASTRUCTURE (EIS SECTION 23.0)

ASSESSMENT HIGHLIGHTS

- With mitigation, residual Project effects on health care services, emergency services, and municipal services and infrastructure are expected to be negligible.
- The Project is not expected to result in measurable adverse residual effects to services and infrastructure.
- The Project is not expected to result in any incremental cumulative effects to services and infrastructure.

Valued Component Overview

An assessment was conducted to determine Project effects on community services and infrastructure, including housing, emergency and health services, and municipal infrastructure.

Scope of Assessment

The assessment of services and infrastructure focused on three sub-components:

- Housing, including permanent and temporary accommodations;
- Emergency and health services, including fire, police, ambulance, local hospitals and health services; and
- Municipal infrastructure, including water and solid waste infrastructure.

The local assessment area included Metro Vancouver, with a focus on the Corporation of Delta and Tsawwassen First Nation. The regional assessment area was Metro Vancouver.

Existing Conditions

Existing service and infrastructure conditions considered housing availability and affordability, supply and demand, health care services and facilities, emergency services, and municipal water and solid waste infrastructure.

Housing supply in Delta is characterized by higher percentages of private owner-occupied households and single-detached housing units than in Metro Vancouver. Based on the 10-year average vacancy

rate (2.5 per cent), housing demand in Delta is within criteria for a balanced market. Health services in Delta are delivered by Fraser Health. Emergency responders to the Roberts Bank terminals include the Delta Police Department, Delta Fire and Emergency Services, and BC Ambulance Service.

Potable water at the existing Roberts Bank terminals is provided by Delta through the Metro Vancouver drinking water system. While Delta provides municipality-wide collection and disposal services for solid wastes, a private contractor is retained by the Roberts Bank terminals to remove all non-hazardous waste and transfer it to the Vancouver landfill or an appropriate recycling facility.

Potential Effects

Potential Project effects on services and infrastructure include:

- Potential constraint on health care services during construction and operation;
- Potential constraint on emergency services during construction and operation; and
- Potential constraint on municipal water and solid waste infrastructure during construction and operation.

SERVICES AND INFRASTRUCTURE

Mitigation Measures

Proposed measures to avoid or reduce potential effects include:

- Implementation of construction and operation environmental management plans related to construction-phase communications, emergency response and traffic management, as described on pages 121 and 122 of this Executive Summary;
- Policing and security management including private site security services, site security systems and equipment; and
- Communication with the Corporation of Delta, Delta Police, Delta Fire, and BC Ambulance Service on operational plans, activities, timelines, service requirements and management of emergency service utilization.

Key Findings

An anticipated small change in population during construction would result in a negligible demand on housing, emergency services and municipal infrastructure. Project-induced population change during operation is not anticipated. Project demand on health care, emergency and municipal services due to direct service utilization is expected to be low relative to historical reported service usage in the local study area.

With mitigation, residual effects are expected to be negligible.

The Project would not use Tsawwassen First Nation emergency or health services, or municipal infrastructure.

The Project is not expected to result in measurable adverse residual effects to services and infrastructure. The Project is not expected to result in any incremental cumulative effects to services and infrastructure.

MARINE COMMERCIAL USE (EIS SECTION 21.0)

ASSESSMENT HIGHLIGHTS

- The Project footprint and the proposed expansion of the area closed to commercial crabbing are expected to result in displacement of commercial crab harvesting.
- The Project is not anticipated to result in significant adverse residual effects to marine commercial use.
- The Project is not expected to result in significant adverse incremental cumulative effects to marine commercial use.

Valued Component Overview

Marine commercial use is the use of marine waters and resources to generate revenue. It has been identified as an important economic factor in local and regional communities and for Aboriginal groups. An assessment was undertaken to determine effects on marine commercial use as a result of the Project.

Scope of Assessment

The assessment of marine commercial use focused on four sub-components:

- Seafood harvesting;
- Marine fish harvesting;
- Guided sport fishing; and
- Marine-based tourism.

The assessment was supported by collection of marine commercial use activity data and interviews with regulators, Aboriginal groups and industry participants. Information regarding the historical, present and future commercial marine uses of the assessment areas was developed, including commercial fishing activity by Aboriginal groups.

Local and regional assessment areas were determined for each of the four sub-components. For commercial fishing, seafood harvesting and guided sport fishing, the study areas included the Roberts Bank area. For marine-based tourism, the study areas included southern Strait of Georgia waters and U.S. waters of the Strait of Juan de Fuca and around the San Juan Islands.

Existing Conditions

Existing conditions were determined for each of the four sub-components, with a focus on crab harvesting, salmon fishing and whale-watching tours. Commercial seafood harvesting in the vicinity of the Project focuses on Dungeness crab. More than 90 per cent of the harvest-eligible populations of this species is harvested in the Roberts Bank and Boundary Bay areas each year. With the institution of a navigational closure in the Roberts Bank area in January 2009, most commercial crab harvesting in the vicinity of the Project occurs in the open area along the western boundary of the closure area. Marine fish harvesting focuses on sockeye salmon, with catch levels varying from year to year depending on species' spawning and growth cycles and other factors.

Guided sport fishing activities primarily target salmon. Other species include lingcod, herring, sturgeon and red snapper. It is estimated that an average of 20 charter sport fishing tours are conducted in the local assessment area annually.

The whale-watching industry in British Columbia is an important feature of the coastal British Columbia tourism industry, and has experienced substantial growth in the last two decades. While killer whales are the primary focus of the tours, other species of interest include humpback, grey and minke whales, as well as seals, porpoises, sea lions and birds. Other marine commercial uses include guided sport fishing and marine-based tourism (e.g., whale-watching and eco-tours).

MARINE COMMERCIAL USE

Potential Effects

Potential Project effects on marine commercial use include potential displacement of commercial crab harvesting during construction and operation, resulting in a change of harvesting area, total harvest and revenue, due to the Project footprint and the proposed expansion of the area closed to commercial crabbing.

Mitigation Measures

Measures to reduce effects include:

- Working with Fisheries and Oceans Canada to engage with commercial crab harvesters to identify and implement feasible mitigation measures; and
- Implementation of construction and operation environmental management plans related to construction-phase communication, construction monitoring and crab salvages, as described on pages 121 and 122 of this Executive Summary.

Key Findings

The Project is anticipated to result in a negligible effect to marine fish harvesting, guided sport fishing and marine-based tourism. These negligible effects are related to changes in area, access, resource availability and harvesting revenues.

