

Container Traffic Forecast Study – Port of Vancouver, 2016



Prepared for the Vancouver Fraser Port Authority by:

OCEAN SHIPPING CONSULTANTS

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Key Terms and Abbreviations used in the Report

The following key terms and abbreviations are used throughout the report and are listed as a guide.

BC	British Columbia
bn	billion
C\$	Canadian dollar
CAGR	compound annual growth rate
Deepsea	direct intercontinental container shipping
dwt	deadweight tonnes
ECNA	Eastern seaboard of North America/East Coast of North America
FEU	forty foot equivalent units
GDP	gross domestic product
GT	gross tonnes
ha	hectares
IMF	International Monetary Fund
imp/exp	import/export
k	thousand
kg	kilogram
km	kilometre
kn	knots
LOA	length overall (of a ship)
m	metre (length) or million (quantity)
mt	million tonnes
mta	million tonnes per annum
nm	nautical miles
NPX	New Panamax (max 13000 TEU)
OECD	Organisation for Economic Co-operation and Development
Pacific Gateway (PG)	Ports of Vancouver and Prince Rupert
Pacific Northwest (PNW)	Wider geographic region consisting of the ports of Port of Vancouver, Prince Rupert,
	Seattle, Tacoma, Portland
Pacific South (PS)	Ports of Long Beach, Los Angeles and Oakland
Pacific West Coast	Western seaboard of North America/West Coast of North America
p.a.	per annum
QCC	quayside container crane
SPP	super-post-Panamax (crane outreach more than 18 rows)
sq.m	square metres
T	terminal
t	tonnes
TEU	twenty foot equivalent units
Transshipment	transfer of containers between vessels
ULCS	ultra large container ship (10,000TEU+)

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EXECUTIVE SUMMARY

Project Introduction

Vancouver Fraser Port Authority commissioned Ocean Shipping Consultants (OSC) to provide a Container Forecast Study in 2014. This Report follows previous work completed by OSC since 2011.

This new 2016 market Report is a stand-alone document that provides container traffic projections to 2050 and is designed to be used by Vancouver Fraser Port Authority as it continues to evaluate its container expansion projects. It is also understood that the container forecasts will also be used as inputs into the environmental and other approval agencies for the permitting process for expansion and the development of new capacity.

This Executive Summary document provides the following information:

- Part 1 an introduction to OSC and the members of the team who have provided the December 2015 Market Report to Vancouver Fraser Port Authority.
- Part 2 a brief synopsis of the container forecasts to 2050 for Vancouver Fraser Port Authority for market regions served by the port and a supply-demand analysis to 2025.

Part 1 - Introduction to Ocean Shipping Consultants

The Ocean Shipping Consultants Team

OSC is the shipping and port economics division of Royal HaskoningDHV of the Netherlands. OSC was acquired by Royal Haskoning in early 2011 and the management remain in place. Royal Haskoning and DHV recently merged to form a large international engineering and project consultancy firm with a global staff of some 8000 people.

Since 1985 OSC has successfully completed more than 275 individual projects in more than 60 countries for in excess of 200 different clients.

The OSC study team is led by Andrew Penfold, OSC Project Director, with assistance from Dean Davison, Principal Consultant and Johan-Paul Verschuure, Port & Transport Economist. The following represents a synopsis of the OSC team and skills brought to this project:

• Andrew Penfold:

Andrew has over 30 years of direct experience as a shipping economist and provider of cargo forecasts. He jointly founded OSC in 1985 and developed a leading independent firm of market analysts with extensive expertise in shipping, port economics and development projects.

At the global level his clients include PSA Corporation, Hutchison Ports and the Ports of Rotterdam, Antwerp, Genoa and Felixstowe. Considerable expertise has also been developed relating to container shipping operations and leading clients include Lloyd's Register of Shipping, Maersk Line and other major container liner operators.

Andrew has worked with Vancouver Fraser Port Authority since 2001 and has provided a number of forecast and market studies supporting the port's continued growth. He led and oversaw all components of the Container Traffic Forecast Study in 2014 and has successfully completed the same for this 2016 project.

Dean Davison:

Dean offers more than 25 years of port and consulting experience. He joined the Port of Tilbury, UK, in 1990 and worked as a container stevedore and operative on conventional/ro-ro terminals before switching to commercial activities. In 1998 Dean moved to Containerisation International magazine as North American writer before joining Drewry Shipping Consultants at the end of 2000 where he successfully completed a wide-range of port, shipping and intermodal projects on a global basis.

In 2005 Dean helped established Moffatt & Nichol's European presence in London before relocating to New York in 2007 where he spent almost six years working on projects for a wide range of North American ports including New York/New Jersey, Savannah, Virginia, Montreal, Oakland, Los Angeles, Wilmington (NC), Houston and Mobile.

Dean joined OSC in late 2012 to further enhance the company's consulting capabilities and worked on the Port of Vancouver Forecast Update Study in 2013 and again in 2014. He is responsible for writing and editing the Container Traffic Forecast Study in 2016.

Johan-Paul Verschuure:

Johan-Paul has over six years of experience in financial and economic feasibility studies and market studies. In his role as a Port & Transport Economist he combines his technical background as a Port Engineer with Financial Economic expertise.

He has a Masters Degree in Civil Engineering with a focus on port development and a Masters Degree in Financial Economics. With this combination he continues to assist on projects for business cases for various types of terminals including container terminals and bulk facilities. Johan-Paul supported the Port of Vancouver Forecast Update Study in 2013 and 2014 is responsible for generating the updated 2016 forecast model.

Forecasting Approach by Ocean Shipping Consultants

Led by Andrew Penfold, OSC has substantial experience of successfully completing a high number of cargo forecasts on a global basis. This includes previously completing container projections for Port of Vancouver in 2012, 2013 and 2014.

The 2016 forecast approach to this modelling process utilises the following fully updated and robust methodology:

The schematic shown in Figure ES1 provides a visual summary of this robust methodology used to determine the container forecasts for Port of Vancouver, with a synopsis noted as follows:

- 1. The market study model forecasts the future container demand for the following levels of aggregation:
 - Total for all North American container ports, broken down to Pacific Coast and Atlantic Gulf coasts.
 - Pacific West Coast container demand.
 - Pacific Northwest region, defined as including Vancouver and Prince Rupert and the US PNW facilities of Seattle, Tacoma and Portland.
 - Pacific Gateway facilities of Port of Vancouver and Prince Rupert.
 - Port of Vancouver container demand forecasts.
- 2. The scenarios underlying the forecasts, as developed in Section I, are:
 - High, medium and low GDP growth scenarios for North America, China and other major Asia areas, Other Canada and West Canada.
 - High, medium and low GDP growth: Demand growth Multipliers for North America and both China and the other major Asia region of key economies.
 - Application of four specific risk/opportunity factors (covering US side capacity development in Pacific Northwest, intermodal transportation from Port of Vancouver increases, application of intermodal transportation costs/charges and market share of Port of Vancouver based on mainly ship size and draught developments).
- The overall container demand outlook is formulated in Section I.11 for North America and subsequently for the Pacific Northwest region by forecasting a market share for this area on the following basis:
 - North American container demand consists of the container volumes handled on the Pacific West Coast, Atlantic Coast and Gulf Coasts. Trade is split by global regions (i.e. NE Asia, SE Asia, Australasia, South America, Middle East/India, Africa and Europe). The total container demand is generated using the North American outlook for GDP and multipliers.
 - The Pacific West Coast container demand is generated based on market share of total North American market versus share of East Coast for each growth scenario.
 - The market share which ports in the Pacific Northwest region are able to attract from the total Pacific West Coast demand is subsequently determined.
- 4. The outlook for the Pacific Gateway area comprises the container volumes for Port of Vancouver and Prince Rupert. The forecasts for import and export containers are developed separately and the approach for each consists of the following.

- The forecast of underlying import demand is based on 2015F¹ import volumes of both ports (excluding empty containers). This volume of full imports in 2015F is split to their destinations. The volumes for each destination are then combined with corresponding GDP outlook for West Canada, Other Canada and US and the North American multipliers outlook.
- The additional potential of the Pacific Gateway for increased penetration in the US and Canadian hinterland is captured by an additional market growth factor for intermodal transport penetration and intermodal cost outlook (see risk/opportunity factors under point 2 above).
- The combined forecast for the Pacific Gateway of the underlying import demand plus the continued penetration of more distant regions is then split by origin and commodity type.

The outlook for the export volumes for the Pacific Gateway follows a similar approach:

- The forecast for full exports is based on the actual full exports in 2014 and the projections for 2015F which use January to October year-to-date data. The full exports are split in two container flows based on 2015 actual destination shares. These two container exports flows are then projected using China or other major Asia GDP scenarios and the Asian multiplier scenarios.
- The total export container forecast is then split by origin and commodity type, based on the known position for 2014, for both China and other major Asia areas.

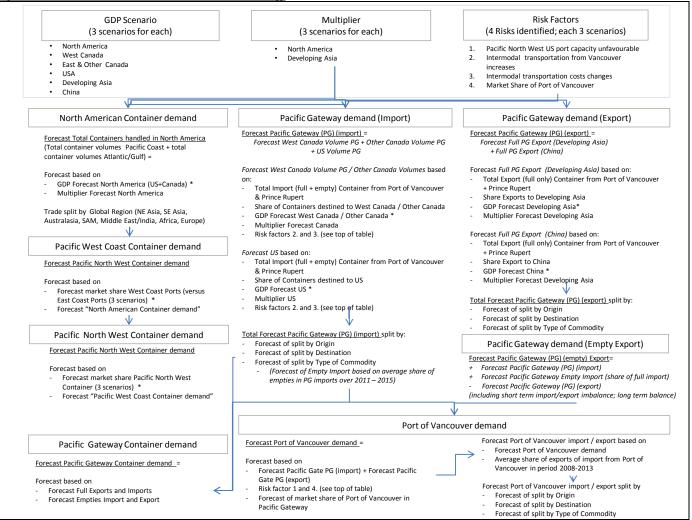
The outlook for empty containers has been carried out as a separate set of steps.

- The empty import containers have been forecast based on their average historic share of full imports and subsequently applying a declining trend.
- The empty export containers are determined as the balance between the full and empty imports minus the full exports. In the near future this balance is set such that the (full and empty) imports make up for roughly 54 per cent as is currently witnessed. However, the forecast assumes that the balance between total imports and exports will move towards a 50-50 per cent split from around 2022 onwards.
- 5. The volumes for Port of Vancouver are determined by the market share which Port of Vancouver is anticipated to capture from the Pacific Gateway volumes. The first (US side capacity development Pacific Northwest) and fourth risk factor (increased ship sizes and draught) are applied to this forecast.

As with the Pacific Gateway forecast, the Port of Vancouver forecasts are split into a set of detailed forecasts to identify the origin, destination and commodity type of the container flows. The import : export ratio is kept the same as that of the total Pacific Gateway to calculate Port of Vancouver imports and exports from the total traffic forecast.

¹ 2015F represents estimated total for 2015, based on year-to-date information available, mostly consisting of January-to-September or October 2014 details.

Figure ES1: Port of Vancouver Forecast Demand Model Methodology



Source: Ocean Shipping Consultants

Part 2 – Port of Vancouver Container Forecasts to 2050

Introduction

The following is a list of key components that make-up the container forecasts for Port of Vancouver:

- Key Recent Trends.
- North American Container Port Demand.
- Macro-Economic trends in North America.
- Economic Drivers Key Port of Vancouver Hinterlands, including Commodity Demand.
- Drivers of Demand to 2025.
- Demand Development 2025-2050.
- Container Port Demand Forecasts to 2025 and 2050.
- Supply-Demand Analysis at Port of Vancouver.

Key Recent Trends

The following represents a summary of the key macro-economic and market factors of relevance:

- The outlook for the Chinese economy is considerably more uncertain than was noted in earlier forecasts. It is apparent that economic expansion is slowing as a result of the shifting of demand in favour of domestic consumption. This is unlikely to significantly impact on the structure of trade between to/from North America in the medium term and may well in actually stimulate export volumes via Vancouver as the Chinese economy is rebalanced.
- The cost differential between Chinese manufacturing and local conditions in North America has also reduced, although the advantages of Chinese output remain significant. This has seen increased interest in *'near-sourcing'* of production to, for example, Mexico and the *'reshoring'* of some production into the US itself. To date, the overall impact has been limited and confined to energy intensive primary industry and it should also be noted that the beneficiaries of this have included cheaper sources of production in, for example, Vietnam and Indonesia. For the medium term, the model of increased reliance on Chinese and other East Asian manufacturing is unlikely to be significant modified as major cost differences will be maintained.
- The collapse in commodity prices (especially oil) that has been noted since mid-2014 is a major trend that will influence the structure of trade in the short to medium term. This has a complex impact on the Canadian position. On the one hand, this is exerting a negative impact on the economies of the major oil and commodity producing Provinces (including BC) but, conversely, this has acted as a major stimulus to demand in the US and in central Canada, where consumption of imported manufactured goods has benefitted. This has also resulted in a decline in the value of the Canadian dollar versus its US equivalent and this has further boosted the competitive position of the Vancouver alternative. While the impact of weak commodity prices has been generally negative for the Canadian economy the results have been broadly positive for Vancouver as a container gateway.
- There has been considerable progress on the Trans-Pacific Partnership Agreement (TPP) with a full text made public in early November 2015. The primary aim of this agreement will be to further reduce trade tariffs between the signatories. This will provide a further stimulus to trade between the members all of the major Pacific Rim economies apart from China and the US and Canada and will provide some further upside on transpacific containerised trade. The speed of progress on this arrangement was faster than had been anticipated in 2014.
- The potential railroad merger of Canadian Pacific and Norfolk Southern could bring additional upsides for the Port of Vancouver, such as improved access to Chicago and better geographic access to the eastern regions of the US, if it is successful. Canadian Pacific will need to

overcome potential surface transportation authority objections and a sense of US nationalism towards foreign ownerships. It is already clear that the cost advantage enjoyed by Canadian railroads over US counterparts will continue and there is not seen to be any price changes implemented by US railroads that will alter this position.

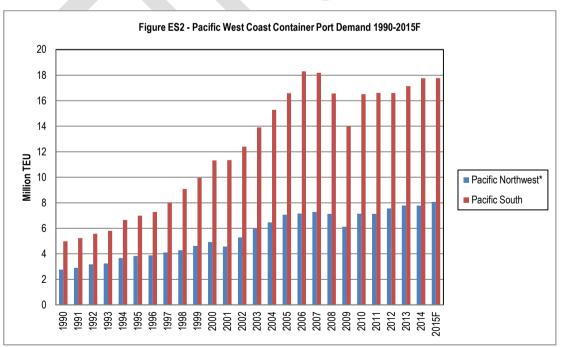
Container shipping merger and acquisition activity will occur during 2016. CMA CGM is
acquiring NOL/APL, with Cosco and China Shipping merging. Some of the major alliances,
notably the G6 Alliance and Ocean Three will see changes. However, for the Port of
Vancouver these developments will have little impact because the need for major shipping
lines/alliances to use the port to meet demand will continue, regardless of the operators.

North American Container Port Demand

Between 1990 and 2007, total North American container port demand increased by 216 per cent to reach just under 50 million TEU, growing at 6.8 per cent per annum. The Global Financial Crisis saw the total fall to 40.2 million TEU for 2009, but a strong recovery saw the total rise to almost 55.8 million TEU for the projected total at the end of 2015.

The distribution of volumes between the Pacific Northwest region where the Port of Vancouver is located and the Pacific South ports in California has remained largely consistent, although the Californian ports were more severely impacted by the downturn and are yet to reach pre-recessionary levels, as Figure ES2 shows.

For 2015F, the Pacific Northwest region ports are projected to handle almost 8.07 million TEU, of which the Port of Vancouver's share accounted for 37.8 per cent, a rise from 31.5 per cent in 2011. Prince Rupert's share is currently 9.6 per cent, as the Pacific Gateway facilities continue to grow faster than the US Pacific Northwest ports of Seattle-Tacoma and Portland. Since 2000, the Port of Vancouver has seen container growth of 6.7 per cent per annum, above the Pacific Northwest regional average of 3.4 per cent.



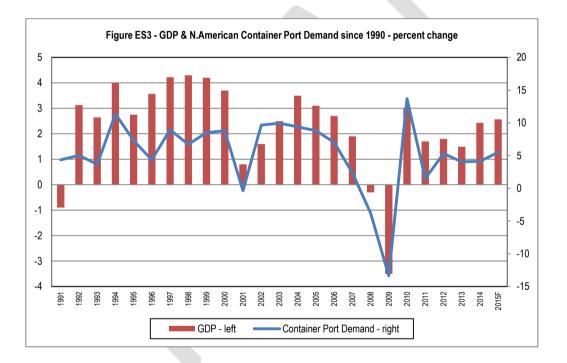
* = Pacific Northwest region classification consists of all major ports, including Port of Vancouver, Prince Rupert, Seattle, Tacoma and Portland.

Macro-Economic Trends in North America

Container trade volumes (and port demand) are directly related to overall volumes of traded goods, especially in the manufactured sector. This is particularly true for cargoes imported into North America. For the Port of Vancouver, the important containerised export sector is driven by the pace of demand for primary goods in the developing Far East markets.

The economic relation between GDP growth and trade growth (port demand) is noted in Figure ES3, which is of central importance, but is not the only driver of growth for containers. Other drivers include:

- Containerisation of general cargoes is more or less at saturation level as North America is a developed market.
- An imbalance of loaded inbound and outbound containers between North America and the Far East means shippers are continually searching for more cargoes on return legs to Asia – hence increasing use of container in sectors not historically regarded as suitable for containerisation, such as forest products, iron and steel scrap and waste papers. This is an important consideration for Port of Vancouver export demand.

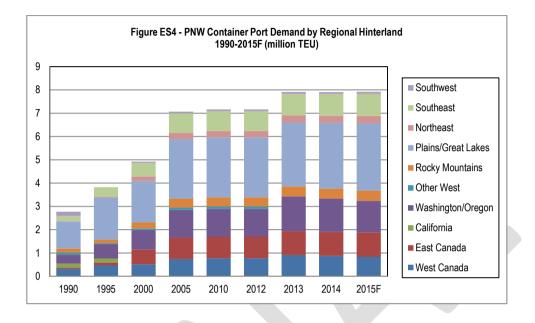


Key Port of Vancouver Hinterlands & Economic Drivers, including Commodity Demand

The development of markets served by the Pacific Northwest region is shown in Figure ES4. The overall growth of volumes handled is shown, along with the economic reach of the region's ports extending. Other key trends include:

- Immediate markets (western Canada and Washington/Oregon) have grown, reflecting stronger economic development of region and declining importance of Californian ports serving these markets.
- Central continental markets have increased in importance and terminals in the Pacific Northwest region are serving more distant areas.

 Competition with Californian ports (and US East Coast ports) for more distant hinterlands remains intense, but economics of using Pacific Northwest ports has improved.



 Considering ports in British Columbia and the US Pacific Northwest area as competitors is justifiable.

In 2014 the Gross Domestic Product (GDP) of Canada was approximately \$1,975 billion according to IMF data and is projected to be C\$1,985 billion by the end of 2015. From 2000 to 2015F, the Canadian economy will have grown by an average annual rate of 4.0 per cent using this data set. The full effects of the Global Financial Crisis have been fully eradicated with year-on-year expansion in the 2010 to 2014 period ranging between 3.3-6.1 per cent. Other key economic points include:

- British Columbia is the fourth largest regional economy in Canada after Ontario, Quebec and Alberta with a GDP of \$186,472 million estimated for 2015F (in 2002 dollars), reflecting a 2.4 per cent increase over 2014, itself a 2.9 per cent rise on the 2014 total. Since 2000 to 2012 the economy of British Columbia has grown at an average annual rate of 2.4 per cent.
- The Canadian prairies consist of Alberta, Saskatchewan and Manitoba and remain the third largest economy in Canada, contributing around 44.2 per cent to the total of Western Canada.
- Ontario and Quebec collectively represent approximately 60 per cent of the Canadian economy with an average annual GDP growth of 0.9 and 1.1 per cent respectively between 2007 and 2015F. These two provinces are the largest economies within Canada in terms of GDP.
- The Great Lakes region is a bi-national Canadian-American area that includes parts of eight US states (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin), plus the province of Ontario. Collectively this means a population of up to 85 million people and remains a key area served by the Pacific Northwest region.
- Within the US market, the Chicago area is a key interchange point for intermodal distribution to/from the US Midwest, along with more localised demand (Chicago is the largest city in Illinois and the third largest city in the US by population). These two factors have long made Chicago a key target of the US West Coast ports, along with Port of Vancouver and Prince

Rupert. In addition, the major ports on the East Coast of North America from Halifax to Savannah, continue to actively target these same areas too and are all regarded as competitors.

