APPENDIX 4-D

Roberts Bank Traffic Data Matrix

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Container Capacity Improvement Program - Roberts Bank Traffic Data Matrix

2015-03-12-01-20000-TAB-0010-Rev0-PMV-Roberts Bank Traffic Data Matrix

March 12, 2015

Technical Report/Technical Data Report Disclaimer

The Canadian Environmental Assessment Agency determined the scope of the proposed Roberts Bank Terminal 2 Project (RBT2 or the Project) and the scope of the assessment in the **Final Environmental Impact Statement Guidelines (EISG)** issued January 7, 2014. The scope of the Project includes the project components and physical activities to be considered in the environmental assessment. The scope of the assessment includes the factors to be considered and the scope of those factors. The Environmental Impact Statement (EIS) has been prepared in accordance with the scope of the Project and the scope of the assessment specified in the EISG. For each component of the natural or human environment considered in the EIS, the geographic scope of the assessment depends on the extent of potential effects.

At the time supporting technical studies were initiated in 2011, with the objective of ensuring adequate information would be available to inform the environmental assessment of the Project, neither the scope of the Project nor the scope of the assessment had been determined.

Therefore, the scope of supporting studies may include physical activities that are not included in the scope of the Project as determined by the Agency. Similarly, the scope of supporting studies may also include spatial areas that are not expected to be affected by the Project.

This out-of-scope information is included in the Technical Report (TR)/Technical Data Report (TDR) for each study, but may not be considered in the assessment of potential effects of the Project unless relevant for understanding the context of those effects or to assessing potential cumulative effects.

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4-D.1 TRAFFIC DATA MATRIX

Roberts Bank Traffic Volumes: SHIP TRAFFIC
Date: 11/03/2015

Horizon Year	Studies	Data Type	Throughput			Ship Traffic														
			Annual Cargo Volumes			Annual Ship Calls			Annual Ship Movements			Average Monthly Ship Movements			Peak Daily Ship Movements			Average Daily Ship Movements		
			DP (MTEUs)	RBT2 (MTEUs)	Westshore - Coal (MT)	DP	RBT2	Westshore	DP	RBT2	Westshore	DP	RBT2	Westshore	DP	RBT2	Westshore	DP	RBT2	Westshore
2010	AQ	Actual	1.53	0	24.7	290	0	246	580 Formula 3 Calculation	0	492 Formula 3 Calculation	48 Formula 4 Calculation	0	41 Formula 4 Calculation	6 Formula 5 Calculation	0	4 Formula 5 Calculation	1.6 Formula 6 Calculation	0	1.4 Formula 6 Calculation
2012	QRA, Noise	Actual	1.80 Throughput Capacity in 2012	0	26.1	269	0	270	538 Formula 3 Calculation	0	540 Formula 3 Calculation	45 Formula 4 Calculation	0	45 Formula 4 Calculation	6 Formula 5 Calculation	0	4 Formula 5 Calculation	1.5 Formula 6 Calculation	0	1.5 Formula 6 Calculation
2023	AQ	Prediction	2.40	1.7	34.0	312	184 Prorated Formula 7 Calculation	304 Formula 1a Calculation	624 Formula 3 Calculation	368 Formula 3 Calculation	608 Formula 3 Calculation	52 Formula 4 Calculation	31 Formula 4 Calculation	51 Formula 4 Calculation	6 Formula 5 Calculation	6 Formula 5 Calculation	4 Formula 5 Calculation	1.7 Formula 6 Calculation	1.0 Formula 6 Calculation	1.7 Formula 6 Calculation
2025	AQ	Prediction	2.40	2.4	35.0	312 Formula 2 Calculation	260	313 Formula 1 Calculation	624 Formula 3 Calculation	520 Formula 3 Calculation	626 Formula 3 Calculation	52 Formula 4 Calculation	43 Formula 4 Calculation	52 Formula 4 Calculation	6 Formula 5 Calculation	6 Formula 5 Calculation	4 Formula 5 Calculation	1.7 Formula 6 Calculation	1.4 Formula 6 Calculation	1.7 Formula 6 Calculation
2030	QRA, Noise	Prediction	2.40	2.4	35.0	312 Formula 2 Calculation	260	313 Formula 1 Calculation	624 Formula 3 Calculation	520 Formula 3 Calculation	626 Formula 3 Calculation	52 Formula 4 Calculation	43 Formula 4 Calculation	52 Formula 4 Calculation	6 Formula 5 Calculation	6 Formula 5 Calculation	4 Formula 5 Calculation	1.7 Formula 6 Calculation	1.4 Formula 6 Calculation	1.7 Formula 6 Calculation

Legend:

Black #	Actual Data or Conceptual and Preliminary Engineering Source Data
Blue #	Spreadsheet calculation
N.A.	Not Applicable

Formulae:

1	Assuming 114 Capesize Vessels or smaller (100,000 MT/ship) and 199 greater than Capesize vessels to transport 35MT of Coal
1a	Ship Calls prorated based on 34MT in 2023
2	Assuming that a "Split Service" between Deltaport and Seattle and Tacoma will continue after RBT2 opens
3	Annual Ship Calls x 2 = Annual Ship Movements
4	Annual Ship Calls / 12 = Average Monthly Ship Movements
5	Berths x 2 (one arrival & one departure/day) = Peak Daily Ship Movements
6	Annual Ship Calls / 360 x 2 = Average Daily Ship Movements

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Roberts Bank Traffic Volumes: CONTAINER TRUCK TRAFFIC

Date: 11/03/2015

Horizon Year	Studies	Data Type	Throughput			Road Traffic - Container Trucks																					
			Annual Cargo Volumes			Annual Containers Moved By Truck [1,000 Truck Trips/year]		Annual Inter or Intra-terminal Truck Trips [1,000/year]		Annual External Truck Traffic				Total Truck Moves per Container		Daily Truck Traffic								Hourly Truck Traffic							
										Inbound Annual External Trucks [1,000 Trucks/year]		Inbound+Outbound Annual External Trucks [1,000 Trucks/year]				Peak Day Inbound Trucks [Trucks/day]		Peak Day Inbound+Outbound Trucks [Trucks/day]		Average Day Inbound Trucks [Trucks/day]		Average Day Inbound+Outbound Trucks [Trucks/day]		Terminal Design Hour External Inbound Trucks [Trucks/hour] [Peak Day]		Terminal Design Hour External Inbound+Outbound Trucks [Trucks/hour] [Peak Day]		Average Hour External Inbound Trucks [Trucks/hour]		Average Hour External Inbound+Outbound Trucks [Trucks/hour]	
			DP (MTEUs)	RBT2 (MTEUs)	Westshore - Coal (MT)	DP	RBT2	DP	RBT2	DP	RBT2	DP	RBT2	DP	RBT2	DP	RBT2	DP	RBT2	DP	RBT2	DP	RBT2	DP	RBT2	DP	RBT2	DP	RBT2
2010	AQ	Actual	1.53	0	24.7	479	0	156	0	313 Formula 10 Calculation	0	625	0	1.63 Formula 12 Calculation	0	1659 Formula 17 Calculation	0	3317	0	1202 Formula 19 Calculation	0	2404	0	199 Formula 25 Calculation	0	398	0	144 Formula 27 Calculation	0	288	0
2012	QRA, Noise	Actual	1.80 Throughput Capacity in 2012	0	26.1	486	0	159 Formula 9 Calculation	0	317 Formula 10 Calculation	0	634	0	1.63 Formula 12 Calculation	0	1685 Formula 17 Calculation	0	3369	0	1221 Formula 19 Calculation	0	2442	0	202 Formula 25 Calculation	0	404	0	169 Formula 27 Calculation	0	339 Prorated Formula 28 Calculation	0
2023	AQ	Prediction	2.40	1.7	34.0	736	521 Prorated Formula 7 Calculation	240 Formula 9 Calculation	170 Prorated Formula 7 Calculation	480 Formula 10 Calculation	340 Formula 10 Calculation	959	679 Prorated Formula 7 Calculation	1.63 Formula 12 Calculation	1.63 Formula 12 Calculation	2548 Formula 17 Calculation	1804 Formula 17 Calculation	5095	3609 Prorated Formula 7 Calculation	1846 Formula 19 Calculation	1308 Prorated Formula 7 Calculation	3692	2615 Prorated Formula 7 Calculation	306 Formula 25 Calculation	217 Prorated Formula 7 Calculation	611	433 Prorated Formula 7 Calculation	222 Formula 27 Calculation	157 Prorated Formula 7 Calculation	443	314 Prorated Formula 7 Calculation
2025	AQ	Prediction	2.40	2.4	35.0	736	736 Formula 8 Calculation	240 Formula 9 Calculation	240 Formula 9a Calculation	480 Formula 10 Calculation	480 Formula 10 Calculation	959	959 Formula 11 Calculation	1.63 Formula 12 Calculation	1.63 Formula 12 Calculation	2548 Formula 17 Calculation	2548 Formula 17 Calculation	5095	5095 Formula 18 Calculation	1846 Formula 19 Calculation	1846 Formula 19 Calculation	3692	3692 Formula 20 Calculation	306 Formula 25 Calculation	306 Formula 25 Calculation	611	612 Formula 26 Calculation	222 Formula 27 Calculation	222 Formula 27 Calculation	443	443 Formula 29 Calculation
2030	QRA, Noise	Prediction	2.40	2.4	35.0	736	736 Formula 8 Calculation	240 Formula 9 Calculation	240 Formula 9a Calculation	480 Formula 10 Calculation	480 Formula 10 Calculation	959	959 Formula 11 Calculation	1.63 Formula 12 Calculation	1.63 Formula 12 Calculation	2548 Formula 17 Calculation	2548 Formula 17 Calculation	5095	5095 Formula 18 Calculation	1846 Formula 19 Calculation	1846 Formula 19 Calculation	3692	3692 Formula 20 Calculation	306 Formula 25 Calculation	306 Formula 25 Calculation	611	612 Formula 26 Calculation	222 Formula 27 Calculation	222 Formula 27 Calculation	443	443 Formula 29 Calculation

Legend:

Black #	Actual Data or Conceptual and Preliminary Engineering Source Data
Blue #	Spreadsheet calculation
N.A.	Not Applicable

Formulae:

7 Prorating for 2023: 2023 RBT2 Throughput / 2025 RBT2 Throughput x 2025 RBT2 Value
8 (Annual Containers Moved Across the Gate By Truck for 4.8M TEUs/1000)/2 = RBT2 Annual Containers Moved Across the Gate By Truck {See 4-D.2 Table 8}
9 (Annual Two Way Truck Trips across the Gate - Net External Two Way Truck Trips East of Causeway) / 1000 = Inter or Intra-terminal Truck Trips {See 4-D.2 Table 8}
9a (Formula 9 for 4.8 column) / 2 {To account for 4.8 MTEU values being for 2 terminals}
10 Inbound+Outbound Annual External Trucks / 2 = Inbound Annual External Trucks
11 (Net External Two Way Truck Movements East of Causeway at 4.8M TEUs/1000)/2 = RBT2 External Two Way Truck Movements {See 4-D.2 Table 8}
12 (Inbound & Outbound Annual External Trucks + Annual Inter-terminal Truck Trips) / Annual Containers Moved By Truck = Total Truck Moves per Container
13 Vehicle Trips Total per Day x 360 / 1000 = Inbound+Outbound Annual Vehicles (1000) {See 4-D.3 Table 2}
17 Peak Day Inbound+Outbound Trucks / 2 = Peak Day Inbound Trucks
18 Peak Day External Daily Trucks at 4.8M TEUs/2 = RBT2 Peak Day External Daily Trucks {See 4-D.2 Table 9}
19 Average Day Inbound+Outbound Trucks / 2 = Average Day Inbound Trucks
20 External Daily Trucks at 4.8M TEUs/2 = RBT2 External Daily Trucks {See 4-D.2 Table 8}
25 Terminal Design Hour External Inbound+Outbound Trucks / 2 = Terminal Design Hour External Inbound Trucks
26 External Peak Hour Truck Movements for 4.8M TEUs/2 = RBT2 Terminal Design Hour {See 4-D.2 Table 9}
27 Average Hour External Inbound+Outbound Trucks / 2 = Average Hour External Inbound Trucks
28 Prorating for 2012: 2012 DP Throughput / 2010 DP Throughput x 2010 DP Cell Value
29 External Truck Trips peak hour, average day at 4.8M TEUs = RBT2 Average Inbound +Outbound Trucks {See 4-D.3 Table 2}

Roberts Bank Traffic Volumes: ALL OTHER ROAD VEHICLE TRAFFIC (EXCLUDING CONTAINER TRUCKS)

Date: 11/03/2015

Horizon Year	Studies	Data Type	Throughput			Road Traffic - All Other Vehicles Except Container Trucks													
			Annual Cargo Volumes			Annual Vehicle Traffic				Daily Vehicle Traffic				Hourly Vehicle Traffic					
						Annual Inbound Vehicles [1,000 Vehicles /year]		Inbound+Outbound Annual Vehicles [1,000 Vehicles/year]		Average Day Inbound Vehicles [Vehicles/day]		Average Day Inbound+Outbound Vehicles [Vehicles/day]		Terminal Design Hour Inbound Vehicles [Vehicles/hour]		Terminal Design Hour Inbound +Outbound Vehicles [Vehicles/hour]		Average Hour Inbound Vehicles [Vehicles/hour]		Average Hour Inbound + Outbound Vehicles [Vehicles/hour]	
			DP (MTEUs)	RBT2 (MTEUs)	Westshore - Coal (MT)	DP & WS	RBT2	DP & WS	RBT2	DP & WS	RBT2	DP & WS	RBT2	DP & WS	RBT2	DP & WS	RBT2	DP & WS	RBT2	DP & WS	RBT2
2010	AQ	Actual	1.53	0	24.7	257 Formula 13a Calculation	0	514 Formula 13 Calculation	0	714 Formula 21 Calculation	0	1427	0	280 Formula 30 Calculation	0	560	0	84 Formula 32 Calculation	0	168 Formula 33 Calculation	0
2012	QRA, Noise	Actual	1.80 Throughput Capacity in 2012	0	26.1	249 Formula 14a Calculation	0	498 Formula 14 Calculation	0	691 Formula 22a Calculation	0	1382 Formula 22 Calculation	0	329 Formula 30 Calculation	0	659 Prorated Formula 28 Calculation	0	81 Formula 32 Calculation	0	163 Formula 33 Calculation	0
2023	AQ	Prediction	2.40	1.7	34.0	377 Formula 15a Calculation	222 Prorated Formula 7 Calculation	753 Formula 15 Calculation	444 Prorated Formula 7 Calculation	1046 Formula 23a Calculation	617 Prorated Formula 7 Calculation	2092 Formula 23 Calculation	1234 Prorated Formula 7 Calculation	430 Formula 30 Calculation	291 Prorated Formula 7 Calculation	859	582 Prorated Formula 7 Calculation	123 Formula 32 Calculation	73 Prorated Formula 7 Calculation	246 Formula 33 Calculation	145 Prorated Formula 7 Calculation
2025	AQ	Prediction	2.40	2.4	35.0	377 Formula 15a Calculation	313 Formula 16a Calculation	753 Formula 15 Calculation	627 Formula 16 Calculation	1046 Formula 23a Calculation	871 Formula 24a Calculation	2092 Formula 23 Calculation	1742 Formula 24 Calculation	430 Formula 30 Calculation	411 Formula 30 Calculation	859	822 Formula 31 Calculation	123 Formula 32 Calculation	102 Formula 32 Calculation	246 Formula 33 Calculation	205 Formula 33 Calculation
2030	QRA, Noise	Prediction	2.40	2.4	35.0	377 Formula 15a Calculation	313 Formula 16a Calculation	753 Formula 15 Calculation	627 Formula 16 Calculation	1046 Formula 23a Calculation	871 Formula 24a Calculation	2092 Formula 23 Calculation	1742 Formula 24 Calculation	430 Formula 30 Calculation	411 Formula 30 Calculation	859	822 Formula 31 Calculation	123 Formula 32 Calculation	102 Formula 32 Calculation	246 Formula 33 Calculation	205 Formula 33 Calculation

Legend:

Black #	Actual Data or Conceptual and Preliminary Engineering Source Data
Blue #	Spreadsheet calculation
N.A.	Not Applicable

Formulae:

7	Prorating for 2023: 2023 RBT2 Throughput / 2025 RBT2 Throughput x 2025 RBT2 Value
13	Vehicle Trips Total per Day x 360 / 1000 = Inbound+Outbound Annual Vehicles (1000) {See 4-D.3 Table 2}
13a	(Formula 13) / 2 = Inbound Annual Vehicles (1000)
14	(1.56 DP + 25 Mt WS) x 360 / 1000 = Inbound+Outbound Annual Vehicles {See 4-D.2 Table 12}
14a	(Formula 14) / 2 = Inbound Annual Vehicles (1000)
15	(2.4 DP + 35 Mt WS) x 360 / 1000 = Inbound+Outbound Annual Vehicles {See 4-D.2 Table 12}
15a	(Formula 15) / 2 = Inbound Annual Vehicles (1000)
16	(4.8 DP & RBT2) / 2 x 360 / 1000 = Inbound+Outbound Annual Vehicles {See 4-D.2 Table 12}
16a	(Formula 16) / 2 = Inbound Annual Vehicles (1000)
21	Average Day Inbound+Outbound Vehicles / 2 = Average Day Inbound Vehicles
22	1.56 DP + 25 Mt WS = Average Day Inbound+Outbound Vehicles {See 4-D.2 Table 12}
22a	(Formula 22) / 2 = Average Day Inbound Vehicles
23	2.4 DP + 35 Mt WS = Average Day Inbound+Outbound Vehicles {See 4-D.2 Table 12}
23a	(Formula 23) / 2 = Average Day Inbound Vehicles
24	(4.8 DP & RBT2) / 2 = Average Day Inbound+Outbound Vehicles {See 4-D.2 Table 12}
24a	(Formula 24) / 2 = Inbound Annual Vehicles
28	Prorating for 2012: 2012 DP Throughput / 2010 DP Throughput x 2010 DP Cell Value
30	Terminal Design Hour Inbound +Outbound Vehicles / 2 = Terminal Design Hour Inbound Vehicles
31	Peak Hour Vehicle Trips (Average Day) at 4.8M TEUs / 2 = RBT2 Terminal Design Hour Vehicles {See 4-D.3 Table 2}
32	Average Day Inbound Vehicles / 8.5 = Average Hour Inbound Vehicles {divided by 8.5 hours to try to account for an average between peak shift times and other hours of the day with no major shifts}
33	Average Hour Inbound Vehicles x 2 = Average Hour Inbound + Outbound Vehicles

Roberts Bank Traffic Volumes: RAIL TRAFFIC

Date: 11/03/2015

Horizon Year	Studies	Data Type	Throughput			Rail Traffic					
			Annual Cargo Volumes			Average [Train Movements/Day]			Peak [Train Movements/Day]		
						Roberts Bank Terminals to Mud Bay Junction			Roberts Bank Terminals to Mud Bay Junction		
			DP (MTEUs)	RBT2 (MTEUs)	Westshore - Coal (MT)	DP	RBT2	Westshore	DP	RBT2	Westshore
2010	AQ	Actual	1.53	0	24.7	6 Conservative 2012 Data Used	0	11 Conservative 2012 Data Used	8 Conservative 2012 Data Used	0	11 Conservative 2012 Data Used
2012	QRA, Noise	Actual	1.80 Throughput Capacity in 2012	0	26.1	6	0	11	8	0	11
2023	AQ	Prediction	2.40	1.7	34.0	8	6 Prorated Formula 7 Calculation	13	10	7 Prorated Formula 7 Calculation	13
2025	AQ	Prediction	2.40	2.4	35.0	8	8	13	10	10	13
2030	QRA, Noise	Prediction	2.40	2.4	35.0	8	8	13	10	10	13

Legend:

Black #	Actual Data or Conceptual and Preliminary Engineering Source Data
Blue #	Spreadsheet calculation
N.A.	Not Applicable

Formulae:

7 Prorating for 2023: 2023 RBT2 Throughput / 2025 RBT2 Throughput x 2025 RBT2 Value

4-D.2 ROBERTS BANK TERMINAL 2 TRAFFIC ASSESSMENT REVIEW

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A Report To: PORT METRO vancouver

For:

ROBERTS BANK TERMINAL 2
TRAFFIC ASSESSMENT REVIEW

JANUARY 2015
TV1097

Submitted By: Delcan

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1.0 BACKGROUND & CONTEXT

The Roberts Bank Terminal 2 Project (RBT2 or Project) is a proposed new three-berth marine terminal at Roberts Bank in Delta, B.C. that could provide 2.4 million TEUs (twenty-foot equivalent unit containers) of additional container capacity annually. The Project is part of Port Metro Vancouver's Container Capacity Improvement Program, a long-term strategy to deliver projects to meet anticipated growth in demand for container capacity to 2030.

The Deltaport Terminal at Roberts Bank is one of four existing container terminals within Port Metro Vancouver. Originally opened in 1997 as a two-berth container terminal, the Deltaport Third Berth Project added an additional berth in 2010 and increased the maximum capacity of the terminal to 1.8 million Twenty Foot Equivalent Units (TEUs).

The Deltaport Terminal, Road and Rail Improvement Project (DTRRIP) is a series of improvements to the existing Deltaport Terminal that will provide an additional 600,000 TEUs of capacity once it is completed, bringing total container capacity at Roberts Bank up to 2.4 million TEUs. Upon the completion of the Roberts Bank Terminal 2 Project the total capacity of the Roberts Bank terminals will be 4.8 million TEUs.