The Project is expected to result in a residual effect of changes to seafood harvesting area, harvest and revenue. The residual effect is determined to be not significant, as Dungeness crab are known to move substantial distances to baited traps, and harvest activity can be moved to another open area.

Other planned or reasonably foreseeable projects and activities would also displace crab harvesting, and this effect would combine with that of the Project to result in an incremental cumulative effect on commercial crab fishing. This adverse incremental cumulative effect is determined to be not significant.

OUTDOOR RECREATION (EIS SECTION 24.0)

ASSESSMENT HIGHLIGHTS

- The Project footprint and the proposed expansion of the area closed to recreational crabbing are expected to result in displacement of recreational crab harvesting. After mitigation, the residual effect is expected to be negligible.
- The Project is not expected to result in measurable adverse residual effects to outdoor recreation.
- The Project is not expected to result in any incremental cumulative effects to outdoor recreation.

Valued Component Overview

Outdoor recreation refers to any activity undertaken for pleasure or enjoyment on land or water that does not include a commercial aspect. An assessment of potential Project effects on outdoor recreation was undertaken.

The results of the outdoor recreation assessment were considered in the assessment of human health.

Scope of Assessment

The assessment of outdoor recreation focused on four sub-components undertaken in the vicinity of the Project:

- Recreational boating and windsport activities;
- Recreational marine fishing and seafood harvesting;
- Recreational hunting; and
- Other land-based outdoor recreation (such as walking and birdwatching).

For land-based activities, the local assessment area included areas within approximately 5 kilometres of the Deltaport Terminal and 2 kilometres of the northeast edge of the Roberts Bank causeway, including Tsawwassen First Nation land and a portion of the Corporation of Delta. The regional assessment area included the Corporation of Delta.

For marine-based activities, the local assessment area included marine areas within 10 kilometres of the terminal north of the Canada-U.S.A. border, and the regional assessment area included Boundary Bay, and the Fraser River from its South Arm mouth to the Pattullo Bridge.

Existing Conditions

Existing conditions considered outdoor recreational activities that occur in the vicinity of the Project, including recreational boating, salmon fishing, crab harvesting, hunting, windsports, walking, running, cycling and birdwatching.

Recreational boating activities include fishing and seafood harvesting, and water-skiing. On a peak day during July and August, more than 30 recreational boats may use the area between the BC Ferries causeway and Point Roberts. Windsurfing and kiteboarding also occur in this area. During a peak day, as many as 25 windsport users may launch from the east side of the BC Ferries causeway. Recreational marine fishing and seafood harvesting provide food for personal use and constitute leisure activities. Although it occurs year-round, peak fishing in the vicinity of the Project occurs between July and early September, and focuses on Pacific salmon and groundfish. Crabs also are harvested year-round between Point Roberts and the area west of the Roberts Bank terminals. Recreational hunters target waterfowl, including ducks, geese, swans and brant in the vicinity of the Project.

OUTDOOR RECREATION

Potential Effects

Potential Project effects on outdoor recreation include potential changes in harvesting area use and access for recreational marine fish and seafood harvesting as a result of the Project footprint, and the proposed expansion of the area closed to recreational crabbing.

Mitigation Measures

Measures to reduce effects include:

- Working with Fisheries and Oceans Canada to engage with recreational crab harvesters to identify and implement feasible mitigation measures; and
- Implementation of construction environmental management plans related to construction-phase communication and crab salvages, as described on page 121 of this Executive Summary.

Key Findings

Project-related effects related to recreational boating and windsport activities, recreational hunting and other land-based recreation are expected to be negligible.

The Project footprint and proposed expansion of the area closed to recreational crabbing are expected to result in the displacement of recreational crab harvesters. Recreational crab harvesters that currently use the western side of the Roberts Bank terminals would be required to move to other areas. Following mitigation, the residual effect of displacement is determined to be negligible.

The Project is not expected to result in measurable adverse residual effects to outdoor recreation. The Project is not expected to result in any incremental cumulative effects to outdoor recreation.

LAND AND WATER USE (EIS SECTION 26.0)

ASSESSMENT HIGHLIGHTS

- Potential effects on the consistency of land use planning designations, marine industrial use, and uses of adjacent protected areas are expected to be fully mitigated, and these uses would be able to continue during construction and operation.
- An effect on access to Tsawwassen First Nation waterlots (community lease lands) is expected to be partially mitigated, and the residual effect is determined to be not significant.
- The Project is not expected to result in significant residual adverse effects to land and water use.
- The Project is not expected to result in any incremental cumulative effects to land and water use.

Valued Component Overview

The land and water use assessment examines potential Project effects on land and water uses within and adjacent to the Project area, as well as opportunities for future land and water use.

Scope of Assessment

The land and water use assessment considers land ownership, land use planning, and general land and water uses within the vicinity of the Project.

The local assessment area for land use consisted of a 1-kilometre radius from the eastern end of the Roberts Bank causeway, and the regional assessment area included land within the Corporation of Delta and Tsawwassen First Nation.

The local assessment area for water use included the marine area within the Corporation of Delta, from the Canada-U.S.A. border to Canoe Passage, including the BC Ferries terminal. The regional assessment area included water within the Corporation of Delta and Tsawwassen First Nation.

Existing Conditions

Existing conditions considered current land and water uses including port and marine-related industrial use, protected areas, Tsawwassen First Nation waterlots (community lease lands), agricultural use and other tenured uses.

Land use plans and documents were reviewed, including Port Metro Vancouver's Land Use Plan (which considers the Project), the Corporation of Delta and Tsawwassen First Nation community and land use plans, Protected Areas, the Agricultural Land Reserve, and Metro Vancouver's Regional Growth Strategy.

Potential Effects

Potential Project effects on land and water use include:

- Potential inconsistency with land use planning designations during construction;
- Potential disturbances to marine-related industrial uses during construction;
- Potential disturbances to Roberts Bank Wildlife Management Area during construction; and
- Potential changes in access to Tsawwassen First Nation waterlots (community lease lands) during construction.

LAND AND WATER USE

Mitigation Measures

Proposed measures to avoid or reduce the potential effects include:

- Implementation of construction environmental management plans related to construction-phase communication and marine traffic management, as described on page 121 of this Executive Summary;
- Engagement with land and water users;
- Engagement with local government, Aboriginal groups and other land use authorities when updating or amending Port Metro Vancouver's Land Use Plan or determining land use designations; and
- Use of Port Metro Vancouver's Community Feedback Line.

Key Findings

The Project would operate within the same general land use context as the existing container terminal uses. There are no anticipated residual effects related to consistency with planning designations.