The key drivers of import demand for ports on the Pacific West Coast (of North America) are household and other consumer goods which originate in China. As Table ES1 shows, the total traffic for these commodities is currently just over four million tonnes, a rise on the three million tonnes seen in 2013. However, as a share of total imports these commodities have fallen - from 41 per cent in 2003 to just under 36 per cent by 2015F.

Table ES1 Port of Vancouver: Containerised Import Volumes 1995-2015F

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
Million Tonnes																	
Household Goods	0.31	1.19	1.31	1.90	2.02	2.18	2.42	3.11	3.21	3.20	2.57	3.14	2.88	2.89	3.03	3.72	4.06
Construction & Materials	0.09	0.26	0.27	0.38	0.45	0.51	0.59	0.83	0.91	1.05	0.77	1.07	1.16	1.28	1.41	1.46	1.40
Industrial, Auto and Vehicle Parts	0.11	0.25	0.27	0.39	0.40	0.45	0.51	0.67	0.68	0.70	0.61	0.83	0.93	1.07	1.17	1.34	1.46
Machinery	0.06	0.18	0.20	0.28	0.33	0.34	0.39	0.54	0.53	0.55	0.40	0.51	0.60	0.77	0.77	0.80	0.80
Basic Metals	0.03	0.14	0.15	0.19	0.18	0.23	0.22	0.34	0.34	0.34	0.17	0.24	0.30	0.40	0.33	0.40	0.41
Other Goods	0.67	1.31	1.33	1.61	1.59	1.69	1.86	2.46	2.47	2.87	2.59	2.91	2.91	3.22	3.68	3.15	3.18
Total	1.27	3.33	3.53	4.75	4.97	5.40	5.99	7.96	8.15	8.72	7.11	8.70	8.78	9.63	10.39	10.87	11.32
Percentage																	
Household Goods	24.2%	35.8%	37.1%	40.0%	40.7%	40.4%	40.4%	39.1%	39.4%	36.7%	36.2%	36.1%	32.8%	30.0%	29.2%	34.2%	35.9%
Construction & Materials	7.1%	7.7%	7.5%	8.1%	9.0%	9.5%	9.9%	10.5%	11.2%	12.1%	10.9%	12.3%	13.2%	13.3%	13.6%	13.4%	12.4%
Industrial, Auto and Vehicle Parts	8.5%	7.4%	7.7%	8.1%	8.1%	8.3%	8.6%	8.4%	8.4%	8.0%	8.6%	9.5%	10.6%	11.1%	11.3%	12.3%	13.0%
Machinery	4.8%	5.4%	5.8%	6.0%	6.6%	6.2%	6.4%	6.8%	6.5%	6.3%	5.6%	5.9%	6.8%	8.0%	7.4%	7.4%	7.0%
Basic Metals	2.7%	4.2%	4.3%	3.9%	3.6%	4.3%	3.6%	4.3%	4.2%	3.9%	2.3%	2.7%	3.4%	4.2%	3.2%	3.7%	3.6%
Other Goods	52.6%	39.4%	37.5%	33.8%	32.0%	31.3%	31.1%	30.9%	30.4%	32.9%	36.4%	33.5%	33.2%	33.4%	35.4%	29.0%	28.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Port of Vancouv er data

In terms of exports, a summary is shown in Table ES2. Export tonnages exceed import volumes, with common commodities much denser. Lumber and woodpulp remain the most significant types of cargo, with these two commodities accounting for almost 50 per cent. Chinese demand remains the primary driver of this demand, with containerisation being the primary transport mode.

Table ES2

Port of Vancouver: Containerised Export Volumes 1995-2015F

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
Million Tonnes																	
Lumber	0.42	1.22	1.15	1.38	1.35	1.55	1.27	1.50	1.73	2.19	2.51	3.32	4.15	4.26	4.50	3.91	3.93
Woodpulp	0.22	1.00	1.04	1.49	1.65	1.97	1.84	2.37	2.45	2.62	2.56	2.09	2.41	2.33	2.46	2.03	2.12
Specialty Crops	0.38	0.90	0.93	0.82	0.81	0.92	1.11	1.31	1.81	1.68	2.12	1.99	1.74	1.91	2.51	2.67	2.52
Meat, Fish & Poultry	0.15	0.37	0.41	0.47	0.43	0.44	0.47	0.50	0.53	0.62	0.65	0.61	0.64	0.55	0.54	0.52	0.54
Basic Metals	0.17	0.19	0.17	0.27	0.40	0.42	0.42	0.51	0.59	0.65	0.69	0.61	0.59	0.57	0.45	0.41	0.42
Other Goods	1.71	2.97	2.84	2.85	3.00	3.36	3.30	3.49	3.99	3.98	3.64	3.62	3.37	3.77	4.36	4.25	4.28
Total	3.05	6.65	6.54	7.28	7.64	8.66	8.41	9.69	11.10	11.74	12.17	12.23	12.89	13.39	14.82	13.79	13.81
Percentage																	
Lumber	13.9%	18.3%	17.6%	19.0%	17.7%	17.9%	15.1%	15.5%	15.6%	18.6%	20.6%	27.1%	32.2%	31.8%	30.4%	28.4%	28.5%
Woodpulp	7.0%	15.1%	15.9%	20.4%	21.6%	22.7%	21.9%	24.5%	22.0%	22.3%	21.0%	17.1%	18.7%	17.4%	16.6%	14.7%	15.4%
Specialty Crops	12.5%	13.5%	14.2%	11.2%	10.6%	10.6%	13.2%	13.6%	16.3%	14.3%	17.4%	16.2%	13.5%	14.3%	16.9%	19.4%	18.2%
Meat, Fish & Poultry	4.9%	5.6%	6.2%	6.5%	5.7%	5.1%	5.6%	5.2%	4.8%	5.3%	5.4%	5.0%	4.9%	4.1%	3.6%	3.8%	3.9%
Basic Metals	5.5%	2.9%	2.7%	3.7%	5.2%	4.8%	5.0%	5.2%	5.3%	5.5%	5.7%	5.0%	4.6%	4.3%	3.0%	3.0%	3.0%
Other Goods	56.2%	44.6%	43.4%	39.1%	39.2%	38.8%	39.2%	36.0%	36.0%	33.9%	29.9%	29.6%	26.1%	28.2%	29.4%	30.8%	31.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Port of Vancouv er data

The importance of Asian markets continues for Port of Vancouver, for both import and export containerised cargo, most notably the Chinese markets:

- Chinese imports have increased from a share of 13.2 per cent in 1995 to an estimated 60.0 per cent for 2015F, reflecting of 6.79 million tonnes. The second largest source in 2015F is South Korea, with just 10.6 per cent.
- China is also the largest destination for exports, rising from just 5.7 per cent in 1995 to 4.34 million tonnes anticipated in 2015F, generating 5.99 million tonnes. Japan remains the second largest export location with an estimated 2015F share of 17.6 per cent, or 2.43 million tonnes.

Drivers of Demand to 2025

Globalisation has boosted economic growth and intensified the link between GDP and trade, with the availability of low-cost transportation via containerisation a beneficiary of developments.

There is now renewed confidence in the outlook for the world economy, but the position remains fragile. The shorter-term outlook for Canada and the US is for sustained economic development, as shown in Table ES3.

Table ES3

Core Macro-Economic Forecasts to 2025

Real % change

	2014	2015	2016	2017	2018	2019	2020	2021-2025
<u>High Case</u>								
West Canada	4.26%	0.35%	1.38%	2.53%	2.53%	2.53%	2.53%	2.53%
Canada	2.81%	1.20%	1.91%	2.77%	2.68%	2.46%	2.31%	2.30%
USA	2.79%	2.96%	3.27%	3.22%	3.08%	2.53%	2.30%	2.30%
Base Case								
West Canada	3.70%	0.30%	1.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Canada	2.44%	1.04%	1.66%	2.41%	2.33%	2.14%	2.01%	2.00%
USA	2.43%	2.57%	2.84%	2.80%	2.68%	2.20%	2.00%	2.00%
Low Case								
West Canada	2.07%	0.24%	0.96%	1.76%	1.76%	1.76%	1.76%	1.76%
Canada	2.07%	0.88%	1.41%	1.93%	1.86%	1.71%	1.61%	1.60%
USA	2.07%	2.18%	2.41%	2.24%	2.14%	1.76%	1.60%	1.60%

Source: Various, incl. Ocean Shipping Consultants

Three drivers of demand have been considered to 2025 and form the basis of the container import traffic forecasts in this Study:

- The Base Case a consensus view of the position through to 2017, with a continued recovery towards trend growth. From the current perspective this remains the likely outcome.
- **The High Case** this takes into account positive developments in 2014, followed by a further strong increase and then a return to a somewhat higher rate of economic expansion.
- The Low Case anticipates further uncertainties at the macro-economic level, such as seen in 2014 and 2015, with the chance of some renewed stagnation. Beyond 2017 a more restrained pace of expansion as the cost of the downturn is worked through the economy.

Developments at this macro-economic level are critical in determining the position for the regional economies. Significant risks for the world economy remain and play directly through into the region.

For export demand from the Port of Vancouver a strong link remains with Asian economic development. Table ES4 collates short-term IMF forecasts with longer-term ranges used in the export forecasting process.

Table ES4

Core Asian Macro-Economic Forecasts to 2025

Real % change

	2014	2015	2016	2017	2018	2019	2020	2021-2025
High Case								
China	8.40%	7.83%	7.25%	6.90%	7.02%	7.28%	7.28%	7.48%
Other Major Asia	1.55%	1.75%	2.27%	2.16%	2.37%	2.58%	2.47%	3.10-3.60%
Base Case								
China	7.30%	6.81%	6.30%	6.00%	6.10%	6.33%	6.33%	6.50%
Other Major Asia	1.50%	1.70%	2.20%	2.10%	2.30%	2.50%	2.40%	3.00-3.50%
Low Case								
China	5.84%	5.45%	5.04%	4.80%	4.88%	5.06%	5.06%	5.20%
Other Major Asia	1.47%	1.67%	2.16%	2.06%	2.25%	2.45%	2.35%	2.90-3.40%

Source: IMF/Ocean Shipping Consultants

The approach taken is to relate the development of GDP to container port demand in the import/export markets and use this as a basic driver of growth, as follows:

- Step 1 identify relationship between GDP and port ranges.
- Step 2 distribute demand by port ranges, using distribution costs and intermodal services include the competitive position of the ports.
- Step 3 generate continental and regional demand forecasts.
- Step 4 apply general macro trends over the period to 2025.

Demand Development 2025-2050

Longer-term container projections have to adopt a scenario-based approach to overcome uncertainties associated with forecasts so far into the future. These scenarios include:

- Continuing Free Trade globalisation will continue, further GPD expansion and Port of Vancouver's market remains focused on China and key Asian markets. (Continuation of High Case).
- Partially Protectionist World development of commonality of interests between Canada and the US and (most likely) the broader NAFTA grouping. (Continuation of Base Case).
- New Economic & Trade Paradigm policy encouragement to re-orientate economic activity on a localised basis, with more limited economic growth in North America and container trade with Asia stagnating. (Continuation of Low Case).

The development of overall container demand has been forecast to the period to 2050 under these conditions to provide a general estimation of likely container traffic over such a long-term basis.

Container Port Demand Forecasts to 2025 and 2050

Container traffic forecasts are summarised for four deliverables:

- North American demand derived from North American GDP forecasts and North American TEU growth/GDP growth multipliers.
- Pacific Northwest regional demand covering both British Columbia ports and US ports, estimated as a fixed share of North American traffic.
- Pacific Gateway (Vancouver and Prince Rupert) derived from Western and Other Canada GDP and North American multipliers.
- Port of Vancouver demand a fixed percentage of Pacific Gateway demand and key competitive conclusions established in this Report.

Total North American Demand

Table ES5 summarises the anticipated development of North American container port demand to 2025, with further estimations of the level of demand under each longer term scenarios to 2050. The Base Case growth option will see annual growth of 3.1 per cent per annum from 2015 to 2025 as traffic increases from 55.8 million TEU to 75.7 million TEU. By 2050 volumes could rise to 116.3 million TEU.

Table ES5

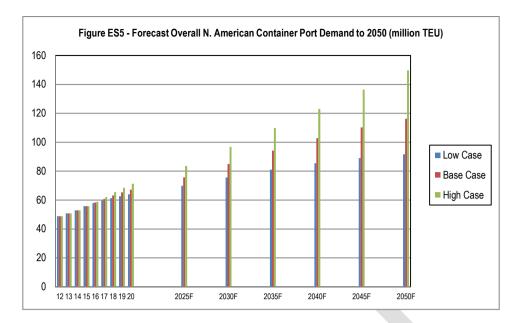
Forecast Overall North American Container Port Demand to 2050

- million TEU

2010A	2011A	2012A	2013A	2014A	2015F	2016F	2017F	2018F	2019F	2020F	2025F	2030F	2035F	2040F	2045F	2050F
45.7	46.3	48.8	50.8	52.9	55.8	58.0	59.6	61.3	62.7	64.0	69.8	75.7	81.0	85.5	89.0	91.7
45.7	46.3	48.8	50.8	52.9	55.8	58.4	60.8	63.2	65.3	67.2	75.7	84.9	94.2	102.8	110.3	116.3
45.7	46.3	48.8	50.8	52.9	55.8	58.7	62.1	65.5	68.5	71.3	83.6	96.8	109.9	123.0	136.4	149.7
	45.7 45.7	45.7 46.3 45.7 46.3	45.7 46.3 48.8 45.7 46.3 48.8	45.7 46.3 48.8 50.8 45.7 46.3 48.8 50.8	45.7 46.3 48.8 50.8 52.9 45.7 46.3 48.8 50.8 52.9	45.7 46.3 48.8 50.8 52.9 55.8 45.7 46.3 48.8 50.8 52.9 55.8	45.7 46.3 48.8 50.8 52.9 55.8 58.0 45.7 46.3 48.8 50.8 52.9 55.8 58.4	45.7 46.3 48.8 50.8 52.9 55.8 58.0 59.6 45.7 46.3 48.8 50.8 52.9 55.8 58.4 60.8	45.7 46.3 48.8 50.8 52.9 55.8 58.0 59.6 61.3 45.7 46.3 48.8 50.8 52.9 55.8 58.4 60.8 63.2	45.7 46.3 48.8 50.8 52.9 55.8 58.0 59.6 61.3 62.7 45.7 46.3 48.8 50.8 52.9 55.8 58.4 60.8 63.2 65.3	45.7 46.3 48.8 50.8 52.9 55.8 58.0 59.6 61.3 62.7 64.0 45.7 46.3 48.8 50.8 52.9 55.8 58.4 60.8 63.2 65.3 67.2	45.7 46.3 48.8 50.8 52.9 55.8 58.0 59.6 61.3 62.7 64.0 69.8 45.7 46.3 48.8 50.8 52.9 55.8 58.4 60.8 63.2 65.3 67.2 75.7	45.7 46.3 48.8 50.8 52.9 55.8 58.0 59.6 61.3 62.7 64.0 69.8 75.7 45.7 46.3 48.8 50.8 52.9 55.8 58.4 60.8 63.2 65.3 67.2 75.7 84.9	45.7 46.3 48.8 50.8 52.9 55.8 58.0 59.6 61.3 62.7 64.0 69.8 75.7 81.0 45.7 46.3 48.8 50.8 52.9 55.8 58.4 60.8 63.2 65.3 67.2 75.7 84.9 94.2	45.7 46.3 48.8 50.8 52.9 55.8 58.0 59.6 61.3 62.7 64.0 69.8 75.7 81.0 85.5 45.7 46.3 48.8 50.8 52.9 55.8 58.4 60.8 63.2 65.3 67.2 75.7 84.9 94.2 102.8	45.7 46.3 48.8 50.8 52.9 55.8 58.4 60.8 63.2 65.3 67.2 75.7 84.9 94.2 102.8 110.3

Source: Ocean Shipping Consultants

The general outlook is further shown in Figure ES5, with the range of demand in 2025 placed at 69.9 million TEU to 83.6 million TEU. A slowdown in the pace of demand growth reflects the maturity of the Transpacific trades, in particular.



Pacific Northwest Region Market

The Pacific Northwest share of total North American container traffic is shown in Table ES6. Under the Base Case scenario total demand via ports in the region will increase from 8.1 million TEU estimated for 2015 to 12.0 million TEU by 2025 and 18.4 million TEU by 2050. Growth will be influenced by:

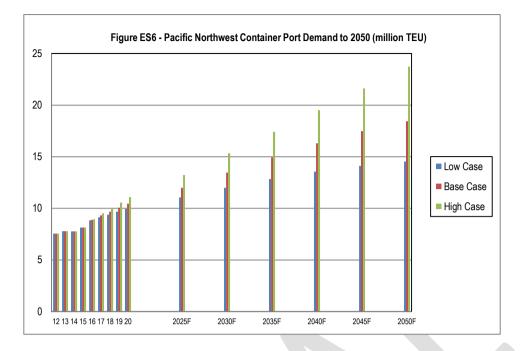
- Asian trades will continue to dominate container demand.
- Availability of export cargoes, particularly from British Columbia.
- All-Water services and the larger Panama Canal will impact ports in California more than the Pacific Northwest region.
- Ability to keep pace with demand growth in terms of terminal capacity and rail intermodal services.

Table ES6 Forecast Pacific Northwest Container Port Demand to 2050 - million TEU

	2010A	2011A	2012A	2013A	2014A	2015F	2016F	2017F	2018F	2019F	2020F	2025F	2030F	2035F	2040F	2045F	2050F
Low Case	7.1	7.1	7.6	7.8	7.8	8.1	8.8	9.1	9.4	9.7	9.9	11.1	12.0	12.8	13.6	14.1	14.5
Base Case	7.1	7.1	7.6	7.8	7.8	8.1	8.9	9.3	9.7	10.1	10.4	12.0	13.5	14.9	16.3	17.5	18.4
High Case	7.1	7.1	7.6	7.8	7.8	8.1	9.0	9.5	10.0	10.6	11.1	13.2	15.3	17.4	19.5	21.6	23.7

Source: Ocean Shipping Consultants

Figure ES6 highlights the considerable range of demand for the Pacific Northwest region of 11.1 million TEU to 13.2 million TEU in 2025 and between 14.5 million TEU and 23.7 million TEU by 2050, depending on the economic growth scenario.



Pacific Gateway Market

The Pacific Gateway market comprises the Port of Vancouver and Prince Rupert. Import demand is driven by the development of Western Canada, Other (Central) Canada and the US GDP, with the latter responsible for the intermodal market and projections to 2050 are shown in Table ES7, with the following key points of note:

- Current container import distribution to different North American regions will remain stable.
- There may be scope for Pacific Gateway ports to further increase transit flows to US markets.
- The current split of containerised imports by commodity grouping will largely remain i.e. emphasis on household goods, components and construction materials.
- Exported goods will continue to focus on commodities grown and manufactured in (primarily) British Columbia. The diversity of container shipping services and many export transloading facilities favour the Port of Vancouver over Prince Rupert.
- Ability to keep pace with demand growth in terms of terminal capacity and rail intermodal services.

Forecast Pacific Gateway - Vancouver + Prince Rupert - Container Port Demand to 2050

	2010A	2011A	2012A	2013A	2014A	2015F	2016F	2017F	2018F	2019F	2020F	2025F	2030F	2035F	2040F	2045F	2050F
Low Case	2.9	2.9	3.3	3.4	3.5	3.8	4.0	4.2	4.3	4.5	4.7	5.4	5.9	6.4	6.7	7.0	7.2
Base Case	2.9	2.9	3.3	3.4	3.5	3.8	4.0	4.2	4.4	4.7	4.9	5.8	6.6	7.3	8.0	8.6	9.1
High Case	2.9	2.9	3.3	3.4	3.5	3.8	4.0	4.3	4.6	4.9	5.2	6.4	7.5	8.6	9.7	10.7	11.8

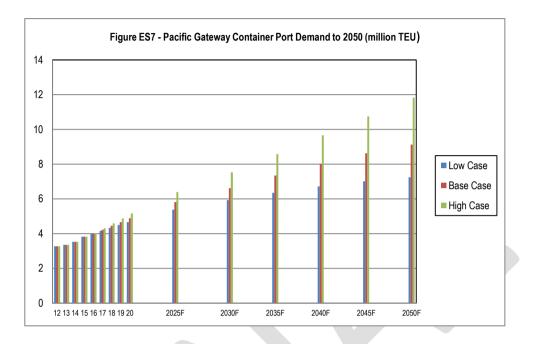
Table ES7

- million TEU

Includes empties

Source: Ocean Shipping Consultants

Under the Base Case growth option, annual growth of 4.8 per cent is projected for the Pacific Gateway region to 2025 from the estimated total for 2015 as container volumes of almost 3.8 million TEU increase to 5.8 million TEU by 2025 and then 9.1 million TEU by 2050. Figure ES7 shows the range of potential growth in more detail over this assessment period.