As part of the project planning process, and in order to understand the flow of traffic that would be associated with the Project, a Traffic Assessment Review has been prepared. The objectives of this review are to:

- Assess the existing road traffic conditions within the Project area;
- Forecast truck, service vehicle, and employee trips using key input variables; and
- Assess the forecast road traffic requirements within the Project area.

1.1 Existing Container Volumes

Container terminal operations are subject to a range of periodic and seasonal fluctuations in volume due to various global economic, logistical and weather-related forces. This means that while each terminal has a "maximum capacity" at which it can function, most terminals will only be able to maintain efficient year-round operations at approximately 85% of this volume, known as "practical capacity". Operating at or below this level allows terminals to adapt to seasonal fluctuations or disruptions in the supply chain.

This traffic assessment uses the throughput achieved during 2011 at Deltaport Terminal as a baseline to analyse associated road and rail traffic levels at Roberts Bank. The throughput of 1.56 million TEUs during 2011 is representative of Deltaport Terminal operating at its "practical capacity".

1.2 Forecast Container Volumes

As part of the project planning process for the proposed Roberts Bank Terminal 2 Project, Port Metro Vancouver has undertaken a third-party container forecast to inform future container capacity requirements in the region.

Each of the forward looking container traffic scenarios assume a terminal throughput consistent with each terminal's stated maximum capacity, which is 2.4 million TEUs for both Deltaport Terminal and the proposed Roberts Bank Terminal 2. This is a conservative approach that permits a reliable analysis of road traffic levels during peak periods. ***Table 1*** summarises the container traffic levels that are used in this assessment.

Table 1: Forecast Container Volumes

Year	Total Roberts Bank Container Traffic (million TEUs)
2010	1.53
2011 (Existing)	1.56
2020	2.4
2023	4.1
2025	4.8
2030	4.8

2.0 PROJECT AREA NETWORK AND OPERATIONAL CONDITIONS

The subject traffic assessment is focused on the Project area which includes the Roberts Bank Causeway. This area consists of all of the terminal entry / exit lanes, roadway connections and service access points. Port Metro Vancouver's jurisdiction includes elements west of the DTRRIP interchange. It is important to document existing operations as changes have been contemplated in order to provide better compatibility with the eventual RBT2 Project. ***Figure 1*** highlights the key Project area road network elements.

DELTAPORT WAY

Deltaport Way is a two-lane undivided highway with a rural cross section consisting of open shoulders and an operating speed of 80 km/h. The roadway connects the Roberts Bank Causeway to provincial Highway 17 and is under the jurisdiction of the British Columbia Ministry of Transportation and Infrastructure (MoTI). On the Causeway, Deltaport Way is two lanes westbound and one lane eastbound.

ROBERTS BANK WAY SOUTH

Roberts Bank Way South is a westerly extension of Deltaport Way which services the existing Deltaport Terminal at its western end. The official transition from Deltaport Way to Roberts Bank Way South is at the connection with Roberts Bank Way North.

ROBERTS BANK WAY SOUTH / ROBERTS BANK WAY NORTH INTERSECTION

Approximately 1 km east of the Deltaport Terminal entry gates is a junction between Roberts Bank Way South and Roberts Bank Way North. Roberts Bank Way North is the access/egress road for the Westshore Terminals coal terminal and also serves the truck exit movement from Deltaport Terminal's Gate 2 described below. Roberts Bank Way North begins at the DTRRIP overpass.

DELTAPORT TERMINAL GATE 1

Gate 1 is located at the west end of Roberts Bank Way South and is used for dropping off containers for export. Trucks drop their container in the export stack and proceed through the terminal to exit at Gate 2. Some trucks pick up an empty container on their way through the terminal after dropping off an export container. Note that Gate 1 would also

be accessed when a truck is arriving solely to pick up an empty container. There are a total of six entry pedestals to serve inbound trucks.

DELTAPORT TERMINAL GATE 2

Gate 2 is located at the west end of Roberts Bank Way North. This serves trucks exiting the terminals after dropping off containers for export and/or picking up empties on their way through. There are a total of seven exit slots to serve outbound trucks.

DELTAPORT TERMINAL GATE 3

Gate 3 is located just east and south of Gate 1 and is used for picking up import containers. There are a total of eight entry pedestals to serve inbound trucks and four exit slots to serve outbound trucks. Note that some truck trips involve dropping off a container for export at Gate 1, travelling through the terminal to exit at Gate 2 and re-entering Gate 3 to pick up an import within the same trip.

TUG BASIN

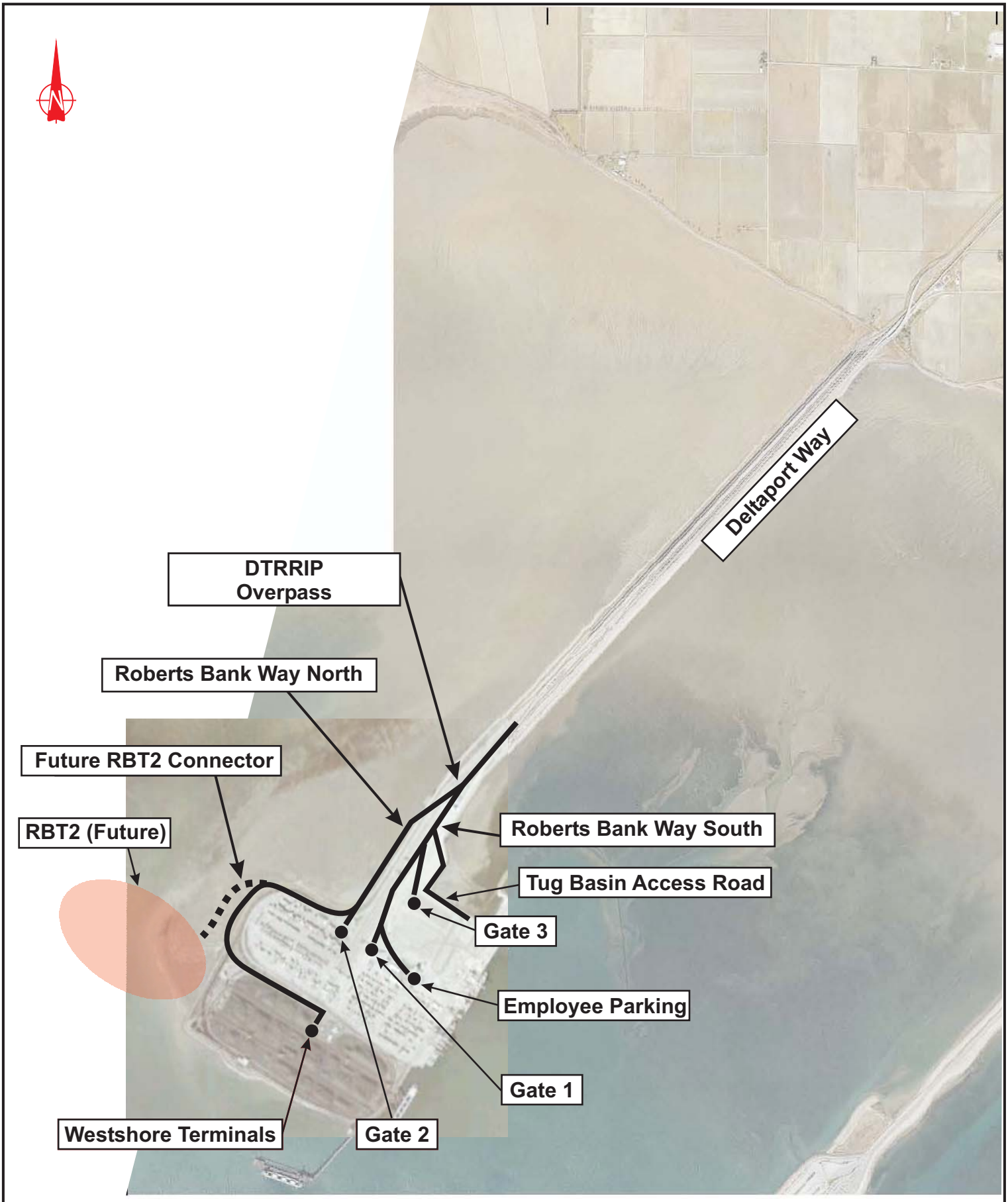
A two lane access road is provided to/from an existing tug boat basin adjacent to Deltaport Berth 3. The access point is immediately east of Deltaport Terminal Gate 3.

DELTAPORT TERMINAL EMPLOYEE PARKING

Deltaport Terminal employees consist of office staff and shift workers and use parking areas located adjacent to Gate 1 (approximately 400 spaces) and Gate 2 (approximately 50 spaces).

ROBERTS BANK WAY NORTH (WESTSHORE TERMINALS ACCESS)

Westshore Terminals moves its coal by way of rail, however, there is a two-lane two-way roadway to provide access from Roberts Bank Way North to the terminal. The west end of the access road provides a parking area for employees and service vehicles.



PORT METRO vancouver

Figure 1 Project Area Road Network

3.0 EXISTING TRANSPORTATION CONDITIONS

Prior to loading potential Port-related expansion traffic onto the project area road network, baseline transportation conditions were quantified. A turning movement count was completed in May 2011 at the junction of Roberts Bank Way South and Roberts Bank Way North. A tabular summary of the data is provided in ***Table 2***.

Table 2: Existing Traffic Volume Data

Link / Intersection	Type of Count	Traffic Volume		
		Daily (2-Way)	AM Peak	PM Peak
Roberts Bank Way South / Roberts Bank Way North	Turning Movement	n/a	550 vph (78% trucks)	495 vph (88% trucks)

As shown in the above table, the total traffic generated by the existing Roberts Bank terminals is 550 vehicles in the peak hour (430 trucks, 120 passenger vehicles). Note that 80% of this traffic was observed to originate east of the Roberts Bank Way South / Roberts Bank Way North intersection, with the remainder being intra-terminal trips.

3.1 Deltaport Terminal Passenger and Service Vehicle Movements

Passenger and service vehicle movements include private and light commercial vehicles generally with two axles and a gross vehicle weight of under 5 tonnes. Passenger vehicles serve shift worker, office / administrative staff, and visitor trips to and from the terminal (including service vehicle trips). They have less impact on the road network due to their smaller size and weight; however, they are subject to intense peaking due to overlaps between arriving and departing shift workers at designated shift change times.

Based on statistics collected in July 2011, there are typically three shifts per day throughout the week. ***Table 3*** summarises the average number of workers on site throughout the month. Note that the terminal is a 24-7 operation with staff on site irrespective of truck gate hours.

Table 3: Deltaport Terminal Worker Presence (July 2011 Averages)

	Shift			24 Hour Total
	1:00 to 8:00	8:00 to 16:30	16:30 to 1:00	
Average of Shift Workers	138	206	166	510
Average of Office / Admin Workers	10	40	10	60
Average of Maintenance Workers	15	55	40	110
Total Presence	163	301	216	680

Service vehicle movements include both scheduled and non-recurrent trips such as maintenance operations, inspections, construction, and equipment / facility servicing. It is assumed that most service vehicles would have two axles and would not exceed 5 tonnes GVW. As shown in ***Table 4***, it is estimated that up to 110 maintenance workers would be on the site throughout a typical day.