The presence of construction-related vessels may require other vessels to change course or result in delays or changes in access to water use activities. This effect is temporary during construction.

The Project has the potential to result in changes in access to Tsawwassen First Nation waterlots (community lease lands) during construction. The presence and activities of construction vessels near the lease lots may result in temporary displacement of activities within the waterlots. It is anticipated that following mitigation, this effect would be reduced but not fully eliminated, and a residual effect is anticipated. However, these uses would be able to continue during construction and operation, and the residual effect is considered to be not significant.

The Project is not expected to result in significant residual adverse effects to land and water use. The Project is not expected to result in any incremental cumulative effects to land and water use.

VISUAL RESOURCES (EIS SECTION 25.0)

ASSESSMENT HIGHLIGHTS

- The Project would result in changes to the daytime visual resources, primarily due to new physical structures such as cranes.
- Changes in nighttime visual resources are anticipated to result from additional lighting.
- Mitigation related to lighting design and operation is expected to reduce adverse effects on nighttime visual resources, although the visibility of increased lighting would result in a residual adverse effect for sites in the southern Gulf Islands.
- The Project is not expected to result in any significant adverse residual effects on visual resources.
- The Project is not expected to result in any significant adverse incremental cumulative effects to visual resources.

Valued Component Overview

Visual resources are natural and cultural aspects of the landscape that have the potential to negatively or positively affect viewers. Potential Project-related effects on visual resources were assessed.

The results of the visual resources assessment were considered in the assessments of marine commercial use, outdoor recreation, human health, and current use of land and resources for traditional purposes.

Scope of Assessment

The assessment of visual resources focused on two sub-components:

- Daytime visual resources, based on the character and extent of visual changes as a result of the Project; and
- Nighttime visual resources, focused on changes in light.

The visual resources assessment was based on the Government of British Columbia's Visual Landscape Inventory guidelines.

The local assessment area for daytime visual resources included areas within 8 kilometres of the Project that would be most sensitive to the direct visual effects of the Project. The regional assessment area extended to 30 kilometres from the Project.

The local assessment area for nighttime visual resources included areas within 60 kilometres of the Project. The regional assessment area for nighttime visual resources included areas within 70 kilometres of the Project, based on the furthest extent of visibility of light from the Project.

Existing Conditions

Existing daytime conditions included consideration of structures such as the BC Ferries terminal, Roberts Bank terminals, and their associated causeways, along with residential and commercial areas, agricultural lands, roads and the railway corridor.

Existing nighttime conditions considered lighting from the BC Ferries terminal, Roberts Bank terminals, greenhouses and road lighting.

Potential Effects

Potential Project effects on visual resources include potential changes in daytime and nighttime visual resources during construction and operation.

VISUAL RESOURCES

Mitigation Measures

Proposed measures to reduce the potential effects include:

- Selecting colour for terminal cranes to reduce contrast and enhance blending with the landscape; and
- Implementation of construction and operation environmental management plans to address light, as described on pages 121 and 122 of this Executive Summary.

Key Findings

While the prominence of port-related structures is expected to increase from several views, the Project is not expected to result in a change in the overall quality of daytime visual resources, as the expected changes are consistent with the character of existing views of port facilities.

Mitigation related to lighting design and operation, such as directing light only to where it is required and the use of a centralized light control system, is expected to reduce adverse effects on nighttime visual resources. However, the visibility of more light sources at night would not be fully mitigated, and would be a residual adverse effect for sites in the southern Gulf Islands.

In consideration of the similarity of the Project to the existing viewscape, the residual effect of the Project alone on visual resources is determined to be not significant.

The Project is not expected to result in any significant residual adverse effects on visual resources. The Project is not expected to result in measurable incremental residual cumulative effects to visual resources.

HUMAN HEALTH (EIS SECTION 27.0)

ASSESSMENT HIGHLIGHTS

- Health of communities in the local assessment area is generally good and comparable to provincial and national averages.
- Seven potential mechanisms for human health effects were assessed: air emissions, noise and vibration, shellfish contamination, stress and annoyance, employment and income, food security, and health inequity.
- Potential Project-related effects on human health are expected to be fully or partially mitigated through the implementation of environmental management plans and additional mitigation measures.
- The Project is not expected to result in any significant adverse effects on human health.
- The Project is not expected to result in measurable incremental residual cumulative effects to human health.

Valued Component Overview

An assessment was conducted to determine potential Project-related effects on human health.

The results of the human health assessment were considered in the assessments of marine commercial use, outdoor recreation, and current use of land and resources for traditional purposes

Scope of Assessment

The human health assessment was carried out using both a quantitative human health risk assessment and a qualitative health impact assessment. The assessment focused on factors contributing to health and community well-being.

The assessment of human health focused on seven sub-components:

- Exposure to air emissions;
- Exposure to noise and vibration;
- Exposure to shellfish contamination;
- Stress and annoyance;
- Employment and income;
- Food security, including potential changes in availability of traditional food; and
- Health inequity, referring to the distribution of Project-related risks and benefits.

The local and regional assessment areas were based on the boundaries for each of the intermediate or valued component assessments that support the human health assessment.

Existing Conditions

Existing conditions included the health of communities in close proximity to the Project, particularly the Corporation of Delta and Tsawwassen First Nation. A health profile of Aboriginal groups within the local assessment area was also included. Health of communities in the local assessment area is generally good and comparable to provincial and national averages for rates of chronic diseases and mortality. Existing conditions were also established for exposure to air emissions, noise and vibration, shellfish contamination, stress and annoyance, employment and income, food security, and health equity.

Potential Effects

Potential Project effects on human health include those related to changes in air emissions and noise levels, as well as changes in stress and annoyance, and health inequity.

HUMAN HEALTH

Mitigation Measures

Proposed measures to avoid or reduce potential effects include:

- Implementation of construction and operation environmental management plans, to address air emissions, noise and light, as described on pages 121 and 122 of this Executive Summary;
- Awareness and education measures regarding contamination levels in food sources; and
- Accommodation measures related to Aboriginal employment, training and contracting opportunities.

Key Findings

The Project is expected to result in measurable residual effects on human health related to exposure to air emissions during construction, and exposure to noise during construction and operation. Mitigation is expected to reduce all other residual effects to a negligible (i.e., not measurable) level.

Several air emissions scenarios during construction and operation were assessed. A residual effect is associated with only one scenario related to dust generated during construction over water between the Project marine terminal and Westshore Terminals. Adverse health effects from air emissions are considered not significant, as predicted exposure levels do not exceed health thresholds.