Forecast Container Handling Volumes at Port of Vancouver

Potential container demand for the Port of Vancouver is determined by the following factors:

- Overall capacity available at the port's terminals to meet potential demand.
- Trends and developments in deepsea containerisation i.e. vessels sizes and market issues.
- Competitive position of the Port of Vancouver's container terminals in terms of marine accessibility.
- Relative costs and capacity of intermodal links to/from the broader hinterland compared to other port options.

The relative competitive position of the Port of Vancouver and its container terminals is summarised in Table ES8. The Port of Vancouver is very competitive in all areas of qualitative assessment, supported by key quantitative factors as infrastructure and transportation costs to key markets.

However, it is crucial that the competitiveness of the port's facilities and levels of service are maintained moving forward.

Table ES8

The Relative Competitive Position of the Port of Vancouver Versus Competing Ports

	Vancouver	Prince Rupert	Sea-Tac	San Pedro
Physical Capability of Terminals	****	****	****	****
Planned Capacity Development	****	*****	**	****
Productivity of Terminals	***	****	***	***
Cost of Transiting Terminals	***	****	****	**
Delivered costs to Midwest	***	****	**	****
Intermodal Capacity	****	*****	***	****
Import/Ex port Balance	****	***	****	****
Local Demand	***	**	****	****
Location as a Regional Hub	****	**	****	****
Existing Customer Base	****	***	****	****
Total	46	37	35	44
- percentage	92.0%	74.0%	70.0%	88.0

Source: Ocean Shipping Consultants

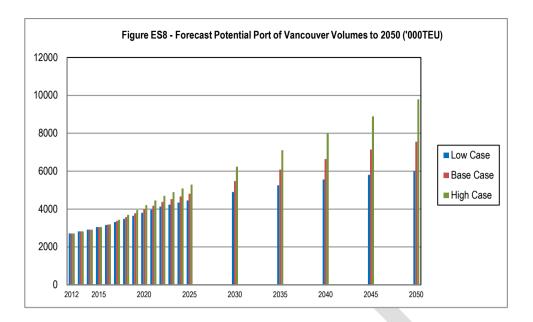
The potential container volumes for the Port of Vancouver to 2050 are shown in Table ES9 and also Figure ES8. The underlying demand is estimated as varying market shares of the Pacific Gateway forecast, including further penetration of the Central and Eastern Canada market and the continued ability to serve key US areas.

Total Base Case traffic is projected to increase from the estimated 2015 figure of just over 3.0 million TEU to over 4.8 million TEU by 2025 and almost 7.6 million TEU by 2050.

The range in 2025 will be between almost 4.5 million TEU and nearly 5.3 million TEU and by 2050 will be almost 6.0 million TEU to almost 9.8 million TEU, depending on economic growth scenario.

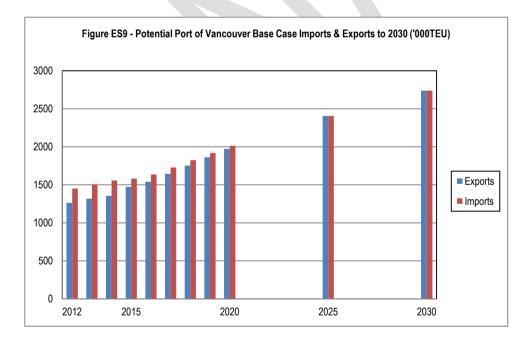
<u>Table ES9</u> Forecast Poter	ntial Total	Vancour	ver Volu	nes to 20	50																
- '000 TEU		Tuncou		1103 10 20																	
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
<u>Total</u>																					
Low Case	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5	3161.1	3317.4	3481.6	3643.7	3807.7	3966.0	4131.0	4236.1	4343.7	4453.7	4904.7	5259.9	5563.8	5809.8	5998.7
Medium Case	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5	3177.1	3371.9	3577.4	3780.5	3986.7	4178.8	4380.2	4520.2	4664.3	4812.6	5479.4	6082.5	6645.3	7139.8	7552.7
High Case	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5	3192.8	3435.4	3693.7	3950.1	4212.1	4450.7	4702.9	4892.3	5089.0	5293.2	6233.7	7108.0	7994.7	8894.8	9793.3

Includes empties Source: Ocean Shipping Consultants



A summary breakdown of imports and exports under the Base Case demand is also shown in Figure ES9.

It is important to note that there is some discontinuity in the forecasts developed to 2025 and the much longer-term projections. The period 2025 to 2050 adopts a scenario-based approach and is to be regarded as a snapshot of potential demand only.



Comparison of Forecasts by CAGR

Table ES10 compares the annual growth rates (CAGR) for the following regions and time periods, with assumptions and conclusions added:

- North America, Pacific Northwest Region and the Port of Vancouver are listed. The Pacific Gateway region (Vancouver and Prince Rupert) is excluded because historic data is unavailable for Prince Rupert as the facility only opened during 2007.
- The Port of Vancouver has matched the North American growth for the period 2000 to 2015 but surpassed the demand generated by the Pacific Northwest region.
- Between 2016 and 2025, and also for the 2025 to 2050 period, the Port of Vancouver will continue to see its total container demand growth surpass projections for North America and the Pacific Northwest region.
- North America, the Pacific Northwest region and the Port of Vancouver are all mature markets, which is reflected in the lower growth in overall terms (if compared to emerging or developing economies).

lorth America	<u>a</u>		Pacific North West Region		Port of Vancouver	Port of Vancouver							
ime Period	Scenario	Average Annual Growth Rate	Time Perio Scenario	Average Annual Growth Rate	Time Perior Scenario	Average Annual Growth Rate							
010-2014	Historic	3.7%	2010-2014 Historic	2.2%	2010-2014 Historic	3.7%							
15		5.5%	2015	4.6%	2015	4.9%							
16-2025	High Scenario Base Scenario	4.1% 3.1%	2016-2025 High Scenario	5.0%	2016-2025 High Scenario	5.7%							
	Low Scenario	2.3%	Base Scenario Low Scenario	3.9% 3.1%	Base Scenario Low Scenario	4.7% 3.8%							
26-2050	High Scenario	2.4%	2026-2050 High Scenario	2.4%	2026-2050 High Scenario	2.5%							
	Base Scenario	1.7%	Base Scenario	1.7%	Base Scenario	1.8%							
	Low Scenario	1.1%	Low Scenario	1.1%	Low Scenario	1.2%							

Source: Ocean Shipping Consultants

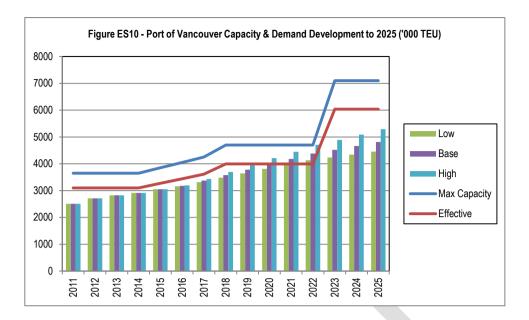
Supply-Demand Analysis at the Port of Vancouver

The scope of this Report is not to conduct a detailed capacity analysis of the Port of Vancouver container terminals. However, it is still very useful to offer a summary of the projected supply-demand position to 2025.

Figure ES10 compares the Port of Vancouver container forecasts with known capacity at the port to 2025.

An effective utilisation rate of around 85 per cent of the maximum or "design" of terminal capacity typically indicates less then optimal use and the first signs of congestion and is shown.

It should be noted that there is already a pressing need for further investment in capacity at container terminals in Vancouver if potential demand is not to be lost.



Key Conclusions for the Port of Vancouver

- The Port of Vancouver remains a highly-competitive option for import and export container volumes moving forward.
- By 2025, the port's terminals are projected to be handling over 4.8 million TEU per annum in total (under the Base Case growth scenario), compared to the 2015 confirmed total of just over 3.0 million TEU.
- Continued growth of Asian imports moving to local markets but also to more distant US and Canadian discretionary areas will continue to grow through the port's competitive intermodal and transportation costs, supported by exports from British Columbia.
- The Port of Vancouver enjoys a highly competitive cost structure for serving eastern Canada and the US Midwest based upon ability to berth the largest vessels, competitive handling charges and relatively low cost intermodal links to the east.
- However, the Port of Vancouver will need intermodal rail capacity to continue to serve these important locations and it must be concluded that there is already a pressing need for container terminal investment if further potential demand is not to be missed.

SECTION I – MACRO-ECONOMIC TRENDS & FORECAST CONTAINER PORT DEMAND TO 2050

1.1 Introduction

Key macro-economic factors and trends form drivers behind container demand in North America and the region's trading partners.

The container terminals at the Port of Vancouver compete with a range of different facilities in serving the following container trade routes:

- Transpacific routes to/from North East Asia i.e. the Hong Kong-Japan range.
- Transpacific routes to/from South East Asia i.e. ASEAN range.
- Other liner services connecting the Pacific West Coast with Europe and the Suez Canal routing from Asia to the East Coast of North America.
- The Pacific Northwest region to/from Europe via the Panama Canal, including the new Panamax dimensions/Panama Canal expansion due to opening in 2016.
- Other relevant trades, including on North-South routes.

Therefore, the future development of container demand will be a function of the following factors:

- The overall scale of demand in the North American markets and specifically demand routed via the Port of Vancouver and competing ports in North America.
- The competitive position of the Port of Vancouver's container terminals versus competing ports in North America.
- The capacity of the terminals to handle containerised cargoes.

As Figure 1.1 clearly identifies, there are a number of different key gateway import-export ports and regions in North America. It can be noted that the following represent the main areas of port activity for container traffic:

- Southern California ports of Long Beach and Los Angeles.
- Port of Vancouver and the Pacific Northwest region (including Prince Rupert, to the north, which collectively comprises the Pacific Gateway area).
- The North East of North America, with ports in Canada and the US.
- The US Southeast region.
- Some limited volumes via the US Gulf.

It should be noted that this Traffic Forecast Study uses the term "Pacific Northwest" to cover the major container ports of Vancouver, Prince Rupert, Seattle and Tacoma. Portland is also included in some analysis of container volumes.



Figure 1.1: Container Gateway Ports in North America, 2015

On this basis, the following represents the key market areas for Vancouver:

- Local Demand i.e. Vancouver and British Columbia.
- Western, Central and Eastern Canadian Demand i.e. Prairies, Ontario and Quebec.
- US Midwest i.e. Chicago and other discretionary markets.
- Continental Demand North American East & Pacific West Coast (including the Pacific South region of Long Beach and Los Angeles.

There is not deemed to be any regional demand competition between Vancouver and Seattle-Tacoma, with the ports' each serving local (separate) markets. Goods cannot easily move across the border between Canada and the US, which means that cargo destined for Western Canada all go through the Port of Vancouver/Prince Rupert and freight destined for the US Pacific Northwest is handled via regional US ports. Any change in the border position would enhance the Port of Vancouver's cargo potential as it is a more cost effective option to these hinterlands than the US Pacific Northwest.

This means that Port of Vancouver competes with Prince Rupert for Canadian cargo, with Prince Rupert, Seattle-Tacoma, US Pacific South ports and North American East Coast ports (notably Savannah, Charleston, Virginia, New York/New Jersey, Halifax and Montreal) for the discretionary US Midwest markets. The role of the ports on the East Coast of Canada and the US being linked to Asia via the Suez Canal is an important consideration for ports serving the Transpacific trades (and those facilities on the US East Coast linked to Asia via the Panama Canal).

While it is in Section VII that the container handling volumes at the Port of Vancouver's terminals are identified to 2050, the approach taken in this Section is to identify broad developments in container port demand in the wider geographic region over the longer term and to assess the core driving forces that will determine container volumes at the regional levels in the coming period.

The analysis is structured as follows:

- The development of North American container port demand is detailed for the period since 1990. This is an important perspective as the relative shares of the major port ranges have developed significantly over the period. In the future, further shifts can be anticipated as a result of the Panama Canal development and other factors.
- The links between GDP, trade expansion and container port volumes over the historical study period are defined.
- The development of the Pacific West Coast markets and the Port of Vancouver's role in this sector is considered. General trends are identified.
- The importance of the Asian trades as the primary driver of Pacific West Coast demand is detailed. The future of trade volumes here will be a critical determinant of future demand over the longer run.

This detailed analysis is used to firmly ground the demand forecasts at the overview level that are summarised in this Section and which form the overall market that the Port of Vancouver will continue to compete within over the longer-term assessment period.

1.2 Overview: North American Container Port Demand Since 1990

Table 1.1 summarises overall demand development in North America since 1990. The developments observed are the following:

- Between 1990 and 2007 the total volumes of containers handled in North American ports increased by some 216 per cent to reach a peak total of just under 50m TEU. This equates to a CAGR of around 6.8 per cent;
- Demand then contracted sharply over 2008 and 2009 on account of the Global Financial Crisis to a low of 40.2m TEU. There followed an immediate rebound in 2010, with good growth thereafter, with 2013 seeing over 49.9 million TEU, surpassing peak pre-recessionary volumes and the estimated total for 2015 of in excess of 55.7 million TEU;
- During the period to 2006 there was a steady increase in the market share of Pacific terminals, with this increasing from 49.6 per cent in 1990 to around 57.4 per cent in 2006. This reflected the strong economic position of post-Panamax vessels plus landbridge connections to the east via Pacific terminals.

However, since 2012 the Pacific region has seen its estimated total share decline from 56.2 per cent to an estimated 53.1 per cent for 2015. This is primarily because the US Atlantic North and South regions have benefitting from cargo switching from the Transpacific routes to the Suez Canal option and the recent workforce disruption on US Pacific West Coast ports. For example, the US Pacific South ports are estimated to see its share decline to just 31.9 per cent in 2015, down on the 34.0 per cent for 2012.

Table 1.1 North America: Container Throughput by Port Range, 1990-2015F

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
MUULA TOU																										
Million TEU	0.77	0.00	0.40		0.07	0.00	0.00		4.00	4.00	4.00	4	- 00		0.47		- 45	7.00	7.40	0.40		7.40	7 50	0		0.07
Pacific Northwest*	2.77	2.90	3.18	3.24	3.67	3.82	3.88	4.10	4.28	4.62	4.92	4.57	5.28	5.97	6.47	7.07	7.15	7.28	7.13	6.13	7.14	7.13	7.56	7.79	7.78	8.07
US Pacific South	4.99	5.23	5.57	5.80	6.66	6.99	7.28	8.03	9.09	9.96	11.32	11.34	12.40	13.90	15.29	16.59	18.29	18.18	16.56	13.99	16.52	16.62	16.60	17.15	17.76	17.77
Mexican Pacific	0.09	0.12	0.15	0.15	0.16	0.17	0.22	0.30	0.32	0.37	0.48	0.51	0.70	0.77	0.93	1.10	1.56	1.83	2.08	1.85	2.05	2.10	3.24	3.35	3.54	3.69
Pacific West Coast	7.84	8.25	8.89	9.20	10.49	10.99	11.37	12.43	13.69	14.95	16.71	16.41	18.38	20.64	22.69	24.75	27.01	27.29	25.77	21.97	25.71	25.86	27.40	28.28	29.08	29.52
Atlantic North	4.59	4.53	4.67	4.68	5.04	5.51	5.64	6.05	6.26	6.78	7.14	7.29	7.99	8.58	9.35	10.09	10.59	10.95	10.79	9.29	10.31	10.83	10.97	11.81	12.49	13.59
Atlantic South	2.33	2.58	2.59	2.89	3.25	3.77	4.01	4.42	4.61	4.90	5.19	5.21	5.49	5.85	6.27	6.95	7.20	7.39	7.25	6.36	7.03	6.95	7.51	7.65	8.23	9.24
US Gulf Coast	1.05	1.13	1.17	1.19	1.22	1.19	1.36	1.49	1.47	1.62	1.69	1.70	1.72	1.84	2.07	2.15	2.24	2.53	2.54	2.54	2.61	2.70	2.91	3.03	3.06	3.34
Atlantic/Gulf	7.96	8.24	8.43	8.76	9.51	10.47	11.01	11.96	12.34	13.30	14.02	14.21	15.19	16.27	17.70	19.19	20.03	20.87	20.59	18.19	19.95	20.48	21.39	22.49	23.78	26.17
Total	15.81	16.49	17.32	17.96	20.00	21.45	22.39	24.39	26.03	28.25	30.74	30.62	33.57	36.92	40.38	43.94	47.04	48.16	46.36	40.16	45.66	46.34	48.79	50.77	52.86	55.70
Per cent share																										
Pacific Northwest*	17.5%	17.6%	18.3%	18.1%	18.3%	17.8%	17.3%	16.8%	16.4%	16.4%	16.0%	14.9%	15.7%	16.2%	16.0%	16.1%	15.2%	15.1%	15.4%	15.3%	15.6%	15.4%	15.5%	15.3%	14.7%	14.5%
US Pacific South	31.5%	31.7%	32.2%	32.3%	33.3%	32.6%	32.5%	32.9%	34.9%	35.3%	36.8%	37.0%	36.9%	37.7%	37.9%	37.8%	38.9%	37.7%	35.7%	34.8%	36.2%	35.9%	34.0%	33.8%	33.6%	31.9%
Mexican Pacific	0.6%	0.7%	0.8%	0.8%	0.8%	0.8%	1.0%	1.2%	1.2%	1.3%	1.6%	1.7%	2.1%	2.1%	2.3%	2.5%	3.3%	3.8%	4.5%	4.6%	4.5%	4.5%	6.6%		6.7%	6.6%
Pacific West Coast	49.6%	50.0%	51.3%	51.2%	52.5%	51.2%	50.8%	51.0%	52.6%	52.9%	54.4%	53.6%	54.8%	55.9%	56.2%	56.3%	57.4%	56.7%	55.6%	54.7%	56.3%	55.8%	56.2%	55.7%	55.0%	53.0%
Atlantic North	29.0%	27.4%	26.9%	26.1%	25.2%	25.7%	25.2%	24.8%	24.0%	24.0%	23.2%	23.8%	23.8%	23.2%	23.2%	23.0%	22.5%	22.7%	23.3%	23.1%	22.6%	23.4%	22.5%	23.3%	23.6%	24.4%
																								20.070		
Atlantic South	14.7%	15.7%	14.9%	16.1%	16.2%	17.6%	17.9%	18.1%	17.7%	17.4%	16.9%	17.0%	16.3%	15.9%	15.5%	15.8%	15.3%	15.3%	15.6%	15.8%	15.4%	15.0%	15.4%	15.1%	15.6%	16.6%
US Gulf Coast	6.6%	6.9%	6.8%	6.6%	6.1%	5.5%	6.1%	6.1%	5.6%	5.7%	5.5%	5.6%	5.1%	5.0%	5.1%	4.9%	4.8%	5.3%	5.5%	6.3%	5.7%	5.8%	6.0%	6.0%	5.8%	6.0%
Atlantic/Gulf	50.4%	50.0%	48.7%	48.8%	47.5%	48.8%	49.2%	49.0%	47.4%	47.1%	45.6%	46.4%	45.2%	44.1%	43.8%	43.7%	42.6%	43.3%	44.4%	45.3%	43.7%	44.2%	43.8%	44.3%	45.0%	47.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Notes:

The 2015F totals are estimated but based on Year-to-Date information released by ports in each region. On average, almost all ports have released throughput data for the period January-September 2015 (and in some cases, October 2015) Port of Vancouver and Prince Rupert totals are confirmed.

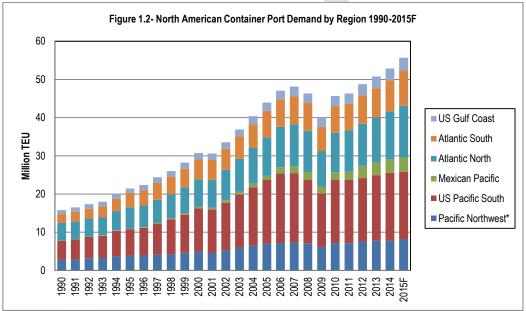
* = Pacific Northwest region classification consists of all major ports, including Port of Vancouver, Prince Rupert, Seattle, Tacoma and Portland.

