## Field Studies Information Sheet – July 2012

Port Metro Vancouver is continuing field studies in July as part of ongoing environmental and technical work for the proposed Roberts Bank Terminal 2 Project.

### Roberts Bank Terminal 2 Project

The Roberts Bank Terminal 2 Project is a proposed new multi-berth container terminal which would provide more than two million TEUs (twenty-foot equivalent unit containers) of additional container capacity. The project is part of the Container Capacity Improvement Program, Port Metro Vancouver's long-term strategy to deliver projects to meet anticipated growth and demand for container capacity until 2030.

No decision has been made to proceed with the proposed Roberts Bank Terminal 2 Project. Port Metro Vancouver is undertaking a comprehensive multi-round, multi-year community, stakeholder and public consultation process regarding the project, which began in June 2011 with Pre-Consultation.
The proposed Roberts Bank Terminal 2 Project will be subject to a thorough and independent environmental assessment.

### Field Studies – July 2012

An overview of field studies that will be taking place in July 2012 is below.

| Overview |
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| **Water and Sediment Quality** |
| • Water and Sediment Quality Study |
| **Biofilm** |
| • Hyperspectral Mapping Study |
| **Marine Fish** |
| • Fish Spawn Habitat Study |
| • Reef Fish Study |
| **Marine Vegetation** |
| • Eelgrass Study |
| • Salt Marsh Study |
| • Ulva Study |
| **Marine Invertebrates** |
| • Juvenile Dungeness Crab Study |
| • Sea Pen Study |
| • Small Invertebrates Study |
| **Coastal Seabirds** |
| • Impacts of Overhead Transmission Wires and Vehicular Traffic on Coastal Seabirds Study |
| • General Bird Abundance and Distribution Study |
| • Shorebird Use of Fraser River Estuary during Southward Migration Study |
| **Coastal Geomorphology** |
| • Continuous Measurement of Discharge Study |
| • Sediment Concentration and Grain Size Study |
| • Salinity and Suspended Solids Study |
| • Direct Observations and Measurements of Flow Study |
| • Bathymetric (Ocean Floor) Study |
| • Erosion and Deposition Study |

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| • Wave Height Study |
| **Marine Mammals** |
| • Underwater Noise Study |
| **Terrestrial Wildlife** |
| • Barn Owl Study |
| • Terrestrial Invertebrates Study |

Some field studies may require access to public and private land. Port Metro Vancouver will obtain permission before accessing private property. As part of the Adaptive Management Strategy developed as part of the Deltaport Third Berth Project, Port Metro Vancouver will continue studies at Roberts Bank in addition to those outlined in this information sheet.

Port Metro Vancouver will produce monthly Field Studies information sheets summarizing work to occur each month. These updates will be available at www.portmetrovancouver.com/CCIP.

| Study Name | Summary |
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| **Sediment and Water Quality – Sediment and Water Quality Study** | Purpose:<br>The purpose of this study is to collect data on sediment and water quality throughout the study area. Furthermore, the study will examine the connection between water and sediment quality and the health of:<br>• Marine invertebrates;<br>• Biofilm;<br>• Eelgrass;<br>• Sea pens; and<br>• Biological resources and communities.<br><br>Study Area:<br>The study area includes:<br>• Roberts Bank<br>• Sturgeon Bank<br>• Boundary Bay<br><br>Methods:<br>Throughout the study area, sediment samples will be taken during daylight hours. Sensors (light and temperature) will be installed in the study area to collect data on water quality.<br><br>Timing:<br>The study will occur in July 2012 and take place during daylight hours |
| **Biofilm – Hyperspectral Mapping Study** | Purpose:<br>The purpose of this study is to:<br>• Determine the extent of biofilm and biofilm habitat at Roberts Bank and surrounding area;<br>• Estimate the total standing biomass of biofilm at Roberts Bank; and<br>• Identify the main biological groups which comprise biofilm. |