A minority of households would experience small increases in noise during construction or operation. The increase would generally be below the range of human perception, and adverse health effects related to noise are considered not significant, as predicted exposure levels do not exceed health thresholds.

Confidence in the assessment is high because models used conservative assumptions and have been validated against studies or monitoring data.

The Project is not expected to result in any significant adverse effects on human health. The Project is not expected to result in measurable incremental residual cumulative effects to human health.

ARCHAEOLOGICAL AND HERITAGE RESOURCES (EIS SECTION 28.0)

ASSESSMENT HIGHLIGHTS

- The Project has the potential to affect archaeological resources, namely fish trap stakes, if present in the Project area.
- Through mitigation, including excavation of test trenches prior to construction activities and the implementation of an Archaeological Monitoring and Management Plan, potential damage to archaeological resources would be avoided and the opportunity for future archaeological study would be protected.
- The Project is not expected to result in significant residual adverse effects to archaeological and heritage resources.
- The Project is not expected to result in any incremental cumulative effects to archaeological and heritage resources.

Valued Component Overview

The purpose of the assessment was to determine whether there is potential for archaeological and heritage resources to exist in the assessment area, and to determine any Project-related effects on these resources, if they are present.

Scope of Assessment

The assessment was supported by an Archaeology Overview Assessment, which included an ethnographic overview of the area and a review of the potential for undocumented heritage sites to exist in the local assessment area.

The results of the archaeological and heritage resources assessment were considered in the assessment of current use of land and resources for traditional purposes.

The local assessment area included the physical footprint of the Project plus a 100-metre buffer zone, as well as a zone of coastal-geomorphological influence. The regional assessment area considered a 4-kilometre area around the Project area.

Existing Conditions

No archaeological sites were identified in the local assessment area, either using the British Columbia Archaeology Branch's online heritage registry or through the Archaeological Overview Assessment. If archaeological or historical materials remain in the intertidal area, it is likely they have been preserved in the sediment layers.

Potential Effects

Potential Project effects on archaeological and heritage resources include:

- Potential crushing or biological degradation of potential fish trap stakes as a result of the construction of containment dykes and the adding of preload and fill materials along the east portion of the causeway expansion;
- Potential reduced access for future archaeological study or preservation of fish trap stakes as a result of the construction of containment dykes and the adding of preload and fill materials along the east portion of the causeway expansion; and
- Potential exposure of potential fish trap stakes during construction as a result of the construction of permanent containment dykes around east and west terminal basins potentially affecting coastal geomorphology in the intertidal area.

ARCHAEOLOGICAL AND HERITAGE RESOURCES

Mitigation Measures

Proposed measures to reduce the potential effects include:

- Implementation of construction environmental management plans related to archaeological monitoring and management, as described on page 121 of this Executive Summary;
- Excavation of a test trench or trenches adjacent to the existing causeway prior to construction to locate potential fish trap stakes. If encountered, the excavation would be expanded, the location of stakes would be mapped, and stakes would be collected, preserved and reported to the British Columbia Archaeology Branch and to Aboriginal groups; and
- Monitor predicted tidal erosion in intertidal areas on an annual basis for the first four years of operation, and sample, investigate and preserve fish trap stakes, if found. If encountered, stakes would be collected, preserved and reported to the British Columbia Archaeology Branch and to Aboriginal groups.

Key Findings

The Project may affect archaeological resources, namely fish trap stakes, if present in the Project area. Direct effects could result from Project-related construction activities, and indirect effects could result from changes to sediment deposition or erosion.

Following mitigation, residual effects would remain, as there is still the potential for stakes to be exposed or crushed. However, the opportunity for future archaeological study would be protected through mitigation, and the assessment concludes these residual effects are not significant.

The Project is not expected to result in significant residual adverse effects to archaeological and heritage resources. The Project is not expected to result in any incremental cumulative effects to archaeological and heritage resources.

16 OTHER EFFECTS ASSESSMENTS

In addition to the effects assessments of the valued components, Port Metro Vancouver undertook assessments of the potential effects of the following:

- Potential Accidents or Malfunctions;
- Effects of the Environment on the Project; and
- Effects of the Project on Potential or Established Aboriginal and Treaty Rights and Related Interests, including the Current Use of Land and Resources by Aboriginal People for Traditional Purposes.

Summaries of these assessments are presented over the next few pages.

POTENTIAL ACCIDENTS OR MALFUNCTIONS (EIS SECTION 30.0)

ASSESSMENT HIGHLIGHTS

- The assessment of potential accidents or malfunctions assessed the environmental effects of plausible worst-case marine- and land-based accidents or malfunctions that could occur during Project construction or operation.
- No adverse residual effects, for any valued component, are expected to result in the event of the plausible worst-case scenarios for road or rail.
- The marine worst-case scenario has the potential to result in significant residual adverse effects to some valued components. However, the scenario was determined to have an extremely low probability of occurring and therefore the effects were considered unlikely.
- Port Metro Vancouver will draw on its many years of safe and successful experience in the oversight of marine intermodal facilities during detailed Project planning and design, construction and operation.
- In order to minimize the potential for unplanned incidents and to minimize the extent and severity of environmental effects if an incident were to occur, Port Metro Vancouver will implement standard proven and Project-specific management and mitigation measures and will rely on all involved parties, including the infrastructure developer, terminal operator, regulatory agencies, vessel owners and operators, and railway and trucking companies, to comply with applicable federal and provincial legislation, regional risk mitigation measures and Port Metro Vancouver requirements.

POTENTIAL ACCIDENTS OR MALFUNCTIONS

Assessment Overview

The assessment of potential accidents or malfunctions considered a wide variety of potential incidents that incorporate both marine- and land-based Project components, as well as construction and operation activities. Examples of the marine-based accidents or malfunctions considered include vessel grounding, vessel collision and onboard spill incidents. Examples of land-based accidents or malfunctions considered include motor vehicle accidents, train derailments and collisions, fires and explosions, on-land spills and container handling incidents.

The assessment focuses on three plausible worst-case scenarios, including a marine-based incident, a rail-related incident and a road-related incident. The probability of each scenario occurring was estimated, and the potential consequences to the biophysical and human environment were identified.

The assessment related to marine-based accidents or malfunctions relied on two independent studies: a quantitative risk assessment that estimated probabilities for different types of marine vessel accidents in the Strait of Georgia, and a qualitative evaluation of the consequences of potential spill incidents associated with Project vessel traffic in Port Metro Vancouver's jurisdiction.