Source: Ocean Shipping Consultants

The share of the Port of Vancouver and the Pacific Northwest ports remained quite stable in the 1990s at between 16-18 per cent of total continental demand, but market share then declined marginally before stabilising since 2006.

However, there is a current trend of the overall share itself falling, with the 2010 total of 15.6 per cent down to 14.7 per cent in 2014, followed by the estimated figure of 14.6 per cent for 2015. This is entirely due to falling volumes at Seattle-Tacoma and the smaller ports in the region seeing no growth.

Moving forward the improvement of the Panama Canal will also potentially impact the relative cost structures of serving the US Midwest markets. These pressures will be felt most acutely in the Californian ports which will be squeezed between reinvigorated All-Water services and the lower transport costs of the Pacific Northwest (especially Canadian) ports.



These developments are further detailed in Figure 1.1.

* = Pacific Northwest region classification consists of all major ports, including Vancouver, Prince Rupert, Seattle, Tacoma and Portland.

Californian ports severely impacted by Global Financial Crisis and yet to return to prerecessionary levels

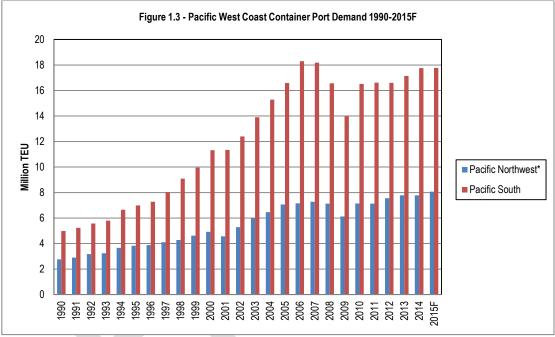
The development of container port demand in the Vancouver and Pacific Northwest areas, plus Californian ports is further summarised in Figure 1.2.

It is apparent that the distribution between the two port ranges has been fairly uniform over the period, with Pacific Northwest (Port of Vancouver, Prince Rupert and US Pacific Northwest) terminals representing between 28 and 36 per cent of total Pacific West Coast container port demand. In fact, since 2007, the Pacific Northwest has accounted for between 27-28 per cent consistently on an annual basis.

However, on a collective basis the Californian ports were more severely impacted by the downturn and even by the end of 2015 are still estimated to have failed to recover to peak volumes, whereas the Pacific Northwest region has seen more of an upturn to recover beyond pre-2007 recessionary levels.

For the current trends, including the estimated position in 2015, the following summary should be noted:

- Oakland saw a nominal increase in 2014 total volumes, but for 2015 year-to-date (October) traffic was down by 5.0 per cent due to weak export volumes. As a port that is predominantly an export facility, any weakness in this activity will more significantly impact overall throughput.
- Los Angeles reported a year-to date (September 2015) total of -2.9 per cent, primarily due to
 exports being down by 14.7 per cent. As a result, the 2014 total of 8.34 million TEU is
 expected to be lower. The port acknowledged that bigger ships calling to its terminals had
 offset the declining traffic to some extent.
- Long Beach is clearly having more success with exports, reporting that its year-to-date (October 2015) volumes for the activity was up by 6.5% and helped generated a total throughput improvement for the assessment period of 5.4 per cent. With a 2014 total of 6.82 million TEU, the port is expecting to surpass 7.0 million TEU for 2015.



* = Pacific Northwest region classification consists of all major ports, including Vancouver, Prince Rupert, Seattle, Tacoma and Portland.

Against this background a more detailed picture of the development of demand on the Pacific West Coast has been derived on a port-specific basis for the period between 1985 and 2015F and this is summarised in more detail in Table 1.2 and Table 1.3.

This represents a more focused review of demand growth and only includes containers handled by the major continental ports between southern California and British Columbia. Container port demand in Hawaii and Alaska is excluded from the analysis – as these will clearly continue to constitute a separate aspect of the market and will only indirectly influence potential demand at the Port of Vancouver, although Mexican Pacific ports are included.

Port of Vancouver share of Pacific Northwest market increasing

Based on 2015F estimates, it is estimated that ports in the Pacific Northwest region will handle almost 8.14 million TEU (including domestic containers). Of this figure, it is anticipated that the Port of Vancouver will be responsible for an estimated 38.0 per cent, on the basis that the port's terminals handling just over 3.09 million TEU. This share represents continued growth since 2012.

The continued development of Prince Rupert since it opened in late 2007 has seen its share rise to an estimated 9.9 per cent for 2015F, reflecting an increase on the 2014 total of 7.9 per cent – reflective of the port's strong January-July throughout increase of 30.7 per cent.

The position with respect to Seattle and Tacoma is more complex. After increasing in the early 2000s, demand at Seattle has been stagnant over much of the subsequent period. Volumes handled reached a level of 2.1m TEU in 2005 and have since then mirrored the overall development of the market, with a contraction followed by a recovery. Market share fell back sharply over 2011 and 2012, however. This pattern has been reciprocated at Tacoma, where demand increased sharply in the early part of the period and has since contracted. There is a considerable degree of short term switching by shipping lines between terminals in these two ports.

To seek to alleviate the position, the two ports finally created the "Northwest Seaport Alliance" in 2015 which is now seeing a port development authority operating that is responsible for managing the ports as a collective facility and unifying investment, operations, planning and marketing activities. As a consequence, the container traffic previously reported individually per port is now offered together and makes the Seattle-Tacoma the "third largest container gateway in North America" according to its marketing material. However, it is difficult to see how this cosmetic change will greatly improve the fundamental problems of fragmented terminal structure and poor intermodal links.

As Table 1.2 shows, the estimated share retained of the Pacific Northwest market in 2015 is put at 44.7 per cent, a marginal rise on the 2014 figure of 44.4 per cent so on this basis the continuing decline in share that has been ongoing since 2005 has been stopped. This is because these two ports accounted for an estimated 58.7 per cent in 2005 and the figure has fallen ever since until it fell to the assessment-period low of 44.4 per cent.

On this basis, the development of the new port alliance of Seattle-Tacoma is an acknowledgement of the need to act, although there are no guarantees that the decision will increase volumes and competitiveness. The difficulties facing both ports continue to be severe and the strong competitiveness for local US markets posed by Southern California and for discretionary regions from the Port of Vancouver, Prince Rupert, Southern California and the eastern seaboard remains.

The position at the Port of Vancouver continues to be far more positive. Total volumes increased from 1.16m TEU in 2000 to an estimated total for 2015 of just over 3.0 million TEU, based on the port's January-August 2015 throughout being up by 6.1 per cent.

Growth at the Port of Vancouver continues to surpass the regional average. For example, between 2000 and 2015 the port enjoyed annual growth of 6.6 per cent per annum, which compares with just 3.4 per cent for the Pacific Northwest area overall. The trend is also evident more recently with the 2000-2015F growth noted to be 5.7 per cent per annum, compared to just 1.4 per cent for the Pacific Northwest in this more recent assessment period. It should be noted that the Port of Vancouver total for 2015 is confirmed, but the other ports are forecast totals.

It is not possible to draw comparisons over the same assessment periods for Prince Rupert because it only commenced operations in 2007. However, for illustrative purposes, if the first full year of operating at Prince Rupert is used (2008) until the confirmed 2015 total, it has seen average growth of 23.0 per cent per annum.

However, it is necessary to remember that in 2008 the terminals that comprise the Port of Vancouver were already handling 2.49 million TEU, a substantial throughout that is still three times what Prince Rupert handled in 2015. This compares to the total Pacific Northwest annual growth figure between 2008 and 2015F of only 1.8 per cent, which means both Vancouver and Prince Rupert are clearly driving regional demand.

Table 1.2 North America Pacific Northwest: Container Throughput by Port, 2000-2015F

	1985	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
<u>'000 TEU</u>																			
Seattle	845.0	1171.1	1479.1	1488.3	1315.1	1438.9	1486.5	1775.9	2087.9	1987.4	1973.5	1704.5	1584.6	2139.6	2033.5	1869.5	3461.7	3456.2	3639.2
Tacoma	505.0	937.7	1092.1	1376.4	1320.3	1470.8	1738.1	1797.6	2066.4	2067.2	1924.9	1861.4	1545.9	1455.5	1488.8	1711.1	3401.7	3430.2	3039.2
Vancouver (BC)	178.2	322.6	496.4	1163.2	1146.6	1458.2	1539.1	1664.9	1767.4	2207.7	2307.3	2492.1	2152.5	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5
Prince Rupert											16.7	181.9	265.2	343.4	410.5	564.9	536.4	618.2	776.4
Others	12.3	35.9	80.8	889.3	784.6	911.9	1206.2	1227.8	1144.3	892.0	1057.4	888.3	582.5	687.0	695.0	700.0	962.5	796.8	600.5
Pacific Northwest	1540.5	2467.3	3148.4	4917.1	4566.6	5279.8	5969.8	6466.1	7066.0	7154.3	7279.8	7128.1	6130.6	7139.7	7134.8	7558.7	7786.1	7784.1	8070.6
Percentage																			
Seattle	54.9%	47.5%	47.0%	30.3%	28.8%	27.3%	24.9%	27.5%	29.5%	27.8%	27.1%	23.9%	25.8%	30.0%	28.5%	24.7%	44.5%	44.4%	45.1%
Tacoma	32.8%	38.0%	34.7%	28.0%	28.9%	27.9%	29.1%	27.8%	29.2%	28.9%	26.4%	26.1%	25.2%	20.4%	20.9%	22.6%	44.3%	44.4%	43.1%
Vancouv er (BC)	11.6%	13.1%	15.8%	23.7%	25.1%	27.6%	25.8%	25.7%	25.0%	30.9%	31.7%	35.0%	35.1%	35.2%	35.1%	35.9%	36.3%	37.4%	37.8%
Prince Rupert	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	2.6%	4.3%	4.8%	5.8%	7.5%	6.9%	7.9%	9.6%
Others	0.8%	1.5%	2.6%	18.1%	17.2%	17.3%	20.2%	19.0%	16.2%	12.5%	14.5%	12.5%	9.5%	9.6%	9.7%	9.3%	12.4%	10.2%	7.4%
Pacific Northwest	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Notes:

Vancouver (BC) includes Fraser Port from 2008 and the 2015 total is confirmed. Prince Rupert 2015 total is confirmed. Seattle-Tacoma now reporting all volumes together and have back-dated individual port traffic to 2013 onwards.

Source: Ocean Shipping Consultants

<u>Table 1.3</u> North America Pacific South: Container Throughput by Port, 2000-2015F

	1985	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
'000 TEU																			
Oakland	855.6	1124.1	1549.9	1776.9	1643.6	1707.8	1923.1	2047.5	2272.5	2391.6	2387.9	2236.2	2050.0	2330.2	2360.5	2344.4	2346.5	2394.1	2274.3
San Francisco	107.2	140.4	45.0	50.1	34.6	23.7	20.6	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northern California	962.8	1264.5	1594.9	1827.1	1678.2	1731.5	1943.7	2079.5	2272.5	2391.6	2387.9	2236.2	2050.0	2330.2	2360.5	2344.4	2346.5	2394.1	2274.3
Los Angeles	1103.7	2116.4	2555.2	4879.4	5183.5	6105.9	7178.9	7321.4	7484.6	8469.9	8355.0	7850.0	6749.0	7801.0	7820.5	8077.7	7868.6	8340.1	8098.1
Long Beach	1171.5	1598.1	2843.5	4600.8	4463.0	4526.4	4658.1	5779.9	6709.8	7290.4	7312.5	6350.1	5067.6	6263.5	6313.6	6045.7	6730.6	6820.1	7188.3
San Pedro Bay	2275.2	3714.5	5398.7	9480.2	9646.5	10632.2	11837.1	13101.3	14194.4	15760.3	15667.5	14200.1	11816.6	14064.5	14134.1	14123.4	14599.2	15160.2	15286.4
Others	0.0	0.0	0.0	16.7	17.2	31.6	117.7	112.3	130.6	135.1	123.7	122.2	121.5	125.5	128.0	130.0	197.9	206.4	207.0
Mexico	25.0	65.0	88.0	477.1	505.5	705.0	774.7	929.4	1095.9	1564.2	1830.4	2078.8	1850.0	2050.0	2121.7	3239.9	3346.0	3540.0	3685.0
Pacific South	3263.0	5044.0	7081.6	11801.1	11847.4	13100.3	14673.2	16222.5	17693.5	19851.2	20009.5	18637.3	15838.1	18570.2	18744.3	19837.7	20489.6	21300.7	21452.7
Percentage																			
Oakland	26.2%	22.3%	21.9%	15.1%	13.9%	13.0%	13.1%	12.6%	12.8%	12.0%	11.9%	12.0%	12.9%	12.5%	12.6%	11.8%	11.5%	11.2%	10.6%
San Francisco	3.3%	2.8%	0.6%	0.4%	0.3%	0.2%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Northern California	29.5%	25.1%	22.5%	15.5%	14.2%	13.2%	13.2%	12.8%	12.8%	12.0%	11.9%	12.0%	12.9%	12.5%	12.6%	11.8%	11.5%	11.2%	10.6%
Los Angeles	33.8%	42.0%	36.1%	41.3%	43.8%	46.6%	48.9%	45.1%	42.3%	42.7%	41.8%	42.1%	42.6%	42.0%	41.7%	40.7%	38.4%	39.2%	37.7%
Long Beach	35.9%	31.7%	40.2%	39.0%	37.7%	34.6%	31.7%	35.6%	37.9%	36.7%	36.5%	34.1%	32.0%	33.7%	33.7%	30.5%	32.8%	32.0%	33.5%
San Pedro Bay	69.7%	73.6%	76.2%	80.3%	81.4%	81.2%	80.7%	80.8%	80.2%	79.4%	78.3%	76.2%	74.6%	75.7%	75.4%	71.2%	71.3%	71.2%	71.3%
Others	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.8%	0.7%	0.7%	0.7%	0.6%	0.7%	0.8%	0.7%	0.7%	0.7%	1.0%	1.0%	1.0%
Mexico	0.8%	1.3%	1.2%	4.0%	4.3%	5.4%	5.3%	5.7%	6.2%	7.9%	9.1%	11.2%	11.7%	11.0%	11.3%	16.3%	16.3%	16.6%	17.2%
Pacific South	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Ocean Shipping Consultants

1.3 North American Economic Development and Container Port Demand

Container trade volumes (and port demand) are directly related to the overall volumes of traded goods – especially in the manufactured sector. This is particularly the case for cargoes imported into North America. In addition, in the case of the Port of Vancouver, the important containerised export sector is driven by the pace of demand for primary goods in the other major Asian markets of interest to the port.

In the North American economies there is also found to be a close relation between the year-on-year development of GDP and the annual development of trade volumes. Although short-term forecasting of the development of container trade volumes clearly requires an analysis of specific commodity sectors, the timescale of the current study is more appropriate to an aggregated approach to demand growth.

Table 1.4 summarises the development of Canadian and US economies in the period since 1990. Following the recession of the early 1990s, a period of virtually unprecedented expansion of the economies was recorded in the period to 2007. Even the economic uncertainties of 2001 did not severely impact on the level of economic expansion. Between 1990 and the estimated total for 2015 the size of the US and Canadian economies increased by almost 75 and 72 per cent, respectively.

Table 1.4

North America:	Overall (GDP	Development	1990-2015F
	Overally	UDF.	Development	1330-20131

- index ed dev elopment

	USA	Canada
1990	100.0	100.0
1991	99.1	98.1
1992	102.2	99.0
1993	104.9	101.3
1994	109.1	106.0
1995	112.1	109.0
1996	116.1	110.8
1997	121.0	115.3
1998	126.2	118.8
1999	131.5	123.8
2000	136.4	130.2
2001	137.5	132.6
2002	139.7	136.4
2003	143.1	139.0
2004	148.2	143.3
2005	152.8	147.6
2006	156.9	151.8
2007	159.9	155.1
2008	159.4	156.2
2009	153.8	151.8
2010	158.4	156.7
2011	161.1	160.6
2012	164.0	162.7
2013	166.4	166.0
2014	170.5	170.0
2015F	174.9	171.8

Source: IMF/Ocean Shipping Consultants

The more recent economic downturn represented the first real dislocation of the container demand model noted since the 1980s. The US economy declined sharply by around 3.8 per cent between 2007 and 2009, but has since recovered this loss with the upturn continuing into 2014, with the trend expected to continue to accelerate through 2015. The same general pattern was noted in Canada, but the decline was somewhat less severe, namely a decline of 2.1 per cent, as a result of strong commodity exports over the period. However, since this drop both exports and imports have continued to improve.

Table 1.5

North America: Trade Volume Development 1990-2015F

- index ed dev elopment

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
USA																										
- Ex ports	100	106	113	117	127	140	152	171	174	185	208	207	213	224	249	270	294	318	330	292	332	356	378	402	427	454
- Imports	100	99	106	116	129	140	152	173	193	215	243	236	244	255	283	301	319	327	318	275	309	324	343	363	384	406
Canada																										
- Ex ports	100	102	110	122	138	151	160	173	187	207	234	229	237	248	276	294	314	325	321	280	315	332	352	373	395	418
- Imports	100	103	110	118	128	135	143	164	174	187	202	192	195	203	220	235	247	262	265	230	260	279	293	307	322	338
					. 20									_00		200			_00	_00	_00	2.0	200	201		

Source: OECD/Ocean Shipping Consultants

The overall scale of total North American trade growth is detailed in Table 1.5, using an indexed development. Once again, by basing development on 1990, the volume of trade (real values) is identified for the period¹. In the US, imports expanded by around 327 per cent between 1990 and 2007 as a result of the process of manufacturing relocation to China and a strong consumer boom. The economic downturn was reflected in a contraction of imports of some 16 per cent between 2007-2009, with this directly reflecting the downturn in Transpacific container flows.

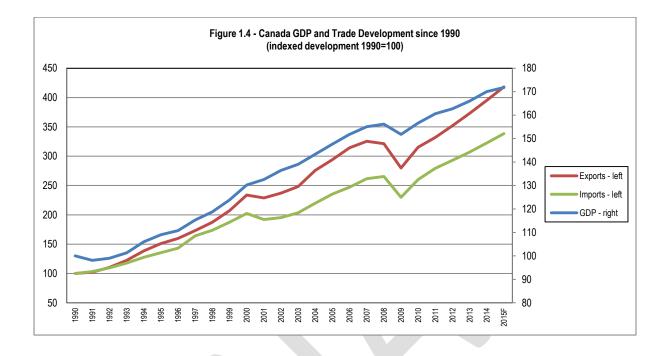
This pattern was also noted with regard to Canada, and here the downturn was somewhat more restricted at around 12 per cent. The scale of the import boom has been less pronounced in Canada than it has been in the US.

The other important trend has been the divergence between imports and exports, as also shown in Table 1.5. The former have driven overall demand growth, but there has been a recent increase in the volume of exports, with this reflecting continuing strong demand from the Asian importers and also a limited rebalancing of relative costs. Over the longer term a further rebalancing can be anticipated, with this impacting on container logistics in the Pacific Northwest region and the broader markets that ports in North America will continue to serve.

For containerisation the effects of these developments have been primarily:

- A continued increase in demand which has placed severe pressures on each stage of the distribution chain.
- In the US, a severe worsening of the balance of trade with this generating severe difficulties for the repositioning of empty containers.
- An assumption that demand will continue to expand at historic rates, with this leading to overinvestment in shipping and terminal capacity.

¹ This run of data relates to the total real value of trade in goods and services. This is seen to be a useful indicator when considering the spectrum of containerised goods flows in the aggregate.



The close relation between GDP and trade volumes in the Canadian economy is further underlined in graphic terms in Figure 1.4, with the estimated 2015 position continuing the trend.

The development of trade is seen to be highly susceptible to macro-economic uncertainties. This was noted to a limited degree over 2000-2001 and in a much more far-reaching manner in the 2007-2009 period. The speed of recovery from such downturns is also apparent. The general upturn from 2010 onwards is also noteworthy, with 2012 levels surpassing pre-recessionary levels, reflected by container volume and trends over the same period of time. This has continued through estimated figures for 2015.