To calculate passenger and service vehicle movements for Roberts Bank terminals, it has been assumed that vehicle occupancy averages 1.2 persons per vehicle. In addition, it has been conservatively assumed that all arriving traffic for a shift arrives in the hour before the shift time and all departing traffic for a shift departs in the hour following the shift time.

Table 4: Deltaport Terminal Passenger and Service Vehicle Traffic Estimation

Container Volume (M TEU)	1.56 (Baseline)
Daily Shift Workers	510
Daily Office / Admin Workers	60
Daily Maintenance Workers	110
Total Persons	680
Total Inbound Vehicle Movements per Day	567
Total Outbound Vehicle Movements per Day	567
Total Vehicle Movements per Day	1,134

3.2 Westshore Terminals Passenger and Service Vehicle Movements

The Westshore Terminals coal terminal occupies 50 ha at the western end of the Roberts Bank Causeway. The terminal has the capacity to handle 29 million tonnes per annum. It is planned to potentially increase capacity to 35 million tonnes per annum. Note that all coal is moved by rail trains of 6,000 to 8,000 ft. in length and road traffic generation is limited to employees and service vehicles. ***Table 5*** summarises the current employee count and shift times based on correspondence with the terminal operator and an assumed 2010 processing capacity of 25 million tonnes.

Table 5: Westshore Terminals Site Presence Assumptions

Shift	Weekday Day	Weekday Afternoon	Weekday Night	24 Hour Total
Time	8:00 to 16:00	16:00 to 24:00	24:00 to 8:00	
Employees	86	30	15	131
Other (Service, Visitors)	12	4	2	18
Total	98	34	17	149

Table 6 summarises the existing road traffic assumed to be generated by Westshore Terminals assuming 1.2 persons per vehicle on average. It has been conservatively assumed that future increases will be proportional to growth in terminal capacity.

Table 6: Westshore Terminals Passenger and Service Vehicle Traffic Estimation

Coal Volume (M t/a)	25 (Baseline)
Daily Employees	131
Daily Service Visitors	18
Total Persons	149
Total Inbound Vehicle Movements per Day	125
Total Outbound Vehicle Movements per Day	125
Total Vehicle Movements per Day	250

4.0 TERMINAL VEHICLE TRIP GENERATION ASSUMPTIONS

The existing and future Roberts Bank terminal area road traffic generation is driven by a number of factors and variables. This section documents the process used to estimate current peak and daily traffic volumes and how potential future changes to these factors will affect the RBT2 traffic generation. As a basic assumption, traffic generated by RBT2 is conservatively estimated to occur at a rate similar to the existing Deltaport Terminal.

Trip generation factors have been estimated for each major mode of travel to and from Roberts Bank. For road traffic, the following trip types are of primary interest:

- Container truck trips; and
- Passenger and service vehicle trips

4.1 Container Truck Movements

Container trucks have a larger impact relative to passenger vehicles due to their size (in the order of 20 m in length), weight, noise and pollution impacts, as well as the additional time and space required to accelerate, stop, and turn. Container truck related trips include tractors pulling trailers with loaded or empty containers, as well as trailers with a bare chassis.

Based on a review of container traffic statistics, as well as container truck volumes on the terminal approaches, the following factors have been identified as primary variables that affect the volume and peaking characteristics of container truck traffic.

TEUS PER CONTAINER

In 2011, there was an average of 1.72 TEUs per individual container moved. This variable is indicative of the relative length of containers moved. The most common intermodal container sizes include 20 foot, 40 foot, and 45 foot containers, as well as 53 foot domestic shipping containers. The 2011 stats suggest there are more 40 foot containers being handled than 20 foot containers (a value of 1.00 would indicate all containers are 20 feet in length while a value of 2.00 would indicate all containers are 40 feet in length). Recent trends observed at Deltaport Terminal and other terminals around the Lower Mainland show an increase to 1.75 TEUs per container can be assumed for the near future.

RATIO OF DOCK MOVES TO GATE MOVES

The number of containers moved across terminal gates may be higher than the number moved between the ship and the dock. This can be explained by the location and configuration of access/egress locations for intra-terminal container movements, the use of dock space for storing empty containers, as well as, container inspection, repair and return procedures.

In 2011, the ratio of containers moved across the gates to the containers moved across the dock was estimated at 1.19.

RAIL MODAL SPLIT

The rail modal split is the percentage of containers moved by rail as opposed to road-based transportation. The percentage split is measured at the dock before containers move through terminal gates. In 2011, the split was 65% rail, 35% road.

TRUCK MOVEMENTS PER CONTAINER

To move a given number of containers across terminal gates requires a certain number of inbound and outbound truck movements. This is a function of the location and configuration of access locations for intra-terminal container movements as well as the percentage of truck movements that both enter and exit the terminal gates with a container (these are referred to as double-ended movements and are in contrast to single ended movements which have an empty chassis either entering or exiting the terminal gates). At Deltaport Terminal, the gate configuration is somewhat anomalous relative to other terminals in that a trip which involves a drop off of an export container and a pick-up of an import container requires a truck to enter at Gate 1, exit at Gate 2 and then re-enter Gate 3 via the Roberts Bank Way North / Roberts Bank Way South junction before exiting with the import container. Therefore, when measured at the gates, up to four truck movements (two inbound and two outbound) may be required to move two containers. Over the course of 2011, an average of 1.63 truck movements were required to move each container across the gates. When the intra-terminal trips are excluded (approximately 20% of the totals based on counts collected by Delcan in 2011) the resultant number of truck movements per container on the external road network is in the order of 1.30. This factor of 1.30 is expected to hold for RBT2 as the new terminal layout will be setup to allow trucks to service import and export areas without having to exit and re-enter the terminal.

EMPTY CONTAINERS

The percentage of empty containers can affect terminal traffic generation if the empties are stored on the terminal. This can create an additional truck trip from the surrounding region to pick up an empty container, move it to an off-dock container stuffing or transload facility, and then return it again for shipping.

TEMPORAL PEAKING FACTORS

Monthly, weekly, daily and hourly peaking factors are an important consideration in the future traffic assessment. Based on a full year of monthly container movements, in 2010 the peak month (October) was higher than the average month (May) by a factor of 1.2. Within a month, the weekly volume can be obtained by dividing by 4.33. Within the week, a peak day has been assumed to carry up to 23% of that week's traffic (compared to 20% for an average five day week). As of June 2013, the following gate hours were scheduled at Deltaport Terminal:

Table 7: Deltaport Terminal Gate Hours

Day of Week	Dayshift Gates		Night Gates
Monday	7:00 - 12:00	12:30 – 16:00	Based on volume
Tuesday	7:00 – 12:00	12:30 – 16:00	Based on volume
Wednesday	7:00 – 12:00	12:30 – 16:00	Based on volume
Thursday	7:00 – 12:00	12:30 – 16:00	Based on volume
Friday	7:00 – 12:00	12:30 – 16:00	Based on volume
Saturday	Closed	Closed	Closed
Sunday	Closed	Closed	Closed

Night gates have been available at Deltaport Terminal for many years and until recently were available only based on demand. In order to better distribute container traffic, extended basic gate hours were announced at Deltaport Terminal and other area deep sea container terminals in May 2014. Gates are now regularly available between 8:00 and 16:00 and from 17:00 to 24:00 regardless of demand.

Based on statistics collected in October 2010, approximately two thirds of daily truck traffic utilised the day gates between 7:00 AM and 4:00 PM with remainder utilising the night gates. The peak hour was found to constitute between 9% and 12% of the daily totals. The morning peak hour for container trucks was observed to be between 8:00 AM and 9:00 AM while the afternoon peak was observed to be between 1:00 PM and 2:00 PM (likely due to backlog associated with the half hour noon lunch break at the gate).

When compared with arrival and departure profiles collected in 2008, the percentage of dayshift gate traffic has decreased from approximately 82% to 66%. This is indicative of better utilisation of available gate hours and reduced container truck traffic impacts during the more congested daytime periods.

The resultant calculation of container truck traffic for each of the baseline (1.56 M TEU), Deltaport Terminal only (2.4 M TEU), and Deltaport Terminal plus RBT2 (4.8 M TEU) scenario horizons on an average day is shown in ***Table 8.***

Table 8: Container Truck Traffic Generation (Average Day)

Variable / Volume (M TEU)	1.56 (Baseline)	2.4	4.8	Factor	Units
Deltaport Terminal + RBT2 Total	1,560,000	2,400,000	4,800,000		TEU/Year
Containers Across Dock	906,977	1,371,429	2,742,857	1.75	Containers / Year (1.72 in 2011)
Containers Across Gate	1,079,302	1,632,000	3,264,000	1.19	Gate Moves / Dock Moves
Intermodal Rail Split	592,845	896,434	1,792,869	65%	Containers / Year
Containers Moved Across the Gate By Truck	486,457	735,566	1,471,131		Gate Containers by Truck
Annual Two Way Truck Movements Across the Gates (In + Out)	792,925	1,198,972	2,397,944	1.63	Trucks / Year
Net External Two Way Truck Movements East of Causeway (In + Out)	634,340	959,178	1,918,355	80%	Trucks / Year
External Containers Ratio				1.30	
Mean Monthly Containers By Truck	40,538	61,297	122,594	12	Containers / Month
Peak Monthly Containers By Truck	40,538	61,297	122,594	1.0	
Peak Month Average Weekly Containers By Truck	9,362	14,156	28,313	4.33	
Peak Daily Containers By Truck	1,872	2,831	5,663	20%	
Empties	487	736	1,472	26%	Containers / Day
Loaded	1,386	2,095	4,190	74%	Containers / Day
Single Ended Moves	1,180	1,784	3,567	63%	Containers / Day
Double Ended Moves	693	1,048	2,095	37%	Containers / Day
Peak Daily Inbound Truck Volume Across the Gates	1,526	2,307	4,615		Trucks / Day
Peak Daily Outbound Truck Volume Across the Gates	1,526	2,307	4,615		Trucks / Day
Total Daily Truck Volume Across the Gates	3,052	4,615	9,230		Trucks / Day
Peak External Daily Inbound Trucks from East of Causeway	1,221	1,846	3,692		Trucks / Day
Peak External Daily Outbound Trucks from East of Causeway	1,221	1,846	3,692		Trucks / Day
Total External Daily Trucks from East of Causeway	2,442	3,692	7,384		Trucks / Day
Peak Hourly Inbound Truck Movements Across the Gates	137	208	415	9%	
Peak Hourly Outbound Truck Movements Across the Gates	137	208	415	9%	
Total Peak Hour Truck Movements Across the Gates	275	415	831		Trucks / Hour
Peak External Hourly Inbound Truck Movements from East of Causeway	110	166	332		Trucks / Hour
Peak External Hourly Outbound Truck Movements from East of Causeway	110	166	332		Trucks / Hour
Total External Peak Hour Truck Movements from East of Causeway	220	332	665		Trucks / Hour

For a peak day, ***Table 9*** provides the adjusted calculations. The monthly, daily and hourly peaking factors were adjusted to represent a worst case scenario. This scenario would reflect only a small number of days in a typical year and has been used for the purposes of sizing terminal infrastructure.