In characterizing potential effects of each plausible worst case scenario, the assessment considered the effectiveness of standard proven and Project-specific management and mitigation measures, including contingency plans and emergency response procedures that would be used to avoid or minimize the environmental consequences of the particular scenario.

Project Considerations

The Roberts Bank terminals have been in operation for more than 40 years without any major adverse environmental effects due to accidents or malfunctions. Experience gained and lessons learned at Roberts Bank terminals, and at other terminals within Port Metro Vancouver's jurisdiction and from reviews of global practices, have contributed to the continuous improvement of port-wide development, operating management practices and safety procedures. Planning and design of the Project have been informed by this knowledge and experience. Together, these measures serve to reduce the likelihood, and minimize the potential adverse effects, of accidents and malfunctions within Port Metro Vancouver's jurisdiction.

Safe and responsible commercial shipping activities are conducted in accordance with an international framework set out by International Maritime Organization conventions, federal regulatory requirements and regional traffic marine risk mitigation measures, including a vessel traffic management system, mandatory vessel pilotage and aids to navigation.

Port Metro Vancouver maintains awareness of activities in its jurisdiction through its Operations Centre, which provides continuous coverage 24 hours per day, seven days per week. Port activities are monitored via camera feeds and a fleet of dedicated patrol vessels. Through its port surveillance activities and vessel inspections, the Operations Centre safeguards the port environment, enforces safety practices and procedures and, in the event of a marine incident, assumes a coordinating role in port-related emergency response situations, working closely with first responders, the community and stakeholders.

Federal legislation provides a regulatory framework for the prevention and management of Project-related accidents and malfunctions. The *Canada Shipping Act, 2001*, for example, incorporates international shipping conventions developed by the International Maritime Organization and implemented

POTENTIAL ACCIDENTS OR MALFUNCTIONS

by Canada, such as the *International Regulations for Preventing Collisions at Sea* 1972 and the *International Convention for the Prevention of Pollution from Ships* (MARPOL) standards for the prevention of pollution from ships. Provisions of the Act that are particularly relevant to the prevention of accidents and malfunctions include the management and control of oil or oily water mixtures and marine pollutants in packaged form, and the requirement for shipboard oil pollution emergency plans and environmental response arrangements.

Key Conclusions

Based on the results of the quantitative risk assessment conducted for Project vessel movements during Project operation, the potential for a container ship collision resulting in a spill is extremely low (i.e., return period greater than one in 1,000 years). However, due to the level of interest expressed by Aboriginal groups and the public during the Project's consultation and engagement process, this type of incident was considered as a plausible worst-case scenario.

The Project does not involve the shipment of fuel and therefore the assessment considered the potential spill of fuel required for container ship operation. The assessment concluded that a spill from the fuel tanks of a container ship in the berth area could result in adverse residual effects to marine vegetation, invertebrates, fish and marine mammals, as well as marine commercial use, outdoor recreation and land and water use. With the exceptions of southern resident killer whales, coastal birds, and current use of land and resources for traditional purposes, these residual effects were considered not significant. However, due to the extremely low probability of such a ship impact and spill scenario, all residual effects were considered unlikely.

In the case of land-based activities, the two worst-case plausible road and rail scenarios were identified as a fuel truck accident on Roberts Bank Way North involving a diesel spill, and a yard locomotive derailment on the widened causeway, also involving a diesel spill. In both cases, due to Project-specific conditions and existing and anticipated practices and procedures, the probability of such an incident is considered very low. As the spill associated with each of the land-based scenarios would occur at a distance away from the marine environment, no potential interactions with marine biophysical valued components were identified. Further, no residual adverse effects were identified with respect to socio-economic valued components, including services and infrastructure, and human health.

As with any activity, the potential for unplanned incidents during Project construction and operation exists. Port Metro Vancouver would draw on its many years of safe and successful experience in the oversight of marine intermodal facilities during detailed Project planning and design, construction and operation. In order to minimize the potential for unplanned incidents and to minimize the extent and severity of environmental effects if an incident were to occur, Port Metro Vancouver would implement standard proven and Project-specific management and mitigation measures and would rely on all involved parties, including the infrastructure developer, terminal operator, regulatory agencies, vessel owners and operators, and railway and trucking companies, to comply with applicable federal and provincial legislation, regional risk mitigation measures and Port Metro Vancouver requirements.

EFFECTS OF THE ENVIRONMENT ON THE PROJECT (EIS SECTION 31.0)

ASSESSMENT HIGHLIGHTS

- An assessment was undertaken to determine how local conditions and natural hazards, such as extreme weather, earthquakes, tsunamis, and climate change, could adversely affect the Project, and in turn could affect the environment.
- Effects of the environment on the Project related to extreme weather and weather-related events, and any subsequent effects on the environment, would be avoided or minimized through application of design criteria and implementation of standard management practices, work procedures and mitigation measures during construction and operation.
- Effects of the environment on the Project related to low-probability events such as a large earthquake, a submarine landslide in the immediate vicinity of the Project or a large tsunami could result in irreparable damage to the Project.
- Effects of a catastrophic natural event or sea level rise would be widespread in the Fraser River delta and would not be unique to the Project.

Assessment Overview

The Port Metro Vancouver undertook an assessment to determine how local conditions and natural hazards could adversely affect the Project, and in turn could affect the environment. Local conditions and natural hazards that were considered included extreme weather and weather-related events, seismic activity, submarine landslides, tsunamis, subsidence (land settlement) and climate change and related sea level rise.

Project Considerations

Port Metro Vancouver has more than 40 years of experience working at Roberts Bank, and is familiar with local conditions and the range of natural hazards that occur in the south coast of British Columbia. The Project would be designed, constructed and operated in a manner that satisfies applicable codes and standards, Port Metro Vancouver requirements, and the terms and conditions of Project approval.

On-site activities during both Project construction and operation would be conducted in a safe, environmentally sound manner, decreasing the consequences of extreme weather-related incidents and effects on the Project, and in turn, to the environment. The infrastructure developer and terminal operator would develop and implement

detailed contingency plans and response procedures to be followed in the event of an emergency.