There have been considerable differences recorded in the regional development of the US and Canadian economy and these are summarised in Table 1.6. This data collates returns from the US Bureau of Economic Analysis (BEA) and Statistics Canada that records the economic activity of each of the provinces, states and regions of the US. The collation of this data represents a major undertaking and the most recent comprehensive data is limited to 2013. Subsequent estimates have been made on the basis of overall economic expansion and reports from major individual states. Whilst this approach has some limitations, it still provides an effective means of analysis of GDP progress in the major existing and potential Port of Vancouver hinterlands.

In order to make a true analysis feasible inflation has been excluded from the analysis and the data is quantified in terms of constant US dollars. It is not the absolute development of the economy that is of interest here but, rather, the contribution of each region and their changing importance.

The data has been assessed in terms of the regions/hinterlands that are of primary significance for Pacific South and Pacific Northwest ports. Accordingly, local markets have been defined for California and Washington/Oregon and the category 'other west' includes all other demand from the US western region. Other regions utilise the broader definitions applied by the US BEA.

In terms of proportional developments, several trends are of direct relevance to the current assessment, notably:

- The western states progressively increased their share of the total US economy over the early years of the assessment and then maintained a largely constant share, with a similar pattern noted in the western provinces of Canada.
- This trend has developed with the more established economic regions of the Midwest and the Northeast seeing shares decline marginally despite strong economic growth.

Despite the increasing importance of the immediate Pacific hinterland markets, it is also important to note that the overall development of continental demand remains focused on the major central and eastern markets. Although local demand will remain very important for the foreseeable future, for ports in the Pacific Northwest like the Port of Vancouver it will be the economics of serving these distant markets (by landbridge) that remains of central importance in the overall development of potential demand.

Table 1.6 USA and Canada: Gross Domestic Product by Region (Current Prices), 1996-2015F

	1996	1997*	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
US\$bn (current)																				
West Canada**	197	205	194	205	235	231	233	284	332	392	408	421	427	419	432	455	467	493	507	515
East Canada	417	432	424	456	490	484	503	586	661	738	755	771	770	733	755	769	748	776	781	788
California & Hawaii	1011	1057	1123	1219	1327	1343	1384	1457	1569	1683	1787	1864	1911	1841	1896	1930	1969	2053	2090	2144
Al'sk,/Org'n/Wshgt'n	279	300	320	343	361	363	378	392	424	450	484	513	532	539	555	565	581	608	618	634
Rockies plus Nevada	285	312	332	358	387	403	416	440	478	517	556	589	614	599	617	627	639	672	689	707
Great Lakes/Plains	1760	1910	2000	2084	2175	2214	2300	2402	2523	2602	2701	2815	2894	2798	2883	2918	2940	3036	3079	3159
US Northeast	1911	2010	2111	2225	2358	2460	2526	2624	2796	2954	3134	3284	3391	3322	3422	3483	3530	3667	3729	3826
US Southeast	1684	1798	1902	2023	2115	2203	2289	2410	2593	2782	2959	3069	3148	3068	3160	3216	3283	3423	3481	3572
US Southwest	785	852	892	950	1026	1073	1105	1172	1273	1386	1508	1606	1699	1646	1696	1726	1796	1892	1973	2025
Total USA	7716	8238	8680	9201	9749	10058	10398	10896	11655	12339	13091	13716	14166	13797	14211	14452	14814	15430	15769	16179
Canada	614	637	617	661	725	716	736	871	993	1130	1163	1192	1197	1167	1204	1235	1256	1313	1337	1353
USA & Canada	8330	8875	9297	9862	10474	10774	11134	11767	12649	13533	14254	14908	15362	14964	15415	15687	16069	16743	17106	17532
Per Cent Share																				
West Canada**	2.4	2.3	2.1	2.1	2.2	2.1	2.1	2.4	2.6	2.9	2.9	2.8	2.8	2.8	2.8	2.9	2.9	2.9	3.0	2.9
East Canada	5.0	4.9	4.6	4.6	4.7	4.5	4.5	5.0	5.2	5.5	5.3	5.2	5.0	4.9	4.9	4.9	4.7	4.6	4.6	4.5
California & Hawaii	12.1	11.9	12.1	12.4	12.7	12.5	12.4	12.4	12.4	12.4	12.5	12.5	12.4	12.3	12.3	12.3	12.3	12.3	12.2	12.1
Al'sk,/Org'n/Wshgt'n	3.4	3.4	3.4	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.4	3.4	3.5	3.6	3.6	3.6	3.6	3.6	3.6	3.5
Rockies plus Nevada	3.4	3.5	3.6	3.6	3.7	3.7	3.7	3.7	3.8	3.8	3.9	3.9	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Great Lakes/Plains	21.1	21.5	21.5	21.1	20.8	20.5	20.7	20.4	19.9	19.2	18.9	18.9	18.8	18.7	18.7	18.6	18.3	18.1	18.0	18.0
US Northeast	22.9	22.6	22.7	22.6	22.5	22.8	22.7	22.3	22.1	21.8	22.0	22.0	22.1	22.2	22.2	22.2	22.0	21.9	21.8	21.9
US Southeast	20.2	20.3	20.5	20.5	20.2	20.4	20.6	20.5	20.5	20.6	20.8	20.6	20.5	20.5	20.5	20.5	20.4	20.4	20.4	20.4
US Southwest	9.4	9.6	9.6	9.6	9.8	10.0	9.9	10.0	10.1	10.2	10.6	10.8	11.1	11.0	11.0	11.0	11.2	11.3	11.5	11.6
USA	92.6	92.8	93.4	93.3	93.1	93.4	93.4	92.6	92.1	91.2	91.8	92.0	92.2	92.2	92.2	92.1	92.2	92.2	92.2	92.3
Canada	7.4	7.2	6.6	6.7	6.9	6.6	6.6	7.4	7.9	8.4	8.2	8.0	7.8	7.8	7.8	7.9	7.8	7.8	7.8	7.7
USA & Canada	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Figures may not sum exactly due to rounding.

* = Discontinuity in US data in 1997, due to change from SIC industry definitions to NAICS industry definitions

** = British Columbia east to Manitoba, Yukon, NW Territories

Sources: US Bureau of Economic Analysis, Statistics Canada, Ocean Shipping Consultants

Macro-economic trends and container port demand see relation continuing

The relationship between the expansion of the North America economies and the level of trade is fundamental to the analysis of recent developments and future prospects. There are, obviously, limits to the ultimate expansion of container trade volumes, but it is unlikely that demand saturation will affect the North American markets over the timeframe of this study.

A close relation is found to exist between the development of regional GDP, total trade volumes and container port demand. In most regions and throughout the period under review, the variables have moved broadly in tandem and, indeed, the link was seen to be sustained during the recent contraction and subsequent recovery.

Given the timescale of the current analysis, it is also necessary to remark upon the penetration of containerisation into general cargo trade. Although by the late 1970s the role of containers was already firmly established on the major long-haul trades (Transatlantic and Transpacific), the overall penetration of containerisation remained limited on other secondary trades. At the outset of the study period, container trade volumes were being further boosted by the conversion of conventional liner trade to containers. This resulted in an additional layer of demand growth over and above that indicated by the progress of total trade. There is little scope for further conversion for import cargoes, but a further shift of some commodities (such as grains, forest products etc.) into empty units will help with export demand.

The indexed development of North American trade volumes and container port demand since 1990 is detailed in Figure 1.5. There is seen to have been a very close relation between these two variables over the period and this has remained highly robust even during periods of economic downturn.

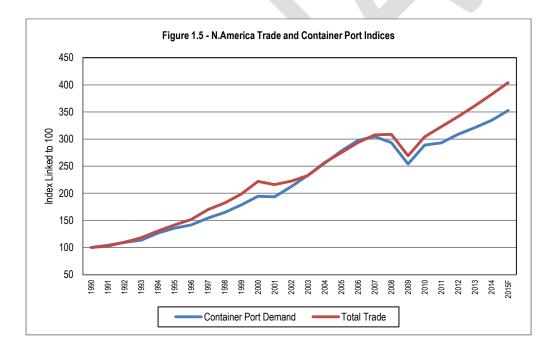


Table 1.7 employs national economic statistics to contrast the growth of the combined GDPs of Canada and the US with the growth in total container port demand in those countries since 1991. These analyses help to show that container port demand has consistently replicated the overall GDP trends over the period, though it does also include periods of negative development, such as during 2008 and 2009.

Table	1.7					
North	America:	Real	GDP	Growth	and	Cont

- annual real % change

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
GDP - A	-0.9	3.1	2.6	4.0	2.7	3.6	4.2	4.3	4.2	3.7	0.8	1.6	2.5	3.5	3.1	2.7	1.9	-0.3	-3.5	3.0	1.7	4.3	1.7	2.4	1.8
Port demand - I	4.4	5.0	3.7	11.4	7.3	4.4	8.9	6.7	8.5	8.8	-0.4	9.6	10.0	9.4	8.8	7.0	2.4	-3.7	-13.4	13.7	1.2	11.9	4.1	4.1	5.5
Ratio (A/B)	-4.8	1.6	1.4	2.8	2.6	1.2	2.1	1.6	2.0	2.4	-0.5	6.0	4.0	2.7	2.8	2.6	1.3	12.5	3.8	4.6	0.7	2.8	2.4	1.7	3.1

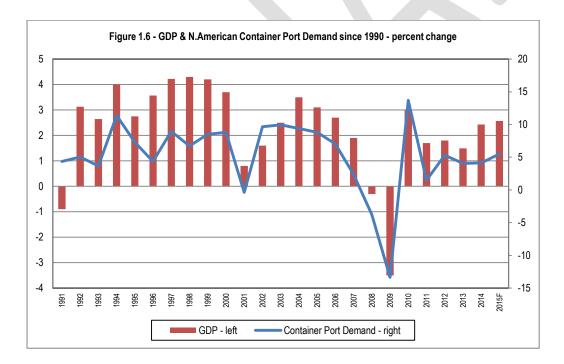
Average Ratio 1991-2015F = 1 : 2.64

Average Ratio 2000-2015F = 1 : 3.52

Sources: IMF & derivation from IMF, US Bureau of Economic Analysis & Statistics Canada, Ocean Shipping Consultants

iner Port Demand Growth , 1991-2015F

In addition to direct, trade-related factors, container port demand has also been boosted by the continuing containerisation of general cargoes in other Asian markets of interest to the Port of Vancouver and of backhaul bulk cargoes in developed markets, as well as by transshipment demand (although transshipment is of marginal importance in the North American markets). These factors, and others discussed below, mean that the relationship between output growth and container port demand growth is not clear-cut. However, as Figure 1.6 indicates, a correlation remains evident and is expected to continue moving forward.



The economic relation between GDP growth and trade growth is very useful in forecasting the development of the containerised sector. However, this underlying relationship is not a sufficient explanation of the growth in container port demand. There are numerous other factors at work, and the limitations of economic data (which are often revised) and container handling statistics further complicate the picture.

Some other factors affecting the development of container port demand, and issues relating to the measurement and comparison of output growth and container port demand growth include:

- In addition to imports and exports, container throughput also includes empty containers, which do not represent cargo actually being traded. The proportion of empty containers within a port's throughput can vary significantly.
- Transshipment trebles the number of port moves per container (and hence the TEU count), but again it does not represent additional cargo. This is not a major aspect of regional North American demand, however.
- The increasing penetration of containerisation is a significant factor in other major Asian markets of interest to the Port of Vancouver, although less so in developed markets, where the containerisation of general cargoes is more or less at saturation level. However, an imbalance of loaded inbound and outbound containers (notably, between North America and Asia) means that shippers continually search for more cargo to containerise on return legs of voyages. This has led to the increasing use of containers in cargo sectors that were not historically regarded as suitable for containerisation for example iron and steel scrap and waste paper. There are also 'neo-bulks' such as forest products that are increasingly containerised. This is an important driver for Port of Vancouver demand.
- Containerisation itself generates trade, by making it easy to transport goods cheaply over considerable distances.
- Container throughput is quantified in volume terms and output is measured in value terms, so the two
 measures are not directly comparable. In recent years, the volume of containerised cargo has
 increased more rapidly than its real value, due to factors such as the fall in price of electronic goods.
- There are also significant economic relationships which modify the underlying link between economic
 growth and trade growth. These include fluctuations in the relative propensities to consume or save, to
 import or purchase domestically, to export or sell domestically, all mediated by relative movements in
 prices, incomes, exchange rates, tastes, confidence and other factors.
- In addition to the limitations of available economic data, there are lags in the economy between causes and their effects, so that it is not always clear which periods should be compared when different aspects of economic development (such as output and trade) are contrasted.
- OSC generally uses the container handling statistics published by ports themselves. Whilst every effort
 is made to employ comparable statistics, on inspection it is found that the methods of calculation can
 differ between ports and distort the data. Furthermore, ports may not distinguish clearly between
 different elements of throughput. Not all ports record transshipment (and few distinguish between huband-spoke and relay).

Despite the numerous factors – which need to be built into, or allowed for in the interpretation of, forecasts – the generation of trade through economic growth provides the most rational foundation for predicting the future direction and scale of import/export container handling demand.

For the purposes of the medium term development of forecasts direct relation between GDP and container port volumes is of central importance. Throughout the period the relation between economic expansion and the level of containerised imports and exports is firmly grounded, although it is apparent that there has been some decline in the intensity of this relation for the reasons detailed.

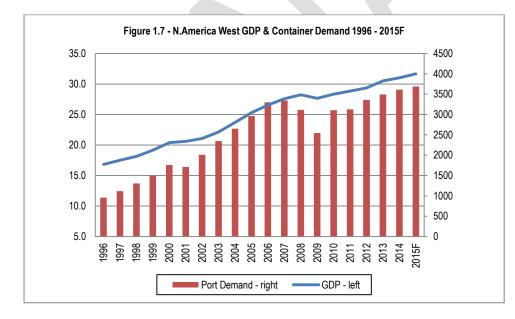
The ratio between North American container port demand and GDP development on an annual basis for the period since 1985 has been calculated. These relations are of central importance in understanding the development of the overall port market and it is necessary to identify trends for the period.

These may be summarised as follows:

- 1985-1990 1:1.98
- 1990-1995 1:2.73
- 1995-2000 1:1.96 1:3.04
- 2000-2005
- 2005-2015F 1:3.52
- 2005-2015F 1:2.88 (If impact of Global Financial Crisis removed)

It is important to note that the period between 2000-2005 recorded a very intense relation. This was the result of strong economic expansion and the acceleration of the 'China Effect' with very strong demand growth. At the same time, the 2008 Global Financial Crisis also distorted the figures. For example, if 2008 is omitted from the assessment, then the ratio for the period between 2000 and 2015F reduces to 1:2.88, which is more consistent with the overall trends anticipated relating to more gradual declining intensity.

In order to further illustrate this relation Figure 1.7 relates the development of container port demand for the West Coast of North America, with the overall development of GDP in the western region of the continent. This offers only a partial picture of the hinterlands of the Pacific ports, but once again, the nature of the relation is very well illustrated and is expected to continue moving forward.



Regional hinterlands and container port demand confirm Pacific Northwest region's widespread markets An analysis has been undertaken that helps to better define the development of North American hinterlands for each port region under review. This complex assessment has been defined on the basis of regional economic development as considered in this Section and also on the basis of partial inland distribution data maintained by the major container ports and terminals.

Although the analysis requires a degree of estimation – and gathers data from a variety of (sometimes inconsistent) sources – this represents a useful analysis of demand growth and hinterland structures.

These analyses have been undertaken on a five-yearly basis for the period since 1990, with a projection provided for 2015 to help provide a degree of dynamic to the analyses. This assessment is detailed in Table 1.8 through to Table 1.12.

The data and information generated helps to provide an important overview of the relative importance of various hinterlands within the overall North American container port market as part of generating the broad patterns of container trade over time for each of the different port ranges.

Table 1.8 Estimated Container Flows by Region and Port Range 1990 mTEU

		Por	t Range		
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific Northwest	Total
West Canada	0.00	0.00	0.00	0.32	0.32
East Canada	0.70	0.00	0.00	0.05	0.76
California	0.00	0.00	1.82	0.17	1.99
Washington/Oregon	0.00	0.00	0.07	0.38	0.44
Other West	0.00	0.00	0.13	0.09	0.22
Rocky Mountains	0.00	0.00	0.21	0.17	0.38
Plains/Great Lakes	0.27	0.17	1.64	1.17	3.25
Northeast	3.61	0.00	0.29	0.02	3.93
Southeast	0.00	2.32	0.58	0.22	3.12
Southwest	0.00	0.89	0.34	0.18	1.41
Total	4.59	3.38	5.08	2.77	15.82

Source: Ocean Shipping Consultants

Table 1.9

Estimated Container Flows by Region and Port Range 1995

mTEU

		Por	t Range		
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific Northwest	Total
West Canada	0.00	0.00	0.00	0.48	0.48
East Canada	0.72	0.00	0.00	0.12	0.84
California	0.00	0.00	2.23	0.16	2.39
Washington/Oregon	0.00	0.00	0.04	0.62	0.66
Other West	0.00	0.00	0.25	0.04	0.29
Rocky Mountains	0.00	0.00	0.41	0.16	0.57
Plains/Great Lakes	0.34	0.20	2.22	1.80	4.55
Northeast	4.45	0.00	0.63	0.04	5.12
Southeast	0.00	3.41	0.71	0.41	4.53
Southwest	0.00	1.35	0.67	0.00	2.03
Total	5.51	4.96	7.16	3.82	21.45

Source: Ocean Shipping Consultants

Table 1.10

Estimated Container Flows by Region and Port Range 2000

mTEU

		Por	t Range		
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific Northwest	Total
West Canada	0.00	0.00	0.00	0.51	0.51
East Canada	0.91	0.00	0.00	0.64	1.55
California	0.00	0.00	3.81	0.00	3.81
Washington/Oregon	0.00	0.00	0.14	0.83	0.97
Other West	0.00	0.00	0.36	0.07	0.43
Rocky Mountains	0.00	0.00	0.63	0.27	0.90
Plains/Great Lakes	0.67	0.36	3.72	1.78	6.53
Northeast	5.55	0.00	1.12	0.19	6.86
Southeast	0.00	4.63	0.98	0.58	6.19
Southwest	0.00	1.89	1.04	0.05	2.98
Total	7.14	6.88	11.80	4.92	30.74

Source: Ocean Shipping Consultants

Table 1.11

Estimated Container Flows by Region and Port Range 2005

mTEU

		Por	t Range		
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific Northwest	Total
West Canada	0.00	0.00	0.00	0.74	0.78
East Canada	1.29	0.00	0.00	0.92	2.22
California	0.00	0.00	5.71	0.00	5.51
Washington/Oregon	0.00	0.00	0.21	1.19	1.38
Other West	0.00	0.00	0.54	0.10	0.62
Rocky Mountains	0.00	0.00	0.95	0.39	1.50
Plains/Great Lakes	0.95	0.48	5.58	2.55	8.49
Northeast	7.85	0.00	1.68	0.27	9.67
Southeast	0.00	6.12	1.47	0.84	9.13
Southwest	0.00	2.50	1.56	0.07	4.65
Total	10.09	9.10	17.70	7.07	43.96

Source: Ocean Shipping Consultants

		P	ort Range		
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific Northwest	Total
West Canada	0.00	0.00	0.00	0.84	0.84
East Canada	1.34	0.00	0.00	1.05	2.39
California	0.00	0.00	8.33	0.00	8.33
Washington/Oregon	0.00	0.00	0.30	1.36	1.66
Other West	0.00	0.00	0.78	0.11	0.89
Rocky Mountains	0.00	0.00	1.39	0.44	1.83
Plains/Great Lakes	0.99	0.60	8.13	2.91	12.63
Northeast	8.14	0.00	2.44	0.31	10.89
Southeast	0.00	7.68	2.14	0.96	10.78
Southwest	0.00	3.13	2.27	0.08	5.48
Total	10.47	11.41	25.81	8.07	55.76

Table 1.12 Estimated Container Flows by Region and Port Range 2015F mTEU

Source: Ocean Shipping Consultants

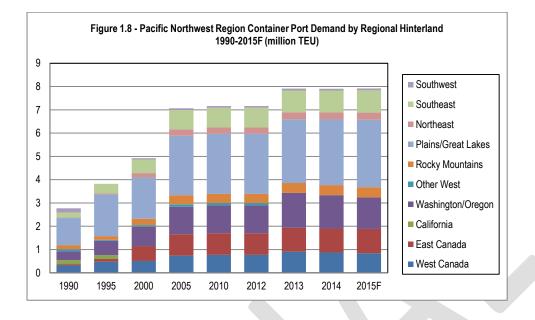
In general terms, it is apparent that the Pacific Northwest port market has recorded significant expansion and development in the period since 1990. At the outset of the study period the immediate geographical hinterland (western Canada and Washington/Oregon) accounted for an estimated 25.9 per cent of regional port demand. The more distant western region generated a further 22.3 per cent of demand. Some significant trends have since been noted in the period to 2015F in the distribution of the regional hinterlands:

- The share attributable to the immediate market (western Canada and Washington/Oregon) has seen continued growth throughout the assessment, although the important conclusion is that there is only a limited role of Californian ports in serving these markets as shipping services continue to develop directly to the region where Port of Vancouver is located (along with the US Pacific Northwest ports).
- The ability to serve the more distant Plains/Great lakes areas (which includes Chicago, as a gateway to the US Midwest) remain of crucial importance. The size of these markets is hugely significant, which is why ports in all parts of North America seek to serve them. However, the Pacific South region remains the most dominant point of entry/exit, with the Pacific Northwest second.
- The major central continental markets were already of some significance to the Pacific Northwest region in the early 1990s, although the role of the Port of Vancouver was far less important than that of the neighbouring US ports. These markets have increased in proportional terms and it can be concluded that terminals in the Pacific Northwest, especially Vancouver and Prince Rupert, are increasingly serving wider continental hinterlands.