Table 9: Container Truck Traffic Generation (Peak Day)

Variable / Volume (M TEU)	1.56 (Baseline)	2.4	4.8	Factor	Units
Deltaport Terminal + RBT2 Total	1,560,000	2,400,000	4,800,000		TEU/Year
Containers Across Dock	906,977	1,371,429	2,742,857	1.75	Containers / Year (1.72 in 2011)
Containers Across Gate	1,079,302	1,632,000	3,264,000	1.19	Gate Moves / Dock Moves
Intermodal Rail Split	592,845	896,434	1,792,869	65%	Containers / Year
Containers Moved Across the Gate By Truck	486,457	735,566	1,471,131		Gate Containers by Truck
Annual Two Way Truck Movements Across the Gates (In + Out)	792,925	1,198,972	2,397,944	1.63	Trucks / Year
Net External Two Way Truck Movements East of Causeway (In + Out)	634,340	959,178	1,918,355	80%	Trucks / Year
External Containers Ratio				1.30	
Mean Monthly Containers By Truck	40,538	61,297	122,594	12	Containers / Month
Peak Monthly Containers By Truck	48,646	73,557	147,113	1.2	
Peak Month Average Weekly Containers By Truck	11,235	16,988	33,975	4.33	
Peak Daily Containers By Truck	2,584	3,907	7,814	23%	
Empties	672	1,016	2,032	26%	Containers / Day
Loaded	1,912	2,891	5,783	74%	Containers / Day
Single Ended Moves	1,628	2,462	4,923	63%	Containers / Day
Double Ended Moves	956	1,446	2,891	37%	Containers / Day
Peak Daily Inbound Truck Volume Across the Gates	2,106	3,184	6,369		Trucks / Day
Peak Daily Outbound Truck Volume Across the Gates	2,106	3,184	6,369		Trucks / Day
Total Daily Truck Volume Across the Gates	4,212	6,369	12,737		Trucks / Day
Peak External Daily Inbound Trucks from East of Causeway	1,685	2,547	5,095		Trucks / Day
Peak External Daily Outbound Trucks from East of Causeway	1,685	2,547	5,095		Trucks / Day
Total External Daily Trucks from East of Causeway	3,369	5,095	10,190		Trucks / Day
Peak Hourly Inbound Truck Movements Across the Gates	253	382	764	12%	
Peak Hourly Outbound Truck Movements Across the Gates	253	382	764	12%	
Total Peak Hour Truck Movements Across the Gates	505	764	1,528		Trucks / Hour
Peak External Hourly Inbound Truck Movements from East of Causeway	202	306	611		Trucks / Hour
Peak External Hourly Outbound Truck Movements from East of Causeway	202	306	611		Trucks / Hour
Total External Peak Hour Truck Movements from East of Causeway	404	611	1,223		Trucks / Hour

4.2 Passenger and Service Vehicle Movements

Using the first principles estimates of activity developed in Section 3.0 and proportional scaling to account for expected terminal throughput increases, traffic generation forecasts for passenger and service vehicle movements were undertaken. ***Tables 10*** and ***11*** summarise the forecast Deltaport Terminal and RBT2 employee traffic volume estimates.

Table 10: Deltaport Terminal and RBT2 Passenger and Service Vehicle Traffic Estimation

Container Volume (M TEU)	1.56 (Baseline)	2.4	4.8
Daily Shift Workers	510	785	1,570
Daily Office / Admin Workers	60	92	184
Daily Maintenance Workers	110	169	338
Total Persons	680	1,046	2,092
Total Inbound Vehicle Movements per Day (@ 1.2 persons per vehicle)	567	871	1,741
Total Outbound Vehicle Movements per Day (@ 1.2 persons per vehicle)	567	871	1,741
Total Vehicle Movements per Day (@ 1.2 persons per vehicle)	1,133	1,742	3,483

Table 11: Westshore Terminals Passenger and Service Vehicle Traffic Estimation

Coal Volume (M t/a)	25 (Baseline)	29	35
Daily Employees	131	152	183
Daily Service Visitors	18	21	25
Total Persons	149	173	208
Total Inbound Vehicle Movements per Day (@ 1.2 persons per vehicle)	125	145	175
Total Outbound Vehicle Movements per Day (@ 1.2 persons per vehicle)	125	145	175
Total Vehicle Movements per Day (@ 1.2 persons per vehicle)	250	290	350

DAILY TRAFFIC PROFILES

A profile representing hour by hour container truck traffic and passenger / service vehicle traffic has been prepared to assess cumulative traffic flows. ***Table 12*** shows the two-way (inbound and outbound) total vehicle movements generated on an hourly basis for each of the growth scenarios on an average day. ***Table 13*** shows the two-way (inbound and outbound) total vehicle movements generated on an hourly basis for the peak design day. Typically this highest container truck activity day would occur following a long weekend.

As shown, the morning peak hour for container trucks occurs between 8:00 and 9:00 while the passenger / service vehicle traffic peaks between 7:00 and 8:00. In the afternoon, container trucks peak between 13:00 and 14:00 while passenger / service vehicle traffic peaks between 16:00 and 17:00. ***Figure 2*** shows this profile graphically for trucks and passenger / service vehicles.

Figure 2: Average Daily Traffic Profiles

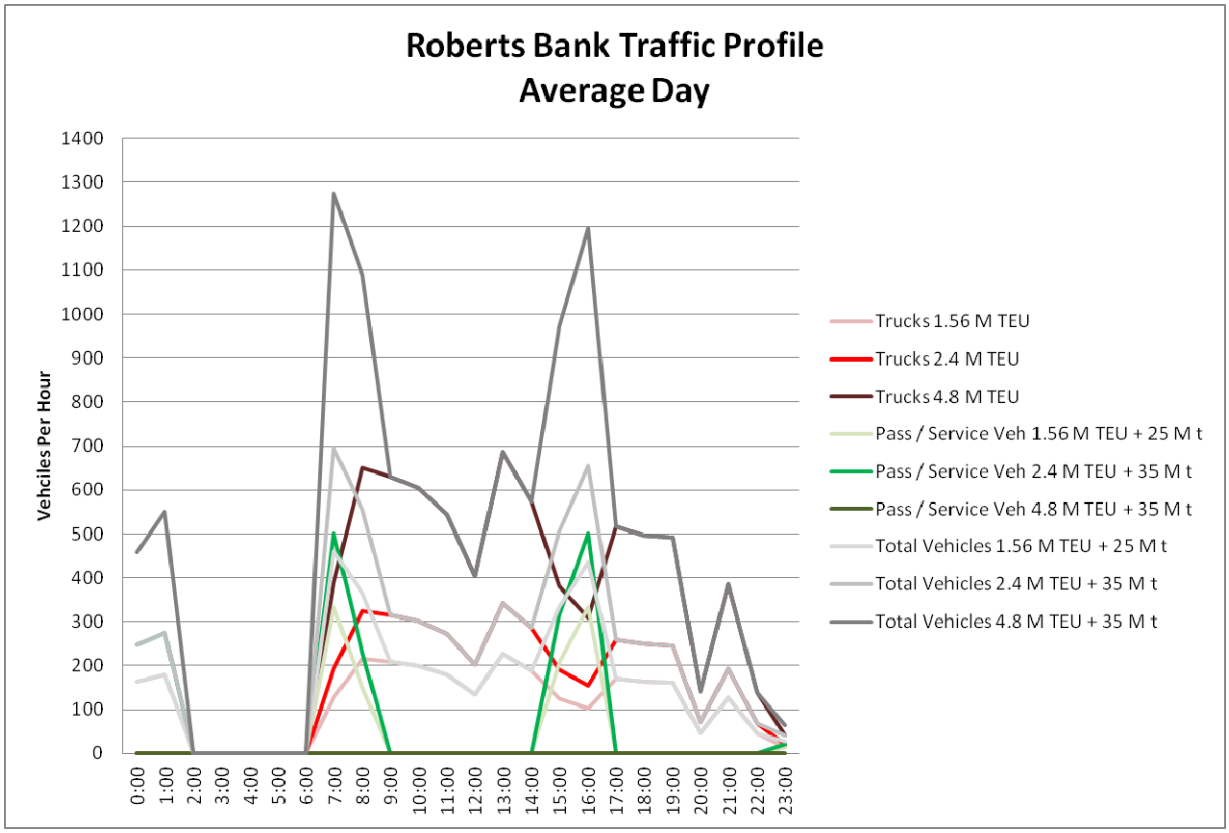


Table 12: Daily Traffic Profiles (Average Day)

	Container Trucks			Deltaport Terminal and RBT2 Passenger / Service Vehicles			Westshore Terminals Passenger / Service Vehicles		Total Roberts Bank Terminals Traffic		
Hour	1.56 M TEU	2.4 M TEU	4.8 M TEU	1.56 M TEU	2.4 M TEU	4.8 M TEU	25 M t	35 M t	1.56 M TEU + 25 M t	2.4 M TEU + 35 M t	4.8 M TEU + 35 M t
0:00	0	0	0	136	209	418	28	39	164	248	458
1:00	0	0	0	179	275	551	0	0	179	275	551
2:00	0	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	0	0	0	0
5:00	0	0	0	0	0	0	0	0	0	0	0
6:00	0	0	0	0	0	0	0	0	0	0	0
7:00	128	194	388	251	386	772	82	115	461	695	1275
8:00	215	325	649	136	209	418	15	21	366	555	1089
9:00	209	316	631	0	0	0	0	0	209	316	631
10:00	200	302	604	0	0	0	0	0	200	302	604
11:00	180	271	543	0	0	0	0	0	180	271	543
12:00	133	202	403	0	0	0	0	0	133	202	403
13:00	227	343	686	0	0	0	0	0	227	343	686
14:00	190	287	573	0	0	0	0	0	190	287	573
15:00	126	191	382	179	275	551	28	39	333	506	972
16:00	102	155	309	251	386	772	82	115	435	656	1197
17:00	171	259	517	0	0	0	0	0	171	259	517
18:00	165	249	498	0	0	0	0	0	165	249	498
19:00	162	245	491	0	0	0	0	0	162	245	491
20:00	47	70	141	0	0	0	0	0	47	70	141
21:00	128	193	386	0	0	0	0	0	128	193	386
22:00	46	70	139	0	0	0	0	0	46	70	139
23:00	14	21	42	0	0	0	15	21	29	42	63
Total	**2442**	**3692**	**7384**	**1132**	**1742**	**3483**	**250**	**350**	**3824**	**5784**	**11217**

Table 13: Peak Traffic Profiles (Peak Design Day)