Key Conclusions

Effects of the environment on the Project, and any subsequent effects on the environment, would be avoided or minimized through a combination of design features, construction practices, and the Project's environmental management program. Preliminary Project design addresses a range of potential effects of the environment on the Project, including extreme weather events and a predicted 1.0-metre sea level rise by 2100 (adjusted to a net 0.5-metre increase by accounting for factors such as uplift and settlement in the area). Measures conducted during Project construction to improve the ability of infrastructure to withstand a submarine landslide resulting from seismic activity include the dredging of soils and silts with poor seismic performance followed by vibro-densification. Due to the unpredictability and uncertainty associated with submarine landslides and tsunamis, and their expected low probability of occurrence at the Project site, measures to protect the Project during such events would be further defined in the detail design phase.

EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Low-probability catastrophic events such as an earthquake of magnitude eight (M8) or higher, a submarine landslide in the immediate vicinity of the Project, or a large tsunami could result in irreparable damage to the Project. The effects of a catastrophic natural event would be widespread in the Fraser River delta and would not be unique to the Project.

The Project design assessed in the EIS considered anticipated climate-related sea level rise. While sea level rise is therefore not expected to adversely affect the Project over the long term (to 2100), it is predicted to result in the inundation and conversion of intertidal habitat to subtidal habitat at Roberts Bank and throughout the Fraser River estuary. This inundation would result in the gradual conversion of the intertidal habitat, including the habitat created adjacent to the Project area to mitigate Project-related effects. Due to the presence of dyke structures and the widespread nature of sea level rise-related changes, it would not be possible to mitigate this effect of the environment on the Project by establishing new intertidal habitat.

EFFECTS OF THE PROJECT ON POTENTIAL OR ESTABLISHED ABORIGINAL AND TREATY RIGHTS AND RELATED INTERESTS, INCLUDING THE CURRENT USE OF LAND AND RESOURCES BY ABORIGINAL PEOPLE FOR TRADITIONAL PURPOSES (EIS SECTION 32.0)

Assessments were conducted on the potential Project-related effects to the current use of lands and resources by Aboriginal peoples for traditional purposes (current use), and potential impacts to the ability of Aboriginal groups to exercise asserted and established Aboriginal and treaty rights and related interests (Aboriginal and treaty rights).

Current Use Effects Assessment

ASSESSMENT HIGHLIGHTS

- The assessment considered the current use of land and resources for traditional purposes by Aboriginal peoples.
- No measurable residual effects on current use are expected following the implementation of measures to avoid, reduce or otherwise address potential adverse Project-related effects on current use.
- As the Project is not expected to result in measurable residual effects to current use, the Project is not expected to contribute incrementally to adverse cumulative effects.

Scope of Assessment

The current use effects assessment considered the results of effects assessments of potential Project and cumulative effects on marine vegetation, marine invertebrates, marine fish, marine mammals, coastal birds, marine commercial use, outdoor recreation, visual resources, land and water use, human health and archaeology and heritage resources, the ongoing productivity of commercial, recreational and Aboriginal fisheries, as well the assessment of potential changes to air quality, noise and vibration, light and the assessment of potential accidents or malfunctions.

The current use effects assessment considered potential effects on:

- Access to preferred current use locations;
- Availability of preferred current use resources;
- Quality of preferred current use resources; and
- Quality of current use experience.

The assessment considered current use of lands and resources for traditional purposes for the following groups:

- Tsawwassen First Nation;
- Musqueam First Nation;
- Semiahmoo First Nation;
- Tsleil-Waututh Nation;
- Stz'uminus First Nation;
- Cowichan Tribes;
- Halalt First Nation;
- Lake Cowichan First Nation;
- Lyackson First Nation;
- Penelakut Tribe;
- Métis Nation British Columbia;
- Stó:lō Tribal Council (Seabird Island First Nation, Scowlitz First Nation, Soowahlie Band, Kwaw'Kwaw'Apilt First Nation, Kwantlen First Nation, Shxw'ow'hamel First Nation, Chawathil First Nation, Cheam Indian Band);

- Stó:lō Nation (Aitchelitz First Nation, Leq'a:mel First Nation, Matsqui First Nation, Popkum First Nation, Skawahlook First Nation, Skowkale First Nation, Shxwha:y Village, Squiala First Nation, Sumas First Nation, Tzeachten First Nation, Yakwekwioose Band); and
- Hwlitsum First Nation.

Assessment Area

The local assessment area, regional assessment area and cumulative effects assessment area for the current use effects assessment took into account each Aboriginal group's asserted or established traditional territory or otherwise defined area of use, including rights established in the Tsawwassen First Nation Final Agreement, as well as the local assessment areas for the valued components linked to current use.

Existing Conditions

Current use information was largely provided by each Aboriginal group in the form of traditional use studies. The current use assessment was primarily linked to marine biophysical valued components. The existing conditions of current use for each Aboriginal group are described in the EIS and considered the following factors, where supporting information was available:

- Current use of waterways and water bodies that would be directly affected by the Project;
- Traditional uses currently practiced (e.g., fishing for crab, bivalves and fin-fish, harvesting plants, birds, trapping wildlife and gathering berries) that could be affected by the Project;
- Places where fish, wildlife and plants are harvested;
- Fish, wildlife and plants of importance for traditional use;
- Access and travel routes for conducting traditional practices;
- Locations of hunting camps, cabins and villages; and
- Culturally important sites, places, or views (e.g., burial sites, spiritual places, sacred sites, cultural landscapes) and attributes (e.g., language, beliefs).

Summary of Potential Effects and Mitigation Measures

Interactions between Project components and activities and current use were considered and the following potential effects were identified, along with proposed measures to avoid, reduce or otherwise address the potential effects.