| Study Name | Summary |
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| | Study Area:<br>The study area includes the intertidal zone between Canoe Pass and the Roberts Bank causeway as well as the inter-causeway area between Deltaport Terminal and BC Ferries at Roberts Bank.<br><br>Methods:<br>Multiple methods will be used in the Hyperspectral Mapping Study:<br>• Flight-based aerial surveys<br>• Field surveys using handheld sensors<br>• Collecting sediment cores at intertidal sampling locations<br><br>Timing:<br>The study will occur in July and August 2012 and take place during daylight hours. |
| **Marine Fish – Fish Spawn Habitat Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of this study is to:<br>1. Identify suitable fish (surf smelt and sand lance) beach spawning habitat along the length of the Roberts Bank causeway.<br>2. Document habitat characteristics of suitable spawning beaches.<br>3. Collect sediment for grain size analysis and egg examination.<br><br>Study Area:<br>The study area includes the western side of the Roberts Bank causeway.<br><br>Methods:<br>Sediment samples will be collected and examined for fish eggs and grain size. Any eggs found will be analyzed to identify approximate time of spawning events.<br><br>Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Marine Fish – Reef Fish Study** | Purpose:<br>The purpose of this study is to document the use of the artificial reefs off the south face of the terminal by fish species.<br><br>Study Area:<br>The study area includes the 10 artificial reefs southwest of the Westshore terminal.<br><br>Methods:<br>Divers will identify and count fish present within the artificial reefs in the subtidal zone.<br><br>Timing:<br>The study will occur in July and August 2012 and take place during daylight hours. |

| Study Name | Summary |
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| **Marine Vegetation – Eelgrass Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of this study is to identify the density and distribution of eelgrass within the study area and to determine if sea water temperature and/or light penetration impacts eelgrass growth.<br><br>Study Area:<br>The study area is composed of two main regions at Roberts Bank:<br>1. The mudflats south of Canoe Pass (Brunswick Point) to the Roberts Bank causeway.<br>2. The "inter-causeway" which includes the mudflat between the Roberts Bank causeway and the BC Ferries terminal causeway.<br><br>Methods:<br>Multiple methods will be used to identify the density and distribution of eelgrass:<br>• Confirm and map the distribution of eelgrass habitat along the Roberts Bank mudflats at very low tides, and collect data.<br>• Map the underwater distribution of eelgrass using an underwater video system towed by a slow moving boat<br>• Water temperature and light intensity sensors will be anchored in the intertidal zone at Roberts Bank to collect data.<br><br>Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Marine Vegetation – Salt Marsh Study** | Purpose:<br>The purpose of this study is to:<br>• Determine the distribution of salt marshes<br>• Determine the species present in salt marshes<br>• Determine the percent cover of salt marsh species<br><br>Study Area:<br>The study will focus on Roberts Bank.<br><br>Methods:<br>The salt marsh study will be conducted by surveying known salt marsh areas at Roberts Bank. Teams will survey randomly generated sampling locations within salt marsh habitat during low tide. At each point information on salt marsh species, their density and spatial extent will be recorded using hand-held data entry system.<br><br>Aerial surveys will be conducted to take specialized photos that will be analyzed to determine the total current extent of the distribution of salt marsh at Roberts Bank.<br><br>Timing:<br>The study will occur in July and August 2012 and take place during daylight hours. |

| Study Name | Summary |
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| **Marine Vegetation – Ulva Study** | Purpose:<br>Ulva is thin flat green algae, also commonly known as sea lettuce. The purpose of the Ulva study is to:<br>• Determine the density of Ulva; and<br>• Determine the percent cover of Ulva<br><br>Study Area:<br>The study will focus on Roberts Bank.<br><br>Methods:<br>Teams will walk to randomly generated sampling location and quantify the percent cover and distribution of Ulva within a sampling location.<br><br>Timing:<br>The study will occur in July and August 2012 and take place during daylight hours. |
| **Marine Invertebrates – Dungeness Crab Study** | Purpose:<br>The purpose of the Dungeness Crab Study is to determine the density of juvenile crabs in various habitat types throughout Roberts Bank.<br><br>Study Area:<br>The study will focus on Roberts Bank.<br><br>Methods:<br>Dungeness crabs will be counted and measured by a team of biologists within the study area at randomly selected sampling locations. Crab size, life history stage and sex will be measured and recorded.<br><br>Timing:<br>The study will occur in July and August 2012 and take place during daylight hours. |
| **Marine Invertebrates – Sea Pen Study** | Purpose:<br>The purpose of the Sea Pen Study is to:<br>• Determine the rarity or uniqueness of the Roberts Bank sea pen bed, both on a local and regional scale; and<br>• Explore possible linkages between sea pen behaviour and sediment and water characteristics.<br><br>Study Area:<br>The study area encompasses approximately 200 hectares of known sea pen habitat around the Deltaport Terminal.<br><br>Methods:<br>Data will be collected using both boat-based and scuba diving methods.<br><br>Sediment sampling will occur where divers collect sediment in three to five areas surrounding the sampling location. |