	Container Trucks			Deltaport Terminal and RBT2 Passenger / Service Vehicles			Westshore Terminals Passenger / Service Vehicles		Total Roberts Bank Terminals Traffic		
Hour	1.56 M TEU	2.4 M TEU	4.8 M TEU	1.56 M TEU	2.4 M TEU	4.8 M TEU	25 M t	35 M t	1.56 M TEU + 25 M t	2.4 M TEU + 35 M t	4.8 M TEU + 35 M t
0:00	0	0	0	136	209	418	28	39	164	248	458
1:00	0	0	0	179	275	551	0	0	179	275	551
2:00	0	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	0	0	0	0
5:00	0	0	0	0	0	0	0	0	0	0	0
6:00	0	0	0	0	0	0	0	0	0	0	0
7:00	257	389	778	251	386	772	82	115	590	890	1665
8:00	403	610	1220	136	209	418	15	21	554	840	1660
9:00	390	589	1179	0	0	0	0	0	390	589	1179
10:00	398	602	1205	0	0	0	0	0	398	602	1205
11:00	318	480	961	0	0	0	0	0	318	480	961
12:00	254	385	770	0	0	0	0	0	254	385	770
13:00	340	515	1030	0	0	0	0	0	340	515	1030
14:00	281	426	851	0	0	0	0	0	281	426	851
15:00	126	191	382	179	275	551	28	39	333	506	972
16:00	140	212	423	251	386	772	82	115	473	713	1310
17:00	118	178	356	0	0	0	0	0	118	178	356
18:00	141	213	426	0	0	0	0	0	141	213	426
19:00	93	140	280	0	0	0	0	0	93	140	280
20:00	46	69	138	0	0	0	0	0	46	69	138
21:00	41	61	123	0	0	0	0	0	41	61	123
22:00	19	29	58	0	0	0	0	0	19	29	58
23:00	4	6	12	0	0	0	15	21	19	27	33
Total	**3369**	**5095**	**10190**	**1132**	**1742**	**3483**	**250**	**350**	**4751**	**7187**	**14023**

4.0 FUTURE POST RBT2 TRANSPORTATION CONDITIONS

In this section combined existing and forecast new Roberts Bank terminals traffic has been used to assess peak design hour traffic flows. Following completion of the RBT2 Project, it is assumed the Roberts Bank area will comprise the following elements:

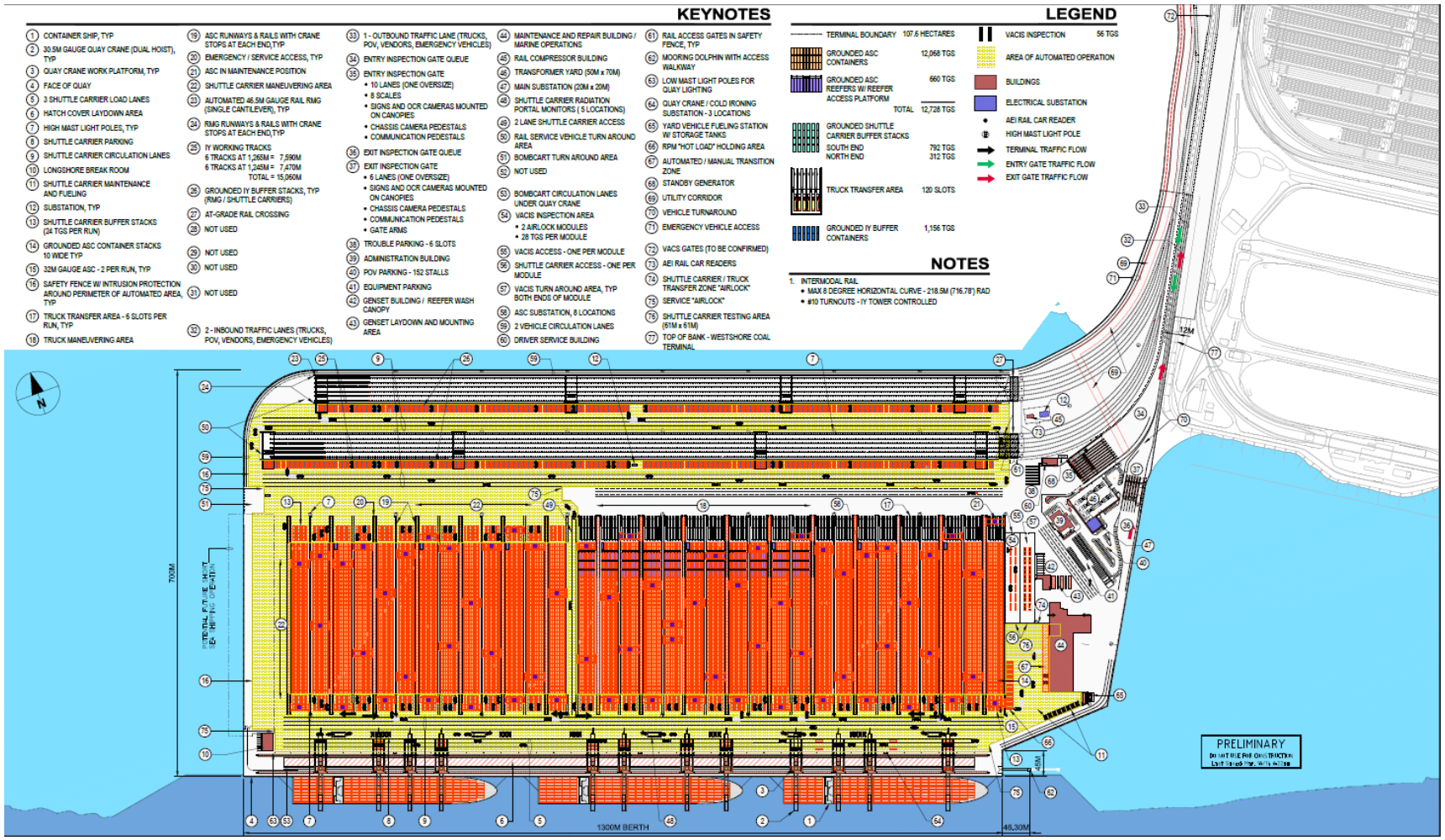
- An upgraded Deltaport Terminal processing 2.4 M TEUs per annum.
- An upgraded Westshore Terminals coal facility capable of processing 35 Million tonnes per annum.
- A new RBT2 processing 2.4 M TEUs per annum with three ship berths;
- Vehicle Access and Control System (VACS) located upstream of the Roberts Bank terminals along the Roberts Bank Causeway;
- A vehicular interchange at the junction of Roberts Bank Way North and Roberts Bank Way South;
- A new vehicular interchange at the junction of Roberts Bank Way North and the existing Deltaport Terminal Gate 2; and
- A new vehicular interchange and railway overpass between a realigned Westshore Terminals Access Road, Roberts Bank Way North, and the new RBT2 access road.

Figure 3 shows the preliminary proposed RBT2 site layout. Key features of the site include:

- Three ship berths;
- Twelve intermodal yard tracks;
- Two vehicle entry lanes and one exit lane;
- Ten lanes at the entry inspection gate, and six lanes at the exit gate; and
- Employee parking area.

It has been conservatively assumed that RBT2 will have similar traffic generation characteristics as Deltaport Terminal.

Figure 3: RBT2 Proposed Layout

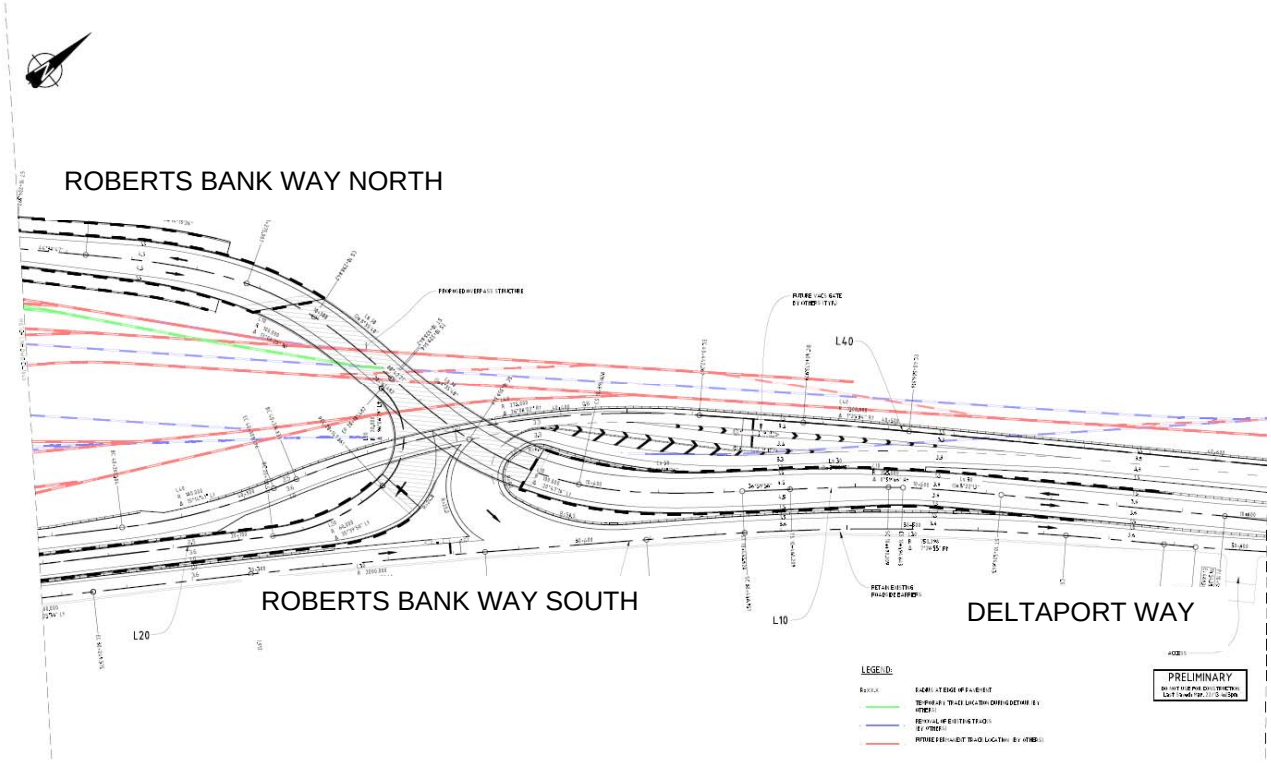


Figures 4 and ***5*** show the current interchange at Roberts Bank Way North / Roberts Bank Way South and the proposed interchange concept at Roberts Bank Way North / RBT2.

The Roberts Bank Way North / Roberts Bank Way South interchange has been developed to accommodate road and rail volumes associated with both the DTRRIP program and the eventual RBT2 expansion.