POTENTIAL EFFECT	MEASURES TO AVOID, REDUCE OR OTHERWISE ADDRESS EFFECTS
Potential changes in access to preferred current use locations	<ul style="list-style-type: none"> Continue to abide by the Memorandum of Agreement in place with Tsawwassen First Nation to accommodate the Tsawwassen First Nation for effects from the Project; Work with Musqueam First Nation to draft Terms of Reference to guide future discussions related to accommodation for effects from the Project; Implement mitigation for marine commercial use and outdoor recreation to address potential displacement-related effects on commercial and recreational crab harvesting; Work with Fisheries and Oceans Canada to ensure necessary consultations with Aboriginal crabbers (for domestic or food, social or ceremonial purposes) concerning the proposed expansion of the area closed to commercial and recreational crabbing; Support Aboriginal crabbing for domestic or food, social, or ceremonial purposes within the area closed to commercial and recreational crabbing; Implement mitigation measures for land and water use to reduce potential changes in access to Tsawwassen First Nation waterlots (community lease lands); Develop a communications protocol to inform appropriate Aboriginal groups of planned or unplanned events related to Project construction or operation that may affect current use access; and Work with appropriate Aboriginal groups to develop and implement a communications mechanism that will support dialogue between Port Metro Vancouver and appropriate Aboriginal groups on topics of concern that arise during construction and initial operation phases.
Potential changes in the availability of preferred current use resources	<p><i>In addition to the above measures:</i></p> <ul style="list-style-type: none"> Implement mitigation measures to reduce Project-related effects to marine resources, including marine vegetation, marine invertebrates, marine fish, marine mammals and coastal birds; Share with appropriate Aboriginal groups information gained through environmental monitoring and follow-up programs to support monitoring, by Aboriginal groups, of environmental conditions related to current use; and Work with appropriate Aboriginal groups to identify opportunities to participate in environmental monitoring and follow-up programs.
Potential changes in the quality of preferred current use resources	<p><i>In addition to the above measures:</i></p> <ul style="list-style-type: none"> Implement mitigation measures for human health to increase Aboriginal subsistence food security.
Potential changes in the quality of the current use experience	<p><i>In addition to the above measures:</i></p> <ul style="list-style-type: none"> Implement mitigation measures for visual resources to reduce Project-related changes in daytime and nighttime visibility; Implement mitigation measures for human health to decrease potential effects from Project-related noise, light, subsistence food avoidance and air emissions; and Implement mitigation measures to reduce potential damage to fish trap stakes, if present.

Key Findings

Following implementation of the mitigation summarized in the table above, adverse residual Project-related effects are expected to be negligible. Therefore, the Project is not expected to contribute to cumulative effects.

ABORIGINAL AND TREATY RIGHTS EFFECTS ASSESSMENT

ASSESSMENT HIGHLIGHTS

- The Project is not predicted to adversely impact the ability of Aboriginal groups to exercise most asserted or established Aboriginal and treaty rights.
- The Project will likely impact the ability of the Tsawwassen First Nation and Musqueam First Nation to exercise the right to fish for crab because of potential changes in access to a primary crab harvesting location.
- This effect is expected to be accommodated by the measures identified to avoid, reduce or otherwise address predicted effects on current use.
- Measures to avoid, reduce or otherwise address predicted effects on current use were considered effective at also addressing expected impacts to the exercise of Aboriginal and treaty rights, and no additional measures have been determined to be required for predicted impacts.

Scope of Assessment

The Tsawwassen First Nation Final Agreement sets out the treaty rights of the Tsawwassen First Nation, which include the right to harvest natural resources, including fish, intertidal bivalves, aquatic plants, migratory birds, wildlife and plants.

The Musqueam First Nation has an established right to fish for food, social, and ceremonial purposes in Canoe Passage (*R. v. Sparrow*) and asserts other Aboriginal rights.

The other Aboriginal groups identified in the current use assessment section also assert Aboriginal rights in the Project area.

The assessment of potential adverse impacts on Aboriginal and treaty rights considered the outcomes of the current use effects assessment, and provides Port Metro Vancouver's understanding of the potential impacts of the Project on the exercise of Aboriginal and treaty rights.

Summary of Potential Effects and Mitigation Measures

The assessment of Aboriginal and treaty rights is descriptive and qualitative, and no determinations of significance are made.

The Project is predicted to impact Tsawwassen First Nation's ability to exercise the treaty right to fish for crab for domestic purposes based on potential changes in access to a primary crab harvesting location. For similar reasons, such Project-related effects would also be expected to impact Musqueam First Nation's ability to exercise the asserted Aboriginal right to harvest crab for food, social, or ceremonial purposes.

Measures to avoid, reduce or otherwise address predicted effects on current use were considered effective at also addressing expected impacts to the exercise of Aboriginal and treaty rights, and no additional measures have been determined to be required for predicted impacts.

The Memorandum of Agreement between the Tsawwassen First Nation and Port Metro Vancouver provides accommodation for effects of the Project. Port Metro Vancouver would work with the Musqueam First Nation to provide accommodation for the impact of the Project on the exercise of Aboriginal rights.

ABORIGINAL AND TREATY RIGHTS EFFECTS ASSESSMENT

As accommodation for any potential impacts that have not been identified to Aboriginal groups' ability to exercise Aboriginal rights, Port Metro Vancouver proposes to assist Aboriginal groups in accessing opportunities resulting from the Project. Through ongoing engagement, Port Metro Vancouver will seek input from Aboriginal communities with respect to plans to facilitate access to Project-related benefits. Discussions with the appropriate Aboriginal groups began on this topic in November and December 2014.

Key Findings

The Project is not predicted to adversely impact the ability of Aboriginal groups to exercise most asserted or established Aboriginal and treaty rights.

The only exception is the harvesting of crabs for domestic or food, social or ceremonial purposes, it is predicted the Project would likely impact Tsawwassen First Nation's ability to exercise the treaty right to fish for crab for domestic purposes based on potential changes in access to a primary crab harvesting location. For similar reasons, such Project-related effects would also be expected to impact Musqueam First Nation's ability to exercise the asserted Aboriginal right to harvest crab for food, social, or ceremonial purposes. These effects are expected to be accommodated by the measures identified to avoid, reduce or otherwise address predicted effects on current use.

17 ENVIRONMENTAL MANAGEMENT PLANS AND FOLLOW-UP PROGRAM (EIS SECTION 33.0)

This section of the Executive Summary describes Port Metro Vancouver's approach to environmental management and the environmental management plans and follow-up program developed for the Project.

Port Metro Vancouver's Approach to Environmental Management

The *Canada Marine Act* requires that port authorities support Canada's trade objectives while providing for a high level of safety and environmental protection. Port Metro Vancouver's legislated mandate of environmental stewardship guides its comprehensive approach to the environment, and includes a wide spectrum of policies, programs and initiatives. Port Metro Vancouver's environmental approach comprises the following elements:

- Environment Policy;
- Corporate Social Responsibility Policy;
- Sustainability Reporting;
- Environmental Review and Authorization;
- Environmental Initiatives and Programs;
- Adherence to Regulations and Guidelines; and
- Planning Exercises.

The environmental management plans proposed for the Roberts Bank Terminal 2 Project are nested within Port Metro Vancouver's environmental commitments and will link to its environmental program elements.

Environmental Management Plans

A Construction Environmental Management Plan and an Operation Environmental Management Plan, each with several sub-plans, would be developed for the Project prior to construction and operation. The purpose of the Environmental Management Plans is to ensure appropriate measures and controls are in place to prevent or reduce adverse environmental effects and to provide clearly defined action plans and emergency response procedures to protect human and environmental health.