| Study Name | Summary |
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| | Additionally, acoustic sensors will be deployed at two locations within the study area, where they will be mounted to the sea floor for one month, in order to capture a robust snapshot of conditions.<br><br>Timing:<br>The study will occur in July and August 2012 and take place during daylight hours. |
| **Marine Invertebrates – Small Invertebrates Study** | Purpose:<br>The purpose of the small invertebrates study is to:<br>• Count and identify small and microscopic marine invertebrate's across the Fraser River Estuary; and<br>• Identify the correlation between invertebrate diversity and density and shorebird usage throughout the Fraser River Estuary<br><br>Study Area:<br>The study area is comprised of three sites within the Fraser River Estuary:<br>• Sturgeon Bank<br>• Roberts Bank<br>• Boundary Bay<br><br>Methods:<br>To quantify and identify small marine invertebrates, sediment cores will be sampled at 250 locations.<br><br>Timing:<br>The study will occur in July and August 2012 and take place during daylight hours. |
| **Coastal Seabirds – Impacts of Overhead Transmission Wires and Vehicular Traffic on Coastal Seabirds Study**<br><br>(continued from June 2012) | Purpose:<br>Bird diverters are special units installed on power lines that help birds see power lines and avoid potentially fatal collisions. The purpose of the study is to calculate the effectiveness of existing bird diverters, while identifying opportunities to further reduce bird collisions with transmission wires and vehicular traffic.<br><br>Methods:<br>The study will examine flight patterns, distribution, abundance and behaviour of birds as they cross the Roberts Bank transmission line. Where bird collisions do occur within 20 metres of the transmission wire and road, birds will be collected and studied.<br><br>Timing:<br>Flight surveys will be undertaken every two weeks at each station. Assessments will occur during daylight hours, weather permitting. This study began in mid-April and will continue in July 2012. |

| Study Name | Summary |
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| **Coastal Seabirds – General Bird Abundance and Distribution Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of this study is to determine and observe Coastal Seabirds, Shorebirds and Waterfowl abundance and seasonal distribution at Roberts Bank.<br><br>Study Area:<br>The study area includes:<br>• Brunswick Marsh<br>• Roberts Bank Causeway<br>• The perimeter of the Deltaport and Westshore terminals<br><br>Methods:<br>A team of two biologists will conduct bird observation surveys, where bird species will be identified and individuals counted.<br><br>The biologists will use binoculars and spotting scopes to count and identify species.<br><br>There are 13 observation points and each one will be identified with flagging tape, and spray paint on the ground surface or with a stake.<br><br>Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Coastal Seabirds – Shorebird Use of Fraser River Estuary During Southward Migration Study** | Purpose:<br>The purpose of this study is determine the abundance and distribution of shorebirds across the Fraser River Estuary during the southward migratory period<br><br>Study Area:<br>The study area is comprised of mudflats within three sites of the Fraser River Estuary:<br>• Sturgeon Bank<br>• Roberts Bank<br>• Boundary Bay<br><br>Methods:<br>The number and distribution of bird use will be assessed by counting droppings at low tide within $1m^2$ quadrants.<br><br>Timing:<br>The study will begin in July and is anticipated to continue until September 2012. The study will occur during daylight hours. |
| **Coastal Geomorphology – Continuous Measurement of Discharge Study** | Purpose:<br>The purpose of the study is to continuously monitor discharge in Canoe Pass during the summer high flow season.<br><br>Specifically, the study will collect data relating to flow discharge in Canoe Pass. |

| Study Name | Summary |
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| (continued from June 2012) | Study Area:<br>The study area includes Canoe Pass (the southern-most arm of the Fraser River).<br><br>Methods:<br>Multiple methods will be used to collect data:<br>1. Sensors and probes will be installed within the study area. These will be connected to computers to collect and monitor data.<br>2. Boat-mounted sensors will be deployed within the study area to gather data.<br><br>Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Coastal Geomorphology – Sediment Concentration and Grain Size Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of the study is to continuously monitor sediment concentration in Canoe Pass.<br><br>Specifically, the study will determine the amount of sediment that exits Canoe Pass and arrives at Roberts Bank.<br><br>Study Area:<br>The study area includes Canoe Pass (the southern-most arm of the Fraser River).<br><br>Methods:<br>To determine the amount of sediment present, a sensor will be installed and used to collect data on the number of particles in the water. Samples will be collected to help determine sediment concentration and grain size.<br><br>Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Coastal Geomorphology – Salinity and Suspended Solids Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of the study is to measure water salinity and suspended solids in Canoe Pass and over the Roberts Bank tidal flats.<br><br>Study Area:<br>The study area includes Canoe Pass (the southern-most arm of the Fraser River) and Roberts Bank to the north of the Roberts Bank causeway.<br><br>Methods:<br>To measure the salinity, a sensor will be deployed (at a minimum of three different depths) from a boat during various tide conditions and at different Fraser River discharges.<br><br>Suspended sediment water samples will be collected by bottling water samples. |