The interchange includes a two-lane overpass of the Deltaport Intermodal Yard tracks as well as the new slip lane providing free flowing entry movement to Gates 1 and 2 as well as the employee parking areas. A right-turn ramp connects eastbound Roberts Bank Way North to westbound Roberts Bank Way South. This ramp facilitates the current intra-terminal gate movements. Note that the reverse movement is not provided, which allows for the elimination of a traffic signal and safer, more efficient movement. Nestled within the northeast quadrant of the interchange are two VACS (Vehicle Access and Control) gates to allow for secure access to the Port and to reject trucks without a valid appointment at the terminal. A rejection lane has also been provided to allow for a return movement from westbound to eastbound Deltaport Way. East of the interchange the eastbound lanes merge into one. Approximately 400 m east of the single lane taper is a low volume railway service access. As full movements are required, a modified protected "T" configuration has been provided to channel movements and minimise delays and conflict. The design speed for the interchange and approach roads is 50 km/h.

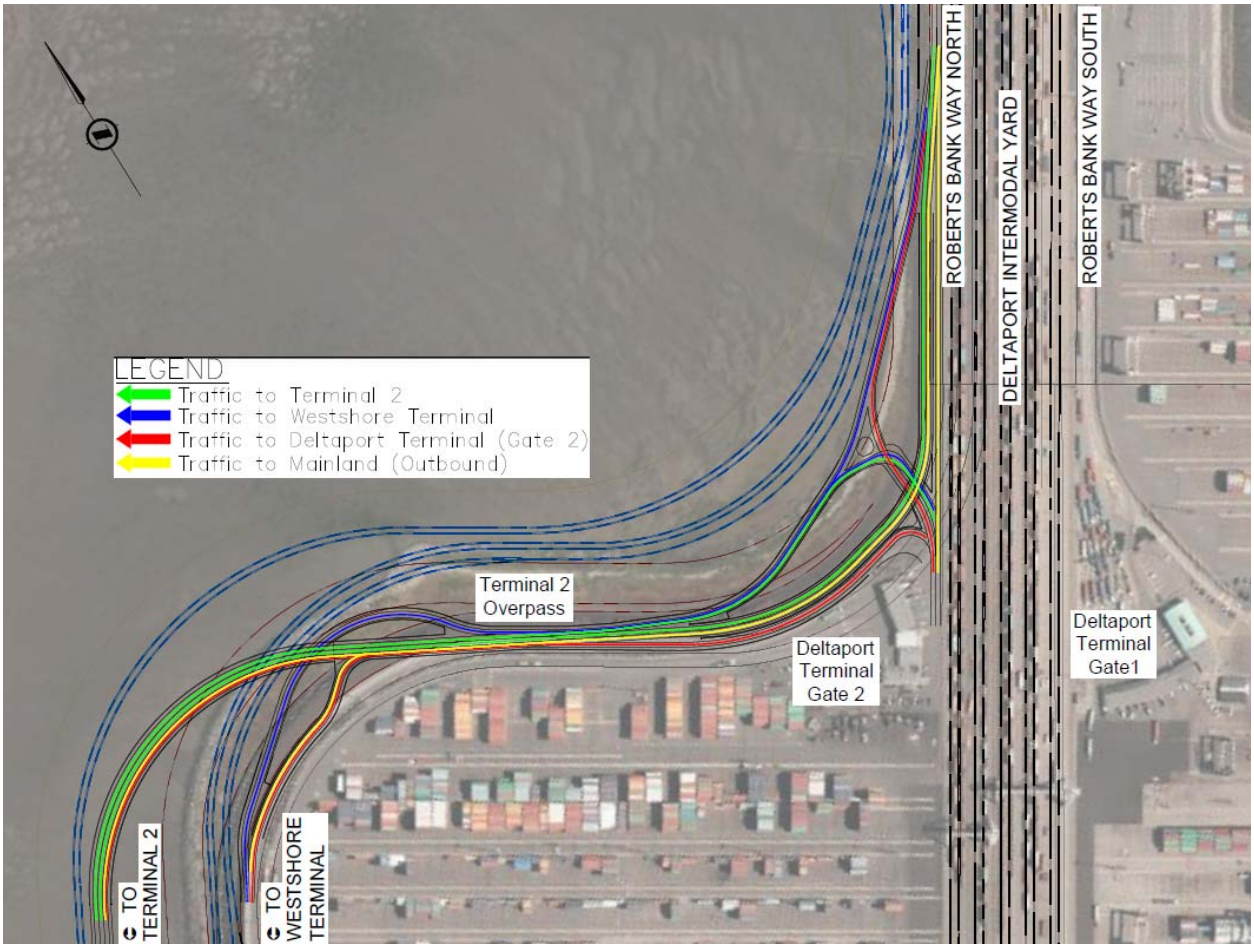
Figure 4: Roberts Bank Way North / Roberts Bank Way South Interchange (DTRRIP Overpass)



The Roberts Bank Way North / RBT2 interchange (RBT2 Overpass) has been developed to provide an efficient connection between RBT2 and the Deltaport Terminal road network while also accommodating Westshore Terminals vehicle access and coal track relocation. The concept provides a connection with the existing Gate 2 exit road. Although there is currently limited inbound traffic to the Gate 2 area, there is the possibility that Gates 1, 2 and 3 will be consolidated in the same general location in the future. The interchange concept also provides a connection between Gate 2 and RBT2.

At the Westshore Terminals Access Road, the new RBT2 three lane roadway extension requires the relocation of coal tracks to accommodate the road base and rail overpass. This provides an opportunity to slip the inbound Westshore Terminals Access Road movement under the RBT2 overpass adjacent to the coal tracks.

Figure 5: Roberts Bank Way North / RBT2 Interchange (RBT2 Overpass)



The proposed infrastructure was evaluated using a variety of micro-simulation (PARAMICS) and capacity analysis (Synchro) tools. It was found that the concepts described could accommodate forecast traffic flows at excellent levels of service with low delays.

5.0 SUMMARY OF FINDINGS

Based on the traffic assessment results, the following are the key findings related to project transportation elements:

1) The Deltaport Terminal has an existing assumed throughput of 1.56 Million TEUs. This throughput is conservatively anticipated to increase to 2.4 Million TEUs by 2020. The addition of Roberts Bank Terminal 2 will add an additional 2.4 M TEUs of capacity by 2025 for a combined Roberts Bank terminals (Deltaport Terminal + RBT2) container capacity of 4.8 Million TEUs.

2) Transportation statistics collected in 2011 indicated a peak hour traffic volume of 550 vph generated by Deltaport Terminal and Westshore Terminals. Approximately 78% of this peak traffic was container truck traffic and 80% was observed to originate east of the Roberts Bank Way South / Roberts Bank Way North intersection. In addition to container truck traffic, there are passenger vehicle and service vehicle movements generated by both terminals. These passenger and service vehicles total just under 1,400 movements per day.

3) Forecast traffic generation for the terminal truck and passenger / service vehicle traffic was derived by scaling the baseline trip generation assumptions to forecast throughput estimates. On an average day, it is anticipated that the Roberts Bank terminals will generate 3,692 truck movements and 2,092 passenger vehicle movements per day when throughput reaches 2.4 M TEUs and 35 Mt/a of coal. When Deltaport Terminal and RBT2 combined reach full capacity of 4.8 M TEUs, the terminals will generate 7,384 truck movements and 3,833 passenger / service vehicle movements per day.

4) Using the forecast traffic volumes and current functional plans for the Roberts Bank Way North / Roberts Bank Way South interchange and the new Roberts Bank Way North / RBT2 interchange, it was found these infrastructure elements would operate at an excellent level of service with low delay.

4-D.3 2010 PROJECTED ROAD TRAFFIC

From: Collings Johnston Inc., Container Capacity Improvement Program – Road Traffic Distribution Report, Sept. 27, 2012 (Posted on the Port Metro Vancouver Website at: http://www.portmetrovancouver.com/dtrrip/resources)

Data on Container Movements

In 2010, the first full year of operation for the expanded, three-berth, container terminal, Deltaport's throughput was approximately 1.5 million TEUs. Throughput for 2011 and year-to-date figures indicate a 7.5% increase in port-wide container volumes. **Exhibit 1** shows a breakdown of laden and empty container movements through Deltaport. The data was collected by PMV who routinely collects data on cargo, train, and truck movements through all PMV terminals.

Truck Traffic Projections

Traffic projections associated with present and future Roberts Bank facilities relate primarily to the movement of containers by truck, employee car traffic, and visitor traffic. Traffic planners use AM and PM commuter peak hours for assessing the operating conditions on roads and bridges. The peak hour represents the hour of the day which carries the highest level of hourly traffic.

The **commuter peak hours**, in the South Delta area, have been observed to be between 7 AM and 8 AM and 4 PM and 5 PM and represent between 8% and 12% of daily traffic.

The **port-related truck peak hours** have been observed to occur between 8 AM and 9 AM and can represent up to 12% of the daily truck total. This happens to be in the adjacent hour to the observed commuter peak hour when background volumes on the network are slightly lower.

The **employee peak hours** occur at shift change times and involve inbound shift vehicles and outbound shift vehicles overlapping. It is assumed that 70% of employee shift trips occur within the employee peak hours and 15% in the AM port-related truck peak hour.

Peak Hours

Port-related Truck Traffic:

AM Peak Hour: 8 AM to 9 AM
PM Peak Hour: 4 PM to 5 PM

Port Employee Traffic:

AM Peak Hour: 7 AM to 8 AM
PM Peak Hour: 4 PM to 5 PM

Commuter Traffic:

AM Peak Hour: 7 AM to 8 AM
PM Peak Hour: 4 PM to 5 PM

Table 1 shows the factors used in determining traffic projections.

Table 1 Factors Used in Roberts Bank Traffic Projections

		DP @1.5 (2010)	DP @ 2.4	DP + Future Port Improvements @ 4.8
Deltaport throughput		1.5 million TEU / year	2.4 million TEU / year	4.8 million TEU / year
TEU per container		1.72	1.75	1.75
Modal split**	Rail	65%	65%	65%
	Truck	60%	60%	60%
Causeway moves per container***		1.32	1.32	1.32
Car occupancy		1.2	1.2	1.2
Marine terminal working days		360	360	360
Peak Port-related Truck Traffic				
% of yearly traffic in peak month		10%	10%	10%
% of yearly traffic in average month		8.33%	8.33%	8.33%
% of monthly traffic in peak week		23.08%	23.08%	23.08%
% of weekly traffic in peak day		23%	23%	23%
% of weekly traffic in average day		20%	20%	20%
% of daily traffic in peak hour		12%	12%	12%
% of containers moved by double-ended moves		37%	37%	37%
% of containers moved by single-ended moves		63%	63%	63%
% of total trips that are involved in inter-terminal moves		20%	20%	20%
% of empty containers		24%	24%	24%
% of laden containers		76%	76%	76%
Employees at Terminal				
Deltaport	Peak	380	592	592
	Average daily total	685	1068	1068
Westshore	Peak	86	122*	181*
	Average daily total	131	186*	276*
Future port improvements	Peak			592
	Average daily total			1068
Daily visitors		40	62	124
% of Trips during Peak Hour				
Employee		70%	70%	70%
Visitor		25%	25%	25%

Notes on Table 1

* Assumes pro-rated future growth.