Therefore, over the study period the economic reach of the Pacific Northwest ports has continued to be extended, especially for the Port of Vancouver and more recently, Prince Rupert. Although competition with Californian ports remains intense and the large-scale ports on the US East Coast cannot be ignored, it is apparent that the economics of using these terminals has significantly improved in recent years. This underlines the need for additional expansion at the Port of Vancouver and will be the likely rationale for Prince Rupert looking to move to its own Phase 2 development.

The importance of various hinterland regions for the Pacific Northwest region is detailed in Figure 1.8.

It can be noted that there is currently a period of stabilisation occurring, with the projected position in 2015F largely reflecting that had occurred in both 2014 and 2013.



1.4 The Asia-North America Container Trades

Table 1.13 summarises the distribution of containerised imports from Asia among port ranges according to the US Marine Administration (MARAD). By the end of 2015 MARAD has released data for full-year 2013 only, not 2014, although a robust estimate is still provided.

However, because the trends have been tracked since 1994 it is still possible to offer a strong indication of development of trade between Asia and North America, as the following notes:

The share of the Pacific South range declined from a high of 62.6 per cent in 2001 to 53.3 per cent in both 2009 and 2010 and has stabilised to between 56-57 per cent in the period to the end of 2013.

The earlier decline was initially driven by a lack of port capacity and resulting congestion and the impact of the recent labour unrest has not yet been included, but will likely see the 2013 figure reduce once again.

There is also no doubt that the gradual erosion of the cost advantages of the Pacific West Coast option as intermodal and stevedoring charges have increased will remain factors moving forward.

 The reduction in the share of trade across the Pacific seaboard was initially reciprocated by an increase in all-water transportation through both the Panama and Suez Canals, to the benefit of the Atlantic and Gulf port ranges.

The share of containerised US imports from Asia handled at Atlantic and Gulf coast ports rose from 22 per cent in 2000 to a peak of 32.1 per cent in 2009 and 2010 and then was broadly maintained thereafter before seeing a small increase in 2013 to 33.4 per cent.

The attractiveness of the All-Water options to the US East and Gulf coasts has also been boosted by expansions in marine terminal capacity on these coasts and the establishment of distribution centres for retailers and importers. In addition, harbour deepening programmes to allow access to larger vessels and crucial improvements to the intermodal rail and barge infrastructure and services linking East and Gulf-coast ports with markets in the Midwest are also improving the position. The development of the Panama Canal to permit the introduction of much larger vessels from the end of 2016 will further improve the relative position of the All-Water option.

Table 1.13	
Canada and US: Containerised Imports from As	aia by Port Range, 1994-2014

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Million tonnes																					
Pacific Northwest	5.86	5.92	5.08	5.29	6.53	6.96	6.95	6.20	7.16	8.13	9.59	10.96	12.26	12.40	11.46	10.13	11.40	11.96	11.95	11.95	12.41
US Pacific South	5.00 15.53	5.92 15.80	5.06 16.81	5.29	22.29	24.82	27.39	27.75	30.86	33.39	9.59 37.75	42.89	46.66	45.88	42.52	36.97	41.59	42.87	45.55	46.70	49.48
US Pacific Coast	21.39	21.72	21.88	23.52	28.82	31.78	34.34	33.95	38.02	41.52	47.34	53.85	58.92	58.28	53.97	47.10	52.98	52.44	54.55	54.81	57.59
US Atlantic South	2.29	2.50	2.51	3.10	3.95	4.30	4.64	4.83	6.31	7.53	8.62	9.93	11.47	11.96	11.18	9.75	10.97	10.25	10.60	11.87	12.95
Altantic North	3.25	3.39	3.06	3.52	4.04	4.52	4.77	5.04	6.57	7.16	9.13	10.50	12.16	12.71	12.05	10.76	12.11	13.66	14.09	15.64	16.99
US Gulf Coast	0.17	0.22	0.19	0.26	0.37	0.47	0.53	0.38	0.37	0.56	1.28	1.45	1.56	1.52	1.55	1.71	1.93	2.02	2.10	2.36	2.72
US Atlantic/Gulf	5.71	6.11	5.76	6.88	8.36	9.28	9.94	10.26	13.25	15.24	19.04	21.87	25.19	26.19	24.78	22.23	25.00	24.15	25.12	27.49	29.86
Total	27.09	27.83	27.64	30.40	37.18	41.06	44.28	44.21	51.27	56.76	66.38	75.72	84.11	84.47	78.75	69.33	77.99	76.59	79.67	82.30	87.26
Per cent share																					
US Pacific Northwest	21.6%	21.3%	18.4%	17.4%	17.6%	16.9%	15.7%	14.0%	14.0%	14.3%	14.5%	14.5%	14.6%	14.7%	14.5%	14.6%	14.6%	15.6%	15.0%	14.5%	14.2%
US Pacific South	57.3%	56.8%	60.8%	60.0%	60.0%	60.4%	61.9%	62.8%	60.2%	58.8%	56.9%	56.6%	55.5%	54.3%	54.0%	53.3%	53.3%	56.0%	57.2%	56.7%	56.7%
US Pacific Coast	78.9%	78.0%	79.2%	77.4%	77.5%	77.4%	77.6%	76.8%	74.2%	73.1%	71.3%	71.1%	70.1%	69.0%	68.5%	67.9%	67.9%	68.5%	68.5%	66.6%	66.5%
US Atlantic South	8.5%	9.0%	9.1%	10.2%	10.6%	10.5%	10.5%	10.9%	12.3%	13.3%	13.0%	13.1%	13.6%	14.2%	14.2%	14.1%	14.1%	13.4%	13.3%	14.4%	14.8%
US Altantic North	12.0%	12.2%	11.1%	11.6%	10.9%	11.0%	10.8%	11.4%	12.8%	12.6%	13.8%	13.9%	14.5%	15.0%	15.3%	15.5%	15.5%	17.8%	17.7%	19.0%	19.4%
US Gulf Coast	0.6%	0.8%	0.7%	0.9%	1.0%	1.1%	1.2%	0.9%	0.7%	1.0%	1.9%	1.9%	1.9%	1.8%	2.0%	2.5%	2.5%	2.6%	2.6%	2.9%	3.1%
US Atlantic/Gulf	21.1%	22.0%	20.8%	22.6%	22.5%	22.6%	22.4%	23.2%	25.8%	26.9%	28.7%	28.9%	29.9%	31.0%	31.5%	32.1%	32.1%	31.5%	31.5%	33.4%	34.2%
		400.0%		400.0%		22.0%					20.7%	20.9%	23.9%	400.0%	J1.0%	JZ. 1%		J1.0%		400.0%	
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Sources: US Maritime Administration confirmed data for full-year 2013. Ocean Shipping Consultants. Includes estimates.

 The position of the Pacific Northwest, including the Port of Vancouver, has been one of relative stability of share of market since 2000. The region's ports have consistently maintained a figure of between 14.0 and 15.5 per cent over this relatively long assessment period.

This position has occurred on the basis of the Canadian ports of Port of Vancouver and Prince Rupert off-setting the lacklustre activity at Seattle and Tacoma.

Total levels of recent containerised imports into the Pacific Northwest (US and Canadian ports) have fluctuated in line with market uncertainties, but the proportional importance of Canadian terminals has increased in line with strong demand from Vancouver and the developing position of Prince Rupert.

The Pacific South (the range of ports from Oakland south to the major Mexican transit terminals) has also been highly volatile, with the role of Mexican ports increasing their share at the margin, while the Atlantic region is benefitting from US Pacific West Coast labour issues and, from the end of 2016, the Panama Canal expansion.

1.5 Economic Drivers – Key Port of Vancouver Hinterlands

With increasing containerised cargoes shipped to/from eastern Canada and the US Midwest, demand at the Port of Vancouver generated by the local economy has been declining in proportional terms. Nevertheless, it remains an important market to be served, so attention is now directed towards the development of the economy in the region under review.

As background, in 2014 the Gross Domestic Product (GDP) of Canada was approximately \$1,975 billion according to IMF data and is projected to be C\$1,985 billion by the end of 2015. From 2000 to 2015F, the Canadian economy will have grown by an average annual rate of 4.0 per cent using this data set.

It can also be noted that the full effects of the Global Financial Crisis have also now been fully eradicated. While the economy contracted by around 5.0 per cent in 2009 the subsequent rebound has been good, with year-on-year expansion in the 2010 to 2014 period ranging between 3.3-6.1 per cent.

<u>Table 1.14</u> <u>Western Canada GDP Development 2000-2015F</u>

constant 2002 million C\$

	Britis	sh Columbia		Alberta	Sa	skatchewan		Manitoba	То	tal
	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change
2000	131355	0.0%	143252	0.0%	35160	0.0%	35476	0.0%	345243	0.0%
2001	133508	1.6%	147126	2.7%	34370	-2.2%	35778	0.9%	350782	1.6%
2002	138193	3.5%	150594	2.4%	34343	-0.1%	36559	2.2%	359689	2.5%
2003	141312	2.3%	155670	3.4%	36074	5.0%	37090	1.5%	370146	2.9%
2004	146562	3.7%	163864	5.3%	37939	5.2%	37752	1.8%	386117	4.3%
2005	153195	4.5%	172202	5.1%	39179	3.3%	38603	2.3%	403179	4.4%
2006	159419	4.1%	182215	5.8%	38176	-2.6%	40103	3.9%	419913	4.2%
2007	164386	3.1%	185937	2.0%	39304	3.0%	40871	1.9%	430498	2.5%
2008	164543	0.1%	187819	1.0%	40866	4.0%	41975	2.7%	435203	1.1%
2009	162215	-1.4%	184017	-2.0%	40333	-1.3%	42485	1.2%	429050	-1.4%
2010	165792	2.2%	189940	3.2%	41424	2.7%	43453	2.3%	440609	2.7%
2011	170599	2.9%	199817	5.2%	43412	4.8%	43931	1.1%	457760	3.9%
2012	173499	1.7%	207610	3.9%	44367	2.2%	45117	2.7%	470593	2.6%
2013	176969	2.0%	215707	3.9%	46497	4.8%	46110	2.2%	485282	3.2%
2014	182101	2.9%	225413	4.5%	47241	1.6%	46801	1.5%	501557	2.6%
2015F	186472	2.4%	222483	-1.3%	47052	-0.4%	47784	2.1%	503791	0.7%

Source: Statistics Canada: Provinces and territories

Western Canada

Against the backdrop of Canada in overall terms, the development of the Western Canada economy since 2000 is detailed in Table 1.14 and includes the provinces of British Columbia, Alberta, Saskatchewan and Manitoba. This region of Canada has seen consistent GDP growth of 2.6 per cent between 2000 and 2015F and while the annual growth isn't overly spectacular, in overall terms it is very stable with little major fluctuation year-on-year. The highest growth occurred in 2006 (3.9 per cent), with the lowest growth in the past 10 years being 1.1 per cent (in 2011). Admittedly, 2000 recorded no growth and 2001 saw just 0.9 per cent, which both came in an economic recession cycle).

Each of the individual provinces is outlined in more detail:

British Columbia is the fourth largest regional economy in Canada after Ontario, Quebec and Alberta with a GDP of \$186,472 million estimated for 2015F (in 2002 dollars), reflecting a 2.4 per cent increase over 2014, itself a 2.9 per cent rise on the 2014 total. Since 2000 to 2012 the economy of British Columbia has grown at an average annual rate of 2.4 per cent.

Approximately 78 per cent of workers in British Columbia are employed in the service industries while the remainder are employed in the manufacturing, construction and resources. Finance, insurance, real estate and leasing remains the largest individual component, accounting for 31 per cent of the service sector GDP and 24 per cent of total GDP.

British Columbia's manufacturing industry continues to be dominated by processing natural resources harvested or extracted in the province such as canning salmon, processing fruits and berries, producing lumber and paper, and smelting and refining ores. This provides a major anchor for containerised export volumes. However, a growing share of British Columbia's manufacturing industry is dealing with many different types of activities, such as shipbuilding, building aircraft parts, manufacturing signs, or manufacturing plastics. British Columbia firms also produce vitamins and health care products, computers and electronic products, and other types of goods.

Manufacturing accounts for 40 per cent of all non-service sector GDP, followed by the construction sector which contributes 27 per cent. Resources and resource extraction are also major components of the British Columbia economy. The largest component is the forestry industry, followed by mining. Approximately half of the softwood lumber produced in Canada comes from British Columbia. Forestry industry products are also the province's most important export commodity. However, the forestry sector has faced many challenges in recent years such as the downturn in US housing, the mountain pine beetle epidemic and lower prices for forestry products.

The Canadian prairies consist of Alberta, Saskatchewan and Manitoba. On the basis of 2015F data, Alberta remains the third largest economy in Canada, contributing around 44 .2 per cent to the total of Western Canada and estimated to be generating a GDP of \$223, 483 million (in 2002 dollars) as illustrated in Table 1.14. Saskatchewan and Manitoba are projected to reach a provincial GDP of \$47,052 million and \$47,784 million, respectively, thus representing 3.2 and 3.3 per cent of the national economy.

Between 2000 and 2015F Alberta's economy will have grown by an average rate of 3.0 per cent, which included a contraction in 2009 of 2.0 per cent due to the Global Financial Crisis. There was a good rebound after this event and the province was one of the strongest performing regions amongst all Canadian areas.

However, for 2015 a decrease of 1.3 per cent is projected on account of weaker commodity pricing and demand, especially oil. In Alberta, natural resources such as oil sands (for example in Fort McMurray) and other forms of oil production are major economic drivers, which also supports related industries such oil refinement and processing and is endorsed by the major exports of crude petroleum and liquid gas accounting for over 65 per cent of export activity.

 Saskatchewan's GDP grew at an average annual growth rate of 2.0 per cent between 2000 and 2015F. There has been a degree of fluctuating GDP growth over this assessment period, ranging from a low of -2.6 per cent in 2006 to a high of 5.0 per cent in 2003 and 4.8 per cent for 2011.

The economy in Saskatchewan depends heavily on natural resources, especially agriculture. According to the government of Saskatchewan, approximately 95 per cent of all goods produced depend directly on the province's basic resources, i.e. grains, livestock, oil and gas, potash, uranium and wood, and their refined products. The projected fall in GDP for 2015 of 1.3 per cent reflects lower pricing and demand for some of these key commodities, especially oil and gas.

In Manitoba, GDP also grew by an annual average of 2.0 per cent between 2000 and 2015F. While most Canadian provincial economies contracted in 2009 due to the global recession, Manitoba's economy still grew at 1.2 per cent from 2008 to 2009, reflecting the ability of the province to see much smaller fluctuations in growth – instead it has largely been small and consistent.

The moderate and stable economy in Manitoba is also based largely on natural resources. This includes agriculture such as cattle farming and grains (mostly found in the southern half of the

province), energy, oil, mining, and forestry play an important role in Manitoba. According to the University of Manitoba, the province is Canada's largest producer of sunflower seed and dry beans, as well as one of the leading sources for potatoes providing French fries for major fast food chains.

Eastern Canada and the US Midwest

The Port of Vancouver (and other ports in North America) continue to seek to serve the more distant eastern regions of Canada as well as the highly competitive US Midwest region. These are key regions of trade for the port (and all competing facilities).

As such it is necessary to present an overview of economic development in these regional markets and the development of Ontario, the Great Lakes, Illinois and Chicago are individually shown in Table 1.16, with 2015 projected figures also included.

On an aggregate basis, this area has seen annualised GDP improvement of 0.7 per cent between 2007 and 2015F and while there was negative growth in 2008-2009 due to the Global Financial Crisis there have been small, but positive, developments since ranging between 1.3 per cent (2013) and 1.9 per cent (2012).

Table 1.15

Eastern Canada / US Midwest GDP Development 2007-2015F

constant 2002	million	C\$

	(Ontario	(Quebec	C	Great Lakes	IIIi	nois	Cł	nicago	1	Fotal
	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change
0007	500 175	4 70/	004000	4.000	4000000	0.00/	004440	0.0%	544000	0.00/		0.00/
2007	530475	1.7%	264606	1.6%	1969826	0.0%	621110	0.0%	514966	0.0%	3900983	0.0%
2008	520023	-2.0%	267057	0.9%	1933161	-1.9%	615281	-0.9%	507503	-1.4%	3843025	-1.5%
2009	503501	-3.2%	265416	-0.6%	1862155	-3.7%	598807	-2.7%	490742	-3.3%	3720620	-3.2%
2010	520670	3.4%	271109	2.1%	1910180	2.6%	610322	1.9%	500268	1.9%	3812549	2.5%
2011	531083	2.0%	275718	1.7%	1938833	1.5%	620087	1.6%	508272	1.6%	3873993	1.6%
2012	538519	1.4%	278475	1.0%	1967915	1.5%	631869	1.9%	528095	3.9%	3944872	1.9%
2013	544981	1.2%	281538	1.1%	1999402	1.6%	637555	0.9%	537600	1.8%	4001077	1.3%
2014	558060	2.4%	285480	1.4%	2027394	1.4%	645206	1.2%	544052	1.2%	4060192	1.5%
2015F	569780	2.1%	289762	1.5%	2053750	1.3%	654239	1.4%	549492	1.0%	4117023	1.5%

Source: U.S. Bureau of Economic Analysis, Statistics Canada

Each of these important regions is assessed in more detail:

Ontario and Quebec collectively represent approximately 60 per cent of the Canadian economy with an average annual GDP growth of 0.9 and 1.1 per cent respectively between 2007 and 2015F. These two provinces are the largest economies within Canada in terms of GDP. Ontario contributes almost 40 per cent to the national GDP, with Quebec providing around 20 per cent. For 2015 Ontario's GDP is projected to increase by 2.1 per cent over 2014, which itself was a 2.4 per improvement over the 2013 figures.

The province continues to see steady increases in its economic development. It primarily remains a service sector economy with strong manufacturing elements. The provincial capital, Toronto is the centre of Canada's financial services and banking industry. Manufacturing also plays an important role, especially the auto industry. Seven of the world's largest vehicle manufacturers operate 14 plants in Ontario. According to Statistics Canada, Ontario's main exports are motor vehicles parts and accessories, accounting for approximately 40 per cent of total exports. The province's leading trading partner is Michigan in the US.

In Quebec, the economy grew on average by 1.1 per cent annually over the assessment period, reflecting steadily improvements at a moderate pace, with recent year-on-year growth continuing at modest, but consistent levels.

Quebec's economy is dominated by manufacturing and the service sectors and the province has more than 250 companies involved with the aerospace manufacturing sector, including Bombardier which is the third largest airplane manufacturer worldwide and is headquartered in Quebec. Within the service industry, it is finance, insurance, real estate and leasing industry the represents the major contributors.

 The Great Lakes region is a bi-national Canadian-American area that includes parts of eight US states (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin), plus the province of Ontario. Collectively this means a population of up to 85 million people.

Clearly, this is an important economic region, with average growth of 0.5 per cent annually between 2007 and 2015F. However, it should be noted that the Global Financial Crisis saw growth reduced by 1.9 per cent and 3.7 per cent in 2008 and 2009, respectively, but following a rebound of 2.6 per cent in 2010 the economic development has risen by between 1.3 per cent and 1.6 per cent – small, but consistent improvements nonetheless.