| Study Name | Summary |
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| | Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Coastal Geomorphology – Direct Observations and Measurements of Flow Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of the study is to observe and measure tidal channels and flow within the proposed project area.<br><br>Study Area:<br>The study area includes:<br>• Canoe Pass (the southern-most arm of the Fraser River)<br>• Roberts Bank between Canoe Pass and the Roberts Bank causeway<br><br>Methods:<br>Direct observations will occur during low tides to observe flow and sediment transport within selected channels. Measurement of flow speed will be accomplished using a hand-held velocity meter. Field observations will be supplemented by photographs taken using a digital camera with onboard GPS.<br><br>Flow measurements and general observations will be recorded.<br><br>Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Coastal Geomorphology – Bathymetric (Ocean Floor) Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of the study is to conduct focused bathymetric (ocean floor) surveys and collect data on the Canoe Pass Channel.<br><br>Study Area:<br>The study area includes Canoe Pass (the southern-most arm of the Fraser River).<br><br>Methods:<br>A boat-mounted sensor will be used to survey selected cross-sections within Canoe Pass.<br><br>Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Coastal Geomorphology – Erosion and Deposition Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of the study is to measure and collect data on the short-term changes in the sediment surface of the tidal flats.<br><br>Study Area:<br>The study area includes the tidal flats in the vicinity of the Roberts Bank causeway.<br><br>Methods:<br>Depth of disturbance rods will be installed in the sediment and monitored on a |

| Study Name | Summary |
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| | monthly basis to assess changes in the elevation of the sediment surface.<br><br>Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Coastal Geomorphology – Wave Height Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of the study is to collect ongoing measurements of wave heights at three locations on the tidal flats at Roberts Bank.<br>Study Area:<br>The study area includes the tidal flats in the vicinity of the Roberts Bank causeway.<br><br>Methods:<br>Wave sensors will be deployed on the seabed and will collect data and take continuous measurements of wave heights.<br><br>Timing:<br>The study will continue in July 2012 and will occur during daylight hours. |
| **Marine Mammals – Underwater Noise Study**<br><br>(rescheduled from June 2012) | Purpose:<br>The purpose of this study is to capture baseline data on ambient underwater noise levels and marine mammal presence at Roberts Bank.<br><br>Study Area:<br>The study area is the waters in the vicinity of Roberts Bank.<br><br>Methods:<br>To capture baseline data on ambient noise levels at Roberts Bank, one underwater noise monitoring sensor will be deployed on the sea floor and will record both ambient noise levels and marine mammal vocalizations.<br><br>Timing:<br>The study will begin in July 2012 to correspond with seasonal peak Killer Whale presence in the area. |
| **Terrestrial Wildlife – Barn Owl Study** | Purpose:<br>The purpose of this study is to collect baseline data on barn owl use of habitats in the study area.<br><br>Study Area:<br>The study area is 10 kilometres-long, and will include a 500-metre buffer on either side of the existing rail line between the end of the Roberts Bank causeway and Fisher Yard.<br><br>Methods:<br>Roadside surveys will be conducted along existing infrastructure to understand barn owl use of open habitat near existing road and rail lines. Biologists will record:<br>• General barn owl behaviour; |

| Study Name | Summary |
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| | • Number of barn owls (plus location); and<br>• Age of barn owl (if possible).<br><br>Timing:<br>The study will begin in July and is anticipated to occur until September 2012. The study will occur at dusk. |
| **Terrestrial Wildlife – Terrestrial Invertebrates Study**<br><br>(continued from June 2012) | Purpose:<br>The purpose of this study is to identify and document the occurrence of terrestrial invertebrates that are species-at-risk in the study area.<br><br>Study Area:<br>The study area is 10 kilometres-long, and will include a 500-metre buffer on either side of the existing rail line between the end of the causeway and Fisher Yard. This study area may be reduced based on the results of the reconnaissance survey, to focus subsequent survey efforts on habitats where the species of interest are more likely to occur.<br><br>Methods:<br>Multiple methods will be used in this study:<br>1. Walking the study area to identify habitats that may contain terrestrial invertebrates that are species at risk<br>2. Visual observation surveys.<br>3. Collecting and identifying terrestrial invertebrates and recording the location, date and time of collection. The locations of suitable habitats will be determined and mapped.<br><br>Timing:<br>The study will continue in July 2012 and occur during daylight hours. |

**For Further Information**
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