** The modal split is based upon the "across the dock" TEUs. The total adds up to more than 100% due to the nature of container shipping where a significant number of containers (both loaded and empty) require more than a single one-way truck trip to be transported between the marine terminal and other destinations in the Lower Mainland, including transloading facilities.

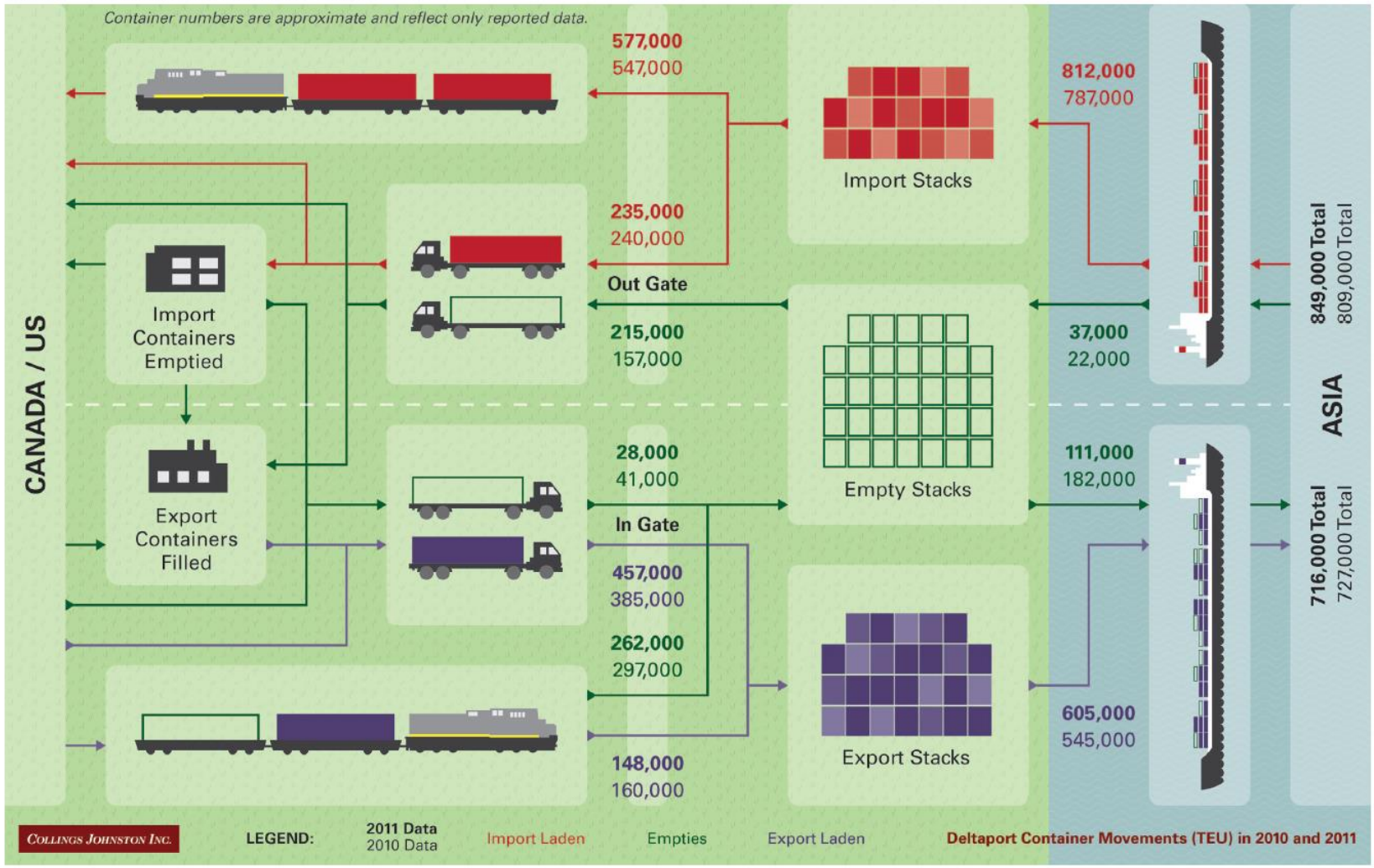
*** The causeway moves per container reflects the number of truck moves required to move one empty or loaded container either to or from the marine terminal. This figure accounts for the fact that currently 37% of the trips to or from the marine terminal are made without a container loaded on the chassis.

Truck trips can be calculated from the number of containers moved by truck. In 2010, 823,000 TEUs were moved by truck which equates to 478,973 containers, as shown in **Table 2**.

The number of containers moved by truck on an average day in 2010 was 1,844. To calculate the actual number of truck trips to and from Roberts Bank, three factors must be taken into account: 63% of containers are moved by single-ended trips, and 37% of containers are moved by double-ended trips.

The following **Exhibit 1** is a diagram showing the modal splits of containers arriving and departing the terminal.

Exhibit 1 Deltaport Container Movements (TEU) In 2010 and 2011



Truck traffic projections for future scenarios in **Table 2** were made using the factors from **Table 1**.

Table 2 Roberts Bank Projected Road and Rail Traffic

		DP @1.5 (2010)	DP @ 2.4	DP + Future Port Improvements @ 4.8
Roberts Bank throughput (million TEU)		1.5	2.4	4.8
Total annual containers moved by truck and rail[1]		1,062,698	1,632,000	3,318,857
Annual containers moved by rail[1]		583,725	896,434	1,792,869
Average daily arriving container trains		2 to 3	4 to 5	7 to 9
Annual containers moved by truck[1]		478,973	735,566	1,471,131
Annual external truck trips[3]	Arrivals PLUS departures	624,581	959,178	1,918,355
Annual vehicle trips[5]	Arrivals PLUS departures	513,600	789,600	1,521,600
Containers Moved by Truck (Average)				
Monthly[2]		39,914	61,297	122,594
Weekly[2]		9,218	14,156	28,313
Daily[2]		1,844	2,831	5,663
External Truck Trips (Average Day)				
Total[3]	Arrivals PLUS departures	2,404	3,692	7,384
Peak hour, avg. day[11]	Arrivals PLUS departures	288	443	886
Peak hour, peak day[4,11]	Arrivals PLUS departures	398	611	1,223
Vehicle Trips (Average Day)				
Deltaport employee[6]	Arrivals PLUS departures	1,142	1,780	1,780
Westshore employee[7]	Arrivals PLUS departures	218	310	460
Future port improvements employee	Arrivals PLUS departures			1,780
Daily visitor[8]	Arrivals PLUS departures	67	103	206
Total[9]	Arrivals PLUS departures	1,427	2,193	4,227
Peak hour[10,11]	Arrivals PLUS departures	560	859	1,644

Notes on Roberts Bank Projected Road and Rail Traffic (Reference Table 2)

Truck Trips

1. The base data for container movements by truck and by rail, as collected by PMV, are shown in **Exhibit 1** and **Table 1**.
2. Monthly, weekly, and daily peaking factors are shown in **Table 1**. Container ships are highly scheduled and monthly peaks resulting from schedule deviations are generally minor.
3. Truck trips are calculated from container volumes using the following formula. [containers moved*37% (double-ended trips)*1 (trip per container)] + [containers moved*63% (single-ended trips)*2 (trips per container)]
4. The peak daily factor = average daily containers / peak daily containers = 72%

Vehicle Trips

5. Annual vehicle trips are calculated by multiplying daily averages by 360 marine working days. Vehicle trips are passenger cars including Deltaport, Westshore, and future port improvement employees and visitors and are reflective of shift changes which do not necessarily overlap with port-related truck peak hours. Vehicle occupancy is assumed to be 1.2 persons per vehicle.
6. Average Deltaport employees @ 1.53 million TEUs: 300 on-site 8:00-16:30, 220 on-site 16:30-24:00, 165 on-site 24:00-8:00 = 685 employees arriving, 685 employees departing per day, other scenarios factored up proportionally to TEUs.
7. Westshore employees @ 24 million tonnes: 86 on-site 8:00-16:00, 30 on-site 16:00-24:00, 15 on-site 24:00-8:00 = 131 employees arriving, 131 employees departing per day, other scenarios factored up proportionally.
8. Other visitors to Deltaport / Westshore assumed at 40 per day arrivals, 40 per day departures, 25% in the employee / visitor peak hour, other scenarios factored up proportionally.
9. Therefore, annual one way vehicle trips = 685 + 131 + 40 = 856 trips / 1.2 persons per vehicle x 360 day = 257,000 trips.
10. On a peak day, up to 380 persons could be on site at Deltaport at one time with three ships in berth. 70% of the employee trips occur within the same employee/visitor peak hour along with 25% of the daily visitor trips. Therefore ((0.7*(380 + 86) + 0.25*40)/1.2)*2 = 560 arrivals PLUS departures. Shift totals scaled based on TEU and tonnage estimates.

Peak Hour Overlap

11. The peak hour for port-related truck trips is between 8 AM and 9 AM, while the peak hour for port employee / visitor trips is in the hour preceding (consistent with the general commuter peak hour in South Delta). Only 15% of each shift's peak traffic is assumed to overlap with the port-related truck peak hour.

4-D.4 PROJECTED RAIL TRAFFIC

The following assumptions and estimates were used to develop traffic volumes for Roberts Bank developed by MainLine Management, Inc. (MLM). These assumptions were developed from previous simulations and comments provided to MLM by stakeholders. Traffic generation was performed by MLM using internal tools that calculate rail footage from projected volumes and ratios. The simulations were performed in 2011.

Container Traffic Generation Assumptions (Deltaport Terminal/RBT2)

Deltaport Terminal Annual TEUs:		2.4 million TEUs
RBT2 Annual TEUs:		2.4 million TEUs
Rail-truck split:	65% rail	35% truck
Import-export split:	53% import	47% export
Rail car feet per TEU:		18.5 ft.
Peaking factor:		20%
Daily generated import feet:		51,000 ft.

Rail Operating Parameters Assumptions

Train length:	8,000 - 12,000 ft.
Departing Import Trains:	
Deltaport Terminal post DTRRIP Peak:	5 trains daily
RBT2 Peak:	5 trains daily
Arriving Export Trains:	
Deltaport Terminal post DTRRIP Peak:	5 trains daily
RBT2 Peak:	5 trains daily

Maximum number of locomotives per train used in assessment: 5

Westshore Terminals Operation

Estimated Annual Tonnage:	35 million metric tonnes
Estimated coal trains:	13 train movements per day (inbound and outbound)

Maximum number of locomotives per train used in assessment: 4

Rail Car Capacity: 106 metric tonnes/car

4-D.5 REFERENCES

4-D.5.1 SHIP TRAFFIC

- WorleyParsons Canada and Seaport Consultants Canada Inc., Projections of Vessel Calls and Movements at the Roberts Bank Marine Terminals, Document Number 09409-01-GE-REP-90001-500, Rev. B, 28 November 2011