The Great Lakes has a strong traditional shipping heritage and although the growth in vessel sizes has tended to preclude more modern ships accessing many of the wharves and locations, there are still sizeable quantities of cargoes moving. Of course, these are all commodities that will not necessary be then moving via the likes of the Port of Vancouver and other larger gateway facilities in North American on the eastern and western seaboards. Nevertheless, it remains a large geographic area and has a substantial population amongst a number of key cities, albeit that some of these can also be classified in other regions already discussed, such as in Ontario and Chicago.

Within the US market, the Chicago area is a key interchange point for intermodal distribution to/from the US Midwest, along with more localised demand (Chicago is the largest city in Illinois and the third largest city in the US by population). These two factors have long made Chicago a key target of the US Pacific South ports, along with Port of Vancouver and Prince Rupert. In addition, the major ports on the East Coast of North America from Halifax to Savannah, continue to actively target these same areas too and are all regarded as competitors.

Between 2007 and 2015F the Chicago economy has grown by an average of just 0.8 per cent per annum, although the Global Financial Crisis of 2008 and 2009 caused reductions of -1.4 per cent and - 3.3 per cent, respectively, clearly pulled down the average. Since 2010, the region has seen continued growth, albeit at lower levels of between 1.0 per cent and 3.9 per cent – largely to be expected for such a large-scale, mature economy.

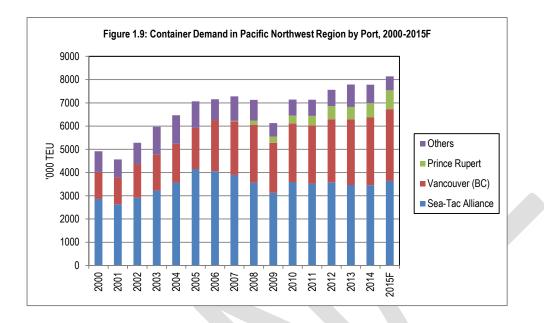
Chicago's economy is considered to have a balanced level of diversification. The Chicago metropolitan area is home to many large companies, such as McDonalds, Boeing and Motorola. The financial sector plays an important role in Chicago, as does the manufacturing activity, with leading manufacturers in the chemicals, food and machinery-related fields.

1.6 A Closer Analysis of Pacific Northwest Container Port Demand

Total demand in the Pacific Northwest region increased by some 48 per cent between 2000 and 2007 and reached a peak of 7.28 million TEU. Demand then reduced in line with the broader economic contraction with a decline of 15.8 per cent recorded between 2007 and 2009. Volumes rebounded in 2010 and by 2012 surpassed pre-recessionary levels.

Overall volumes further stabilised in 2013 and 2014 and are anticipated to increase for 2015F to 8.13 million TEU. This represents average annual growth of 4.3 per cent over the assessment period.

The development of this demand over the assessment period of 2000 to 2015F is detailed on a per-port basis in Figure 1.9.



On a port-specific basis the level of container demand has varied. It is clear that while the Port of Vancouver has seen continued, stable growth and Prince Rupert has been able to increase its volumes strongly (albeit as a brand new port commencing operations entirely), the US facilities of Seattle and Tacoma have seen their throughputs largely stagnate.

The dynamic development in demand that was noted in the early 2000s has now been superseded by a more uncertain trade profile, culminating in these two ports forming the new Northwest Seaport Alliance in an attempt to better operate, market and increase their volume throughputs.

The development of demand in terms of the type of containers handled at the regions ports is summarised for the period since 2008 in Table 1.16. Here, the analysis focuses on the development of demand in terms of container status (i.e. loaded/empty and inbound/outbound).

The US ports handle a significant volume of domestic container flows – i.e. containers shipped to/from Alaska and Hawaii and this complicates the overall picture. These volumes are largely a separate business using Jones Act vessels on specific trades.

In total, these containers accounted for around 0.87 million TEU in 2014 and volumes have directly tracked the level of the US economy over the period, which means that the total has only just reached the pre-recessionary level of 0.84 million TEU seen in 2008.

Table 1.16

Pacific Northwest Region Container Port Demand 2008-2014

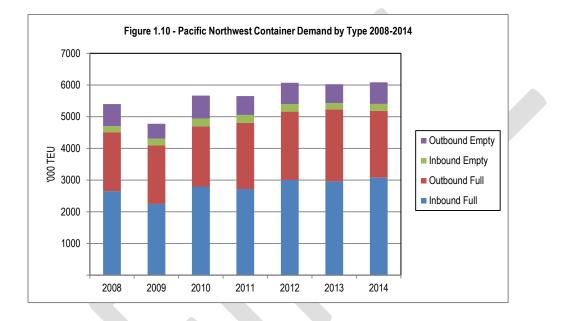
- TEU

		2008	2009	2010	2011	2012	2013	2014
Port of Vand	couver							
Int Full	Inbound	1,238,350	1,007,304	1,233,051	1,234,585	1,349,375	1,418,528	1,499,079
	Outbound	915,465	925,411	940,921	999,725	1,048,824	1,125,619	1,045,676
	Total	2,153,815	1,932,715	2,173,972	2,234,310	2,398,198	2,544,147	2,544,755
Int Empty	Inbound	55,958	115,546	63,894	86,026	101,934	89,464	57,599
	Outbound	282,334	104,201	276,443	186,697	213,028	191,865	310,547
	Total	338,292	219,747	340,337	272,722	314,962	281,329	368,146
TOTAL		2,492,107	2,152,462	2,514,309	2,507,032	2,713,160	2,825,476	2,912,901
Prince Rupe	<u>ert</u>							
Int Full	Inbound	101,080	155,675	193,511	233,146	318,065	301,804	358,902
	Outbound	25,280	38,777	63,107	100,389	124,542	151,624	156998
	Total	126,360	194,452	256,618	333,535	442,607	453,428	515,900
Int Empty	Inbound	2	126	0	1,596	3	2,036	2,045
	Outbound	55,515	70,645	86,748	75,339	122,247	80,975	100,222
	Total	55,517	70,771	86,748	76,935	122,250	83,011	102,267
TOTAL		181,877	265,223	343,366	410,470	564,857	536,439	618,167
<u>Tacoma</u>								
Int Full	Inbound	648,947	472,533	476,746	479,828	611,085	695,748	1,217,366
	Outbound	483,665	420,791	337,538	375,744	457,078	529,255	907,867
	Total	1,132,612	893,324	814,284	855,572	1,068,163	1,225,003	2,125,233
Int Empty	Inbound	0	0	0	0	0	0	161,139
	Outbound	215,363	182,322	162,461	166,385	196,739	219,722	270,458
	Total	215,363	182,322	162,461	166,385	196,739	219,722	431,597
Int	Total	1,347,975	1,075,646	976,745	1,021,957	1,264,902	1,444,725	2,556,830
Domestic	Total	513,377	470,209	478,762	466,838	446,231	446,843	870,733
TOTAL		1,861,352	1,545,855	1,455,507	1,488,795	1,711,133	1,891,568	3,427,563
Seattle								
Int Full	Inbound	664,472	612,236	897,224	768,964	728,557	543,655	Included
	Outbound	434,546	459,557	558,237	612,450	525,913	468,253	in
	Total	1,099,018	1,071,793	1,455,461	1,381,414	1,254,470	1,011,908	Tacoma
Int Empty	Inbound	133,189	102,119	182,455	164,154	136,321	102,242	Volumes
	Outbound	144,289	110,629	197,659	167,105	139,076	107,252	as
	Total	277,478	212,748	380,114	331,259	275,397	275,397	Northwest
Int	Total	1,376,496	1,284,541	1,835,575	1,712,673	1,529,867	1,218,875	Seaport
Domestic	Total	327,996	300,055	304,002	320,862	339,625	373,878	Alliance
TOTAL		1704492	1584596	2139577	2033535	1,869,492	1,592,753	
TOTAL Pacif	fic Northwest							
Int Full	Inbound	2,652,849	2,247,748	2,800,532	2,716,523	3,007,082	2,959,735	3,075,347
	Outbound	1,858,956	1,844,536	1,899,803	2,088,308	2,156,357	2,274,751	2,110,541
	Total	4,511,805	4,092,284	4,700,335	4,804,831	5,163,438	5,234,486	5,185,888
Int Empty	Inbound	189,149	217,791	246,349	251,776	238,258	193,742	220,783
	Outbound	697,501	467,797	723,311	595,526	671,090	599,814	681,227
	Total	886,650	685,588	969,660	847,301	909,348	859,459	902,010
TOTAL		5,398,455	4,777,872	5,669,995	5,652,132	6,858,642	6,846,236	6,958,631

Source: Ocean Shipping Consultants

It is the international business that is of primary significance and within these volumes it is apparent that there is a significant loaded export component based upon local produce. This is a feature of the region as a whole, but the volumes exported by the Port of Vancouver are seen to be by far the highest in the range. This is a significant aspect of local demand. In addition, it should be noted that loaded export containers are of far less proportional importance at Prince Rupert than at the Port of Vancouver.

The breakdown of container volumes in the Pacific Northwest region by type of activity is shown in Figure 1.10 for the period of 2008 to 2014. The handling of loaded containers continues to dominate the overall share of activity, as expected, based on the higher demand for full containers arriving from Asia to meet local demand but also more distant Canadian and US markets. While the total volumes have fluctuated, initially due to the Global Financial Crisis, the make-up of the throughput remains much more constant – a factor that is not expected to significantly alter moving forward.

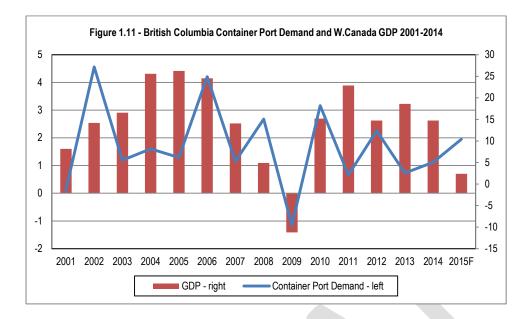


Before focusing on the development of demand volumes at the Port of Vancouver, attention is directed towards the relation between economic development in Western Canada (the primary local hinterland that the Port of Vancouver serves and competes with Prince Rupert to meet demand) and the level of containers handled over the period.

Figure 1.11 summarises the nature of this link in the period between 2001 and through to 2015F in terms of yearon-year real development of the two indicators. The broader link that has been noted at a higher level is clearly noted in this specific instance, with demand closely tracking GDP development in the hinterland. For the entire period since 2001, the average link between GDP and container port demand is placed at 1 : 2.93.

It is important to note that this ratio has also been maintained for the period since 2007 – i.e. including the downturn and subsequent recovery.

This link is seen to be considerably more intense than is noted for either the Pacific Northwest region or for the Pacific West Coast as a whole and reflects the increasing market share of British Columbia ports, while illustrating how the ports are less and less dependent upon local conditions and more related to the overall continental position.



1.7 The Structure of Port of Vancouver Container Demand

Containerised Demand by Commodity

The types of commodities being shipped through the Port of Vancouver in containers and the direction of the flows (i.e. imports or exports) is an important part of the assessment of cargo demand for the port's facilities.

Using data from the Vancouver Fraser Port Authority the international origin and source of containerised cargoes and also at regions within the North American hinterland where demand is generated is noted since 1995, with a robust estimate provided for 2015.

Table 1.17 presents a summary of the long term development of containerised imports in terms of major commodity groupings based on confirmed data for the period to 2014 and then year-to-date to September 2015, with the following key factors to be noted:

- In 2000, a total of 3.33 million tonnes was imported and by the end of 2015 this figure is expected to reach 11.32 million tonnes, reflecting good, continued growth annually.
- For the Pacific West Coast as a whole one of the key drivers of import demand is the broad spectrum of consumer and other household goods which are primarily originated in China. These commodities have continued to see good, double-digit volume growth over the assessment period, though the proportional importance of these items has declined from a peak of almost 41 per cent in 2003 to an estimated level of just under 36 per cent likely for 2015, although this latest estimate reflects an increase on the recent low share of 29.2 per cent in 2013.
- The change in share of consumer goods has been reciprocated by an increase in the role of construction materials in the containerised cargo base. The total in 2000 was just 7.7 per cent of all imports and this total peaked at 13.6 per cent in 2013 before falling back slightly in 2014 and 2015F, to 13.4 per cent and 12.4 per cent, respectively. Nevertheless, this overall improvement reflects both strong demand and the increasing containerisation of these commodities.

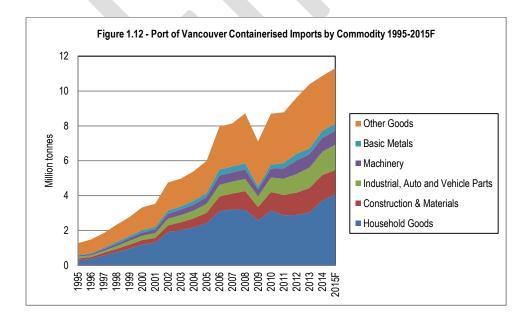
- The balance of the import demand has been stable, although it should be noted that there has been growth in the role of Industrial components (including auto parts) in the container sector, increasing from 7.4 per cent in 2000 to an estimated 13.0 per cent for 2015.
- As a result of all of these specific classifications seeing increases the commodities known as "other goods" has fallen considerably, from the 52.6 per cent share in 1995 down to just 28.1 per cent projected for 2015. This trend indicates that there continues to be a greater concentration of the highervolume commodities being imported into the Port of Vancouver.

Table 1.17 Port of Vancouver: Containerised Import Volumes 1995-2015F

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
Million Tonnes																	
Household Goods	0.31	1.19	1.31	1.90	2.02	2.18	2.42	3.11	3.21	3.20	2.57	3.14	2.88	2.89	3.03	3.72	4.06
Construction & Materials	0.09	0.26	0.27	0.38	0.45	0.51	0.59	0.83	0.91	1.05	0.77	1.07	1.16	1.28	1.41	1.46	1.40
Industrial, Auto and Vehicle Parts	0.11	0.25	0.27	0.39	0.40	0.45	0.51	0.67	0.68	0.70	0.61	0.83	0.93	1.07	1.17	1.34	1.46
Machinery	0.06	0.18	0.20	0.28	0.33	0.34	0.39	0.54	0.53	0.55	0.40	0.51	0.60	0.77	0.77	0.80	0.80
Basic Metals	0.03	0.14	0.15	0.19	0.18	0.23	0.22	0.34	0.34	0.34	0.17	0.24	0.30	0.4	0.33	0.40	0.41
Other Goods	0.67	1.31	1.33	1.61	1.59	1.69	1.86	2.46	2.47	2.87	2.59	2.91	2.91	3.22	3.68	3.15	3.18
Total	1.27	3.33	3.53	4.75	4.97	5.40	5.99	7.96	8.15	8.72	7.11	8.70	8.78	9.63	10.39	10.87	11.32
Percentage																	
Household Goods	24.2%	35.8%	37.1%	40.0%	40.7%	40.4%	40.4%	39.1%	39.4%	36.7%	36.2%	36.1%	32.8%	30.0%	29.2%	34.2%	35.9%
Construction & Materials	7.1%	7.7%	7.5%	8.1%	9.0%	9.5%	9.9%	10.5%	11.2%	12.1%	10.9%	12.3%	13.2%	13.3%	13.6%	13.4%	12.4%
Industrial, Auto and Vehicle Parts	8.5%	7.4%	7.7%	8.1%	8.1%	8.3%	8.6%	8.4%	8.4%	8.0%	8.6%	9.5%	10.6%	11.1%	11.3%	12.3%	13.0%
Machinery	4.8%	5.4%	5.8%	6.0%	6.6%	6.2%	6.4%	6.8%	6.5%	6.3%	5.6%	5.9%	6.8%	8.0%	7.4%	7.4%	7.0%
Basic Metals	2.7%	4.2%	4.3%	3.9%	3.6%	4.3%	3.6%	4.3%	4.2%	3.9%	2.3%	2.7%	3.4%	4.2%	3.2%	3.7%	3.6%
Other Goods	52.6%	39.4%	37.5%	33.8%	32.0%	31.3%	31.1%	30.9%	30.4%	32.9%	36.4%	33.5%	33.2%	33.4%	35.4%	29.0%	28.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Port of Vancouver data

The trends from Table 1.17 are further noted in se developments are also summarised in Figure 1.12, with the continued good growth notable after the Global Financial Crisis in 2009, including for the 2015 projections.



A parallel assessment has been developed that summarises the important Port of Vancouver containerised export cluster. Table 1.18 highlights the following significant points:

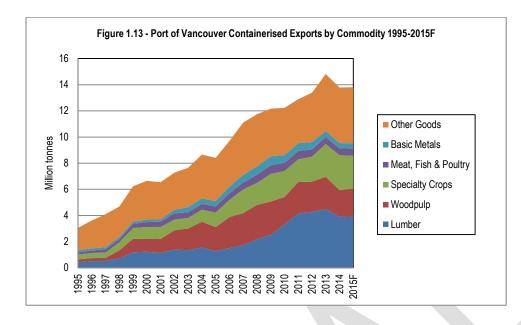
- The tonnage of containerised exports continues to exceed the total tonnage of container imports for 2015F imports were 11.32 million tonnes, compared with 13.81 million tonnes for exports. This is because the commodities exported are generally considerably denser than the broad spectrum of containerised imports. This results in difficulties with regard to inventory both ratios of 20': 40' containers and also empty container availability.
- Lumber and wood pulp are the most significant cargo sectors in the local cargo base. The market share of these commodities has increased from 37 per cent in 2005 to a peak of 50.9 per cent in 2011 although market share has since fallen back somewhat since to an estimated 43.9 per cent for 2015. Chinese demand has been the primary driver of this trend, with containerisation being the primary mode for these rapidly developing volumes. This routing back to China is expected to continue moving forward.
- Specialty crops have seen some increase in market share and this reached some19.4 per cent of demand in 2014, before dropping back slightly to an estimated 18.2 per cent for 2015. This sector will continue to be directly driven by East Asian demand over the forecast period and is expected to see some marginal fluctuations as a result.
- The balance of demand has remained fairly stable over the period, with the increase in forest product market share reciprocated by a decline in the 'Other Goods' category.

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
Million Tonnes																	
Lumber	0.42	1.22	1.15	1.38	1.35	1.55	1.27	1.50	1.73	2.19	2.51	3.32	4.15	4.26	4.50	3.91	3.93
Woodpulp	0.22	1.00	1.04	1.49	1.65	1.97	1.84	2.37	2.45	2.62	2.56	2.09	2.41	2.33	2.46	2.03	2.12
Specialty Crops	0.38	0.90	0.93	0.82	0.81	0.92	1.11	1.31	1.81	1.68	2.12	1.99	1.74	1.91	2.51	2.67	2.52
Meat, Fish & Poultry	0.15	0.37	0.41	0.47	0.43	0.44	0.47	0.50	0.53	0.62	0.65	0.61	0.64	0.55	0.54	0.52	0.54
Basic Metals	0.17	0.19	0.17	0.27	0.40	0.42	0.42	0.51	0.59	0.65	0.69	0.61	0.59	0.57	0.45	0.41	0.42
Other Goods	1.71	2.97	2.84	2.85	3.00	3.36	3.30	3.49	3.99	3.98	3.64	3.62	3.37	3.77	4.36	4.25	4.28
Total	3.05	6.65	6.54	7.28	7.64	8.66	8.41	9.69	11.10	11.74	12.17	12.23	12.89	13.39	14.82	13.79	13.81
Percentage																	
Lumber	13.9%	18.3%	17.6%	19.0%	17.7%	17.9%	15.1%	15.5%	15.6%	18.6%	20.6%	27.1%	32.2%	31.8%	30.4%	28.4%	28.5%
Woodpulp	7.0%	15.1%	15.9%	20.4%	21.6%	22.7%	21.9%	24.5%	22.0%	22.3%	21.0%	17.1%	18.7%	17.4%	16.6%	14.7%	15.4%
Specialty Crops	12.5%	13.5%	14.2%	11.2%	10.6%	10.6%	13.2%	13.6%	16.3%	14.3%	17.4%	16.2%	13.5%	14.3%	16.9%	19.4%	18.2%
Meat, Fish & Poultry	4.9%	5.6%	6.2%	6.5%	5.7%	5.1%	5.6%	5.2%	4.8%	5.3%	5.4%	5.0%	4.9%	4.1%	3.6%	3.8%	3.9%
Basic Metals	5.5%	2.9%	2.7%	3.7%	5.2%	4.8%	5.0%	5.2%	5.3%	5.5%	5.7%	5.0%	4.6%	4.3%	3.0%	3.0%	3.0%
Other Goods	56.2%	44.6%	43.4%	39.1%	39.2%	38.8%	39.2%	36.0%	36.0%	33.9%	29.9%	29.6%	26.1%	28.2%	29.4%	30.8%	31.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 1.18 Port of Vancouver: Containerised Export Volumes 1995-2015F

Source: Port of Vancouv er data

These export volumes developments are further summarised in Figure 1.13, with the small decline in overall tonnes for 2014 noted, followed largely flat growth anticipated for 2015 (based on January to September 2015 activity).