Port Metro Vancouver would ensure the selected infrastructure developer and terminal operator:

- Retains qualified professionals to develop the Environmental Management Plans and their sub-plans;
- Leads implementation of the Environmental Management Plans and their sub-plans for all personnel, subcontractors or others on-site;
- Ensures implementation of and compliance with the Environmental Management Plans, all required Project permits and conditions of approvals; and
- Assures reporting of compliance with the Environmental Management Plans in a manner and at a frequency to be determined in conjunction with regulatory agencies and Port Metro Vancouver.

Port Metro Vancouver would also include these requirements as conditions in the Port Metro Vancouver-issued Project permit, a necessary authorization for the infrastructure developer and terminal operator to undertake construction on lands managed by Port Metro Vancouver.

Project-related Environmental Management Plans would be developed prior to the start of construction and operation phases to ensure alignment with required permits and approvals, final designs, finalized construction or operation approaches, and site-specific considerations. During the finalization of the plans, relevant regulatory agencies would be consulted to ensure plans address regulatory requirements. Environmental Management Plans and their sub-plans would be subject to review by applicable regulatory agencies. In addition, feedback on applicable sub-plans would be solicited from Aboriginal groups potentially affected by the Project.

The development of the Project's Environmental Management Plans would be informed by the valued component assessments presented in the EIS and would set out the applicable legislation and regulations, and relevant standards and guidelines to be complied with and the mitigation measures to be implemented during Project construction and operation. The Environmental Management Plans would also describe compliance monitoring efforts and reporting to regulators.

Construction Environmental Management Plan

The Construction Environmental Management Plan would provide the basis for compliance with the terms and conditions of Project approval, applicable regulatory requirements and other construction guidance documents, throughout Project construction.

The Construction Environmental Management Plan would consist of the following sub-plans, and their implementation would reduce potential construction-related effects to intermediate and valued components.

	Intermediate Components								Valued Components																
Sub-plans	Air Quality	Noise and Vibration	Light	Coastal Geomorphology	Surficial Geology and Marine Sediment	Marine Water Quality	Underwater Noise	Population	Marine Vegetation	Marine Invertebrates	Marine Fish	Marine Mammals	Coastal Birds	Ongoing Productivity of CRA Fisheries	Labour Market	Economic Development	Local Government Finances	Services and Infrastructure	Marine Commercial Use	Outdoor Recreation	Land and Water Use	Visual Resources	Human Health	Archaeological and Heritage Resources	Current Use of Land and Resources
Construction Compliance Monitoring Plan	•	•			•	•	•		•	•	•	•	•						•	•			•		•
Environmental Training Plan									•	•	•	•	•												•
Air Quality and Dust Control Plan	•																						•		•
Archaeological Monitoring and Management Plan																							•		
Light Management Plan			•								•		•									•	•		•
Noise Management Plan		•											•										•		•
Underwater Noise Management Plan		•				•					•	•	•												
Marine Mammal Observation Plan												•													
Land and Marine Traffic Management Plan													•					•			•				
Dredging and Sediment Discharge Plan					•	•			•	•	•	•	•												•
Sediment and Erosion Control Plan					•	•			•	•	•	•	•												•
Marine Species Salvage Plan										•	•	•	•						•	•					•
Hazardous Materials and Waste Management Plan					•	•			•	•	•	•	•					•							•
Health and Safety and Emergency Response Management Plan																		•							
Spill Preparedness and Response Plan					•	•			•	•	•	•	•												•
Communications Plan																		•	•	•	•		•		•

Operation Environmental Management Plan

The Operation Environmental Management Plan would provide the basis for compliance with the terms and conditions of Project approval, applicable regulatory requirements, and other operational guidance documents, throughout the operational life of the Project.

The Operation Environmental Management Plan would consist of the following sub-plans, and their implementation would reduce potential operation-related effects to intermediate and valued components.

	Intermediate Components								Valued Components																
Sub-plans	Air Quality	Noise and Vibration	Light	Coastal Geomorphology	Surficial Geology and Marine Sediment	Marine Water Quality	Underwater Noise	Population	Marine Vegetation	Marine Invertebrates	Marine Fish	Marine Mammals	Coastal Birds	Ongoing Productivity of CRA Fisheries	Labour Market	Economic Development	Local Government Finances	Services and Infrastructure	Marine Commercial Use	Outdoor Recreation	Land and Water Use	Visual Resources	Human Health	Archaeological and Heritage Resources	Current Use of Land and Resources
Operation Compliance Monitoring Plan	•				•	•	•		•	•	•	•	•										•		•
Environmental Training Plan									•	•	•	•	•												•
Hazardous Materials and Waste Management Plan					•	•			•	•	•	•	•					•							•
Light Management Plan			•								•		•									•	•		•
Noise Management Plan		•											•										•		•
Health and Safety and Emergency Response Management Plan																		•							
Spill Preparedness and Response Plan					•	•			•	•	•	•	•										•		•

Roberts Bank Terminal 2 Project Follow-Up Program

In addition to the Construction and Operation Environmental Management Plans, Port Metro Vancouver is committed to developing and implementing a follow-up program for the Project. The purpose of the follow-up program is to verify the accuracy of residual effect predictions made in the EIS, and to determine the effectiveness of any measures taken to mitigate the adverse environmental effects of the Project.

To ensure the Program's elements adequately reflect conditions of Project approvals, final designs and construction or operation approaches, as well as public, Aboriginal group and regulator feedback received during the review of the EIS, Port Metro Vancouver would lead the development of the follow-up program after the submission of the EIS.

The follow-up program would include:

- An evaluation of the adequacy of existing data to provide a benchmark against which to test Project-related effects;
- A monitoring design drawing on the measurable parameters identified to be field-tested;
- A methodological approach for using field-collected data to measure and verify the accuracy of the effects predicted in the EIS;
- A reporting framework that defines frequency of reporting, distribution and feedback mechanisms; and
- Details of Port Metro Vancouver's approach to adaptive management for the Project through construction and operation.

The follow-up program would be developed in consultation with federal agencies, including the Canadian Environmental Assessment Agency, Fisheries and Oceans Canada, and Environment Canada. Complete drafts of the Roberts Bank Terminal 2 Project follow-up program would be made available prior to the start of field measurements to ensure parties consulted on the program and approving agencies have an opportunity to evaluate and approve the Program. Feedback from Aboriginal groups regarding the draft follow-up program would be sought through Port Metro Vancouver's ongoing engagement initiatives.

For More Information:

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