Of the individual export commodities, those items listed as specialty crops are noteworthy. While not the largest cargo in terms of volumes, there are known industry trends of importance to the Port of Vancouver, as the following notes:

- World grain demand has continued to increase year-on-year, rising by just over 3.1 per cent per annum between 2000 and 2014, which is double the CAGR generated between 1980 and 2000 (a CAGR of 1.46 per cent), with volumes forecast to increase from 345.7m tonnes in 2011/12 to some 418.6m tonnes in 2020/21 a CAGR of 2.15 per cent.
- Containerised grain shipping no longer regarded as just a niche market or acting just as an economical backhaul. The US Midwest Shippers Association has noted that although only 10 per cent of total grain exports use containers at present, the trend is growing and will continue to do so. The US Department of Agriculture endorsed this view, confirming that growth of around 10 per cent is occurring annually since 2013 in terms of grain exports using containers.
- The US Soybean Council confirms that 25 per cent of all exports from North America are being shipped to China, to meet the country's growing food demand requirements. Further strong export growth, of up to 60 per cent in total, is anticipated by 2020.
- There are distinct advantages of using containers that support global food manufacturing (such as food safety and quality assurance, greater traceability and minimal damage).
- Transloading facilities are crucial for export grain and the new Canadian National facility in Chicago will
 assist serving the US Midwest area and Pacific Gateway ports can benefit. With 40 per cent of total US
 corn and soyabean originating from the US (Midwest) states of Illinois, Iowa, Michigan and Wisconsin,
 the new Canadian National is well-placed to attract cargo that can be moved west, subject to sufficient
 rail capacity.
- To further endorse infrastructure developments supporting export demand to Asia for North American grains, known projects outside of the Pacific Gateway region include:

- Total Terminals Inc (TTI) facility at Long Beach which is seeking to develop a transload operation at its Pier T operation. The plan is to be able to (initially), transfer 750,000 tonnes of grain sourced from the US Midwest into empty containers for shipment to China. Full build-out could see a capacity of 2.8 million tonnes developed.
- Union Pacific offers a new transload facility in Yermo, Southern California, specifically designed for unit trains of grain from the US Midwest that are then moved to Los Angeles and Long Beach.
- Oakland has a new transload facility in San Leandro.
- Tacoma Transload facility is served by major railroads, including Canadian Pacific and can handle corn, soybeans and wheat.
- Minot, North Dakota (North Dakota Port Services) intermodal rail provided by BNSF that offers transloading and inland container access for specialty crops.

In essence, it is imperative that the Port of Vancouver is able to offer comparable transload services to effectively compete with Pacific Northwest region ports and facilities in California. In the same way that there are import discretionary markets for imports from Asia, there is also a seemingly growing market for exports too in reverse for cargo moving back to Asia.

The economic importance of forest products to the Pacific Gateway region, and therefore the Port of Vancouver, is identified in Section 1.7. The Forest Products Association of Canada (FPAC) advocates on behalf of the sector regarding transportation, trade and taxes for 66 per cent of certified forest lands in Canada. It states that the Canadian forest products industry is worth C\$57 billion per year, of which almost 50 per cent of revenues are generated from selling products in international market. The group also confirms the following:

- British Columbia has 60 million hectares of forest (of which 50 per cent is time production).
- Forest products are the number one export commodity from Canada to Asia.
- Forest product exports to the US are dropping in favour of Canada in the past 10 years the share moving to the US has fallen from 80 per cent to 62 per cent.
- A new free trade deal between Canada and South Korea (Canada's fourth largest export market in Asia) is expected to help boost export demand further. Currently C\$500 million of wood, pulp and paper is exported, of which 50 per cent is from western Canada.

In addition, as part of FPAC's Vision 2020 initiative it is targeting generating an additional C\$20 billion in economic activity from the forest products industry, of which a large component will be serving growing markets. With forest products already being Canada's leading export commodity to Asia, of which the largest proportion is generated by western Canada, then the Pacific Gateway ports are well-placed to meet this growing demand.

However, while FPAC offers no conclusive comments relating to likely increasing traffic, it does acknowledge the need for an efficient transportation network to support growth and future export activities.

China is expected to continue to be the major driver for Canadian forest products. In 2010, Canada surpassed Russia to become the largest supplier of softwood lumber to China.

Forestry Innovation Investment (FII), the market development agency for forest products of the British Columbia government, announced that by the end of October 2013 the previous record for 2011 had been beaten, with total lumber softwood exports to China reaching C\$1.17 billion. This overall trend has continued into 2014.

Monthly volumes of products moving totaled around 865,000m³ and with a noted 20,000+ major wood-building projects being served by Canadian forest products, future demand is expected to remain strong. Japan is a smaller market but remains the largest market for British Columbia in terms of high-grade lumber. The Japanese government announced in 2010 that it intends to expand the use of wood products in building construction and the position was re-affirmed during 2015.

The production of forest products locally in British Columbia and western Canada means that Pacific Gateway ports remain the preferred location for exports of these products when moving in containers (and via breakbulk). The need for transportation access to centres for transloading of these goods into international containers will also be an important consideration in the future.

Conversion of tonnes to TEU based on historical data continues to see weights rising, slowly

The development of container cargo volumes and weights are summarised in Table 1.19. This is an important perspective in the current context, not just with respect to the container inventory issues already mentioned but also because container cargo statistics are maintained in tonnage terms and it will be necessary to translate these volumes into TEU numbers for the forecasting process.

Table 1.19 summarises the development of container weights over the period since 2008. It is calculated that the average cargo weight for an export laden TEU via the Port of Vancouver has generally been around 13 tonnes.

This trend is expected to continue for 2015, with the projected total of just over 13.3 tonnes reflecting recent developments in commodities moving through the port. One noted development in 2015 was the amount of machinery/parts moving, with the January to September 2015 period seeing a total of 2.3 million tonnes exported, an increase on the 2014 total of 131,000 tonnes.

Obviously it is necessary to monitor this trend into 2016 to see if it continues to occur or if 2015 was simply due to a specific large-scale contract for this commodity.

The corresponding figure for imports is much lower at between 7.1 to 7.2 tonnes per laden TEU. There have been only limited variations to these weights over the study period, with this fact reflecting largely stable commodity profiles in each sector of commodities being shipped via the Port of Vancouver.

Table 1.19

Port of Vancouver Containerised Export Volumes 2008-2015F

- million tonnes

	2008	2009	2010	2011	2012	2013	2014	2015F
Exports								
Million Tonnes	11.741	12.167	12.232	12.892	13.396	14.618	13.792	16.688
Million TEUs	0.915	0.925	0.941	1.000	1.048	1.126	1.043	1.253
Tonnes/TEU	12.82	13.15	13.00	12.90	12.78	12.98	13.22	13.31
Imports								
Million Tonnes	8.718	7.112	8.696	8.783	9.626	10.224	10.874	11.317
Million TEUs	1.238	1.007	1.233	1.235	1.349	1.419	1.498	1.58
Tonnes/TEU	7.04	7.06	7.05	7.11	7.14	7.21	7.26	7.17

Source: Port of Vancouv er data

Containerised demand by trading partner – Importance of Asia, notably China, continues

The importance of the Asian markets in driving containerised cargo flows through the region (and via the Port of Vancouver) is clearly evident. Table 1.20 outlines the containerised imports by source country and the dominance of Asian locations is evident, along with the following additional key conclusions:

- China continues to be the single largest country source of imports, with an estimated 6.79 million tonnes anticipated for 2015F, equating to 60.0 per cent of total activity. The emergence of this country has impacted all other locations with shares falling as China's dominance has increased.
- The second largest grouping is some distance behind, at just 17.6 per cent and comprising all other locations not specifically noted – in 2000 the share was 26.2 per cent.
- Other significant individual countries in are South Korea with a projected 1.20 million tonnes (10.6 per cent) for 2015, Taiwan at 0.47 million tonnes (4.2 per cent), Hong Kong (0.46 million tonnes / 4.1 per cent) and Thailand (0.41 million tonnes / 3.6 per cent). The major Asian locations listed individually still account for the vast majority of the port's container imports and this is will not alter moving forward.

Table 1.20 Port of Vancouver: Containerised Imports by Source 1995-2015F

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
Million Tonnes	1333	2000	2001	2002	2003	2004	2003	2000	2001	2000	2003	2010	2011	2012	2013	2014	20131
China	0.17	0.96	1.17	1.83	2.33	2.77	3.38	4.94	5.20	5.35	4.05	5.15	5.09	5.32	5.95	6.61	6.79
Hong Kong	0.27	0.64	0.60	0.76	0.62	0.55	0.47	0.53	0.52	0.53	0.45	0.56	0.52	0.59	0.44	0.44	0.46
South Korea	0.06	0.31	0.32	0.41	0.36	0.39	0.37	0.61	0.58	0.64	0.65	0.72	0.83	1.23	1.17	1.12	1.20
Taiwan	0.13	0.32	0.32	0.36	0.35	0.35	0.35	0.37	0.37	0.37	0.30	0.38	0.42	0.62	0.54	0.46	0.47
Thailand	0.11	0.23	0.27	0.34	0.34	0.35	0.34	0.39	0.38	0.36	0.36	0.39	0.37	0.34	0.39	0.41	0.41
Others	0.53	0.87	0.85	1.04	0.97	0.99	1.07	1.11	1.10	1.47	1.30	1.50	1.54	1.88	2.12	1.83	1.99
Total	1.27	3.33	3.53	4.75	4.97	5.40	5.99	7.96	8.15	8.72	7.11	8.70	8.78	9.98	10.61	10.87	11.32
Percentage																	
China	13.2%	28.8%	33.3%	38.4%	46.8%	51.4%	56.5%	62.1%	63.8%	61.4%	57.0%	59.2%	57.9%	53.3%	56.1%	60.8%	60.0%
Hong Kong	21.6%	19.1%	16.9%	16.1%	12.5%	10.2%	7.8%	6.6%	6.3%	6.0%	6.3%	6.4%	6.0%	5.9%	4.1%	4.0%	4.1%
South Korea	4.4%	9.4%	9.0%	8.7%	7.3%	7.2%	6.2%	7.7%	7.1%	7.3%	9.1%	8.3%	9.5%	12.3%	11.0%	10.3%	10.6%
Taiwan	10.2%	9.6%	9.0%	7.7%	7.0%	6.4%	5.9%	4.7%	4.6%	4.3%	4.3%	4.4%	4.8%	6.2%	5.1%	4.2%	4.2%
Thailand	8.6%	6.9%	7.7%	7.2%	6.9%	6.6%	5.7%	5.0%	4.7%	4.1%	5.1%	4.5%	4.2%	3.4%	3.7%	3.8%	3.6%
Others	42.1%	26.2%	24.1%	21.9%	19.5%	18.3%	17.9%	14.0%	13.5%	16.9%	18.2%	17.2%	17.6%	18.8%	20.0%	16.8%	17.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Port of Vancouv er data

With respect to export destinations from the Port of Vancouver, these are summarised in Table 1.21 and again China is the dominant single location, as the following key conclusions note, which is subject to the potential developments from the Trans Pacific Partnership (TPP) agreement currently under discussion:

- It is projected that for 2015 Chinese exports will reach almost 6.0 million tonnes, a marginal rise over the 5.8 million tonnes for 2014. This will see China's share of containerised tonnes remain around 43.3 per cent of total activity.
- The next largest single country location will be Japan, with an anticipated 2.43 million tonnes for 2015, equal to an estimated 17.6 per cent share of the total.
- Other notable locations are Taiwan with an expected 0.76 million tonnes (or a 5.5 per cent share), followed by South Korea (with 0.61 million tonnes / 4.4 per cent share) and Hong Kong (with 0.30 million tonnes / 2.2 per cent share).
- The remaining share of 26.9 per cent, or 3.72 million tonnes, will be generated by all other countries in 2015. This share has seen some relatively minor fluctuations over the past 10 years, ranging from 20.8 per cent in 2000 to 28.1 per cent for 2014. However, the major destinations in Asia listed still comprise for the majority of all export activity through the Port of Vancouver and this is not expected to alter moving forward.

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
Million Tonnes																	
China	0.17	1.06	1.22	1.74	2.21	2.62	2.80	3.49	3.75	4.07	5.17	4.84	5.68	5.55	6.72	5.97	5.99
Japan	1.21	2.59	2.52	2.46	2.21	2.55	2.18	2.37	2.48	2.58	2.23	2.51	2.47	2.89	2.38	2.18	2.43
Taiwan	0.50	0.79	0.69	0.75	0.79	0.86	0.77	0.84	0.98	0.89	0.69	0.79	0.81	0.74	0.73	0.76	0.76
South Korea	0.15	0.43	0.44	0.53	0.55	0.56	0.55	0.68	0.88	0.91	0.75	0.62	0.59	0.65	0.58	0.64	0.61
Hong Kong	0.30	0.50	0.40	0.43	0.39	0.40	0.36	0.44	0.44	0.54	0.44	0.46	0.43	0.45	0.43	0.37	0.30
Others	0.73	1.29	1.27	1.37	1.50	1.66	1.75	1.88	2.58	2.75	2.90	3.02	2.91	3.11	3.77	3.88	3.72
Total	3.05	6.65	6.54	7.28	7.64	8.66	8.41	9.69	11.10	11.74	12.17	12.23	12.89	13.39	14.61	13.80	13.81
Percentage																	
China	5.7%	15.9%	18.7%	23.9%	28.9%	30.3%	33.3%	36.0%	33.8%	34.7%	42.5%	39.6%	44.0%	41.4%	46.0%	43.3%	43.4%
Japan	39.5%	38.9%	38.5%	33.8%	28.9%	29.5%	25.9%	24.4%	22.3%	22.0%	18.3%	20.5%	19.2%	21.6%	16.3%	15.8%	17.6%
Taiwan	16.3%	11.8%	10.5%	10.3%	10.3%	10.0%	9.1%	8.7%	8.9%	7.6%	5.7%	6.5%	6.3%	5.5%	5.0%	5.5%	5.5%
South Korea	4.9%	6.4%	6.8%	7.3%	7.2%	6.5%	6.5%	7.0%	7.9%	7.7%	6.1%	5.0%	4.6%	4.9%	4.0%	4.6%	4.4%
Hong Kong	9.8%	7.5%	6.1%	5.9%	5.1%	4.6%	4.3%	4.5%	3.9%	4.6%	3.6%	3.7%	3.4%	3.4%	2.9%	2.7%	2.2%
Others	23.8%	19.4%	19.4%	18.8%	19.6%	19.2%	20.8%	19.4%	23.2%	23.4%	23.8%	24.7%	22.6%	23.2%	25.8%	28.1%	26.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 1.21			
Port of Vancouver: Containerised	Exports by	Destination	1995-2015F

Source: Port of Vancouv er data

Containerised trade by North American hinterland – importance of US continues to increase

In considering the development of the Port of Vancouver demand it is important to define and assess the role played by various North American hinterlands in driving containerised cargo volumes. Table 1.22 details the long term development of import demand in terms of ultimate destination for the period through to estimates for 2015, based on January to September year-to-date data.

Throughout the 1990s the Port of Vancouver was primarily a port serving local containerised import demand, with British Columbia accounting for around 53.1 per cent of demand in 1995. The proportional importance of local markets declined sharply in the period to 2000 and then fell further in the first years of the 2000s and between 2010 and 2015 has fluctuated between 27 per cent and 30 per cent of total demand. This represents a sizeable cargo base for shipping lines calling at the port that equates to an estimated 3.36 million tonnes for 2015, a rise on the 3.04 million tonnes noted for 2014.

The strong economic growth in Alberta and the Prairies has also seen the market share increase with these regions surpassing 11 per cent in 2011 and maintaining a double-digit share until 2014. The projected figure for 2015 is expected to be 0.99 million tonnes, which makes it the lowest total since 0.81 million tonnes was recorded for 2010.

The role of the Port of Vancouver as a gateway for eastern and central Canada has shown some decline over the past 10 years and has fallen from 56.9 per cent in 2005 to an estimated 37.4 per cent for 2015. This does not reflect a particular weakness at the Port of Vancouver as the 2011 and 2012 figures suggest stabilisation in shares but, rather, is a manifestation of the broader trend in favour of all-water services and Atlantic ports².

It should still be noted that even though the share of the port's total import market has fallen, the actual volumes handled for this area has in fact increased since 2011 when it had fallen to 3.93 million tonnes. There were increases noted year-on-year in 2012, 2013 and 2014, when 4.24 million tonnes was handled and the projected figure for 2015 is virtual parity with this 2014 total.

² It should also be noted that the picture is distorted by the 'transloading' of containers at depots in BC. This entails the unloading of maritime containers and the reloading of goods into domestic (53') containers for onward distribution – primarily by rail – to the east. This further complicates the position with Vancouver being more dependent upon eastern markets than would be indicated by this run of data.

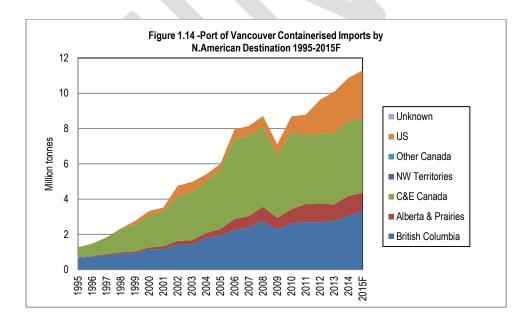
	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
Million Tonnes																	
British Columbia	0.67	1.15	1.17	1.43	1.43	1.80	1.91	2.26	2.39	2.76	2.28	2.61	2.68	2.70	2.76	3.04	3.36
Alberta & Prairies	0.03	0.10	0.16	0.20	0.24	0.27	0.39	0.61	0.64	0.80	0.67	0.81	1.04	1.05	1.07	1.14	0.99
C&E Canada	0.56	1.83	1.96	2.52	2.72	2.92	3.36	4.53	4.56	4.49	3.59	4.39	3.93	3.97	4.05	4.24	4.23
NW Territories	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Canada	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
US	0.00	0.23	0.23	0.61	0.58	0.41	0.33	0.54	0.56	0.65	0.58	0.89	1.13	1.91	2.34	2.45	2.71
Unknown	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.03
Total	1.27	3.33	3.53	4.75	4.97	5.40	5.99	7.96	8.15	8.72	7.11	8.70	8.78	9.63	10.22	10.88	11.32
Percentage																	
British Columbia	53.1%	34.6%	33.1%	30.0%	28.8%	33.3%	31.9%	28.4%	29.3%	31.7%	32.0%	30.0%	30.5%	28.0%	27.0%	28.0%	29.7%
Alberta & Prairies	2.4%	3.1%	4.4%	4.1%	4.7%	5.0%	6.5%	7.7%	7.9%	9.2%	9.4%	9.3%	11.9%	10.9%	10.5%	10.5%	8.7%
C&E Canada	44.3%	54.9%	55.6%	53.0%	54.7%	54.1%	56.1%	56.9%	55.9%	51.5%	50.5%	50.5%	44.7%	41.2%	39.6%	39.0%	37.4%
NW Territories	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Canada	0.0%	0.0%	0.1%	0.1%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
US	0.1%	7.0%	6.6%	12.8%	11.7%	7.6%	5.5%	6.8%	6.8%	7.5%	8.1%	10.2%	12.9%	19.8%	22.9%	22.5%	24.0%
Unknown	0.1%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 1.22 Port of Vancouver: Containerised Imports by N. American Destination 1995-2015F

Source: Port of Vancouv er data

The other clear and highly noticeable trend has been the increase in the US as a market for the Port of Vancouver. This was only 6.6 per cent in 2001 and had reached just 8.1 per cent by 2009 but strong growth from 2011 onwards should be noted and the projected share for 2015 is 24.0 per cent - hence it should be noted that the Port of Vancouver is an important gateway for US imports of Asian cargo.

These import developments are further summarised by Figure 1.14, with the recent development of US markets clearly noticeable.



The position with regard to export cargoes is different. The role of locally-sourced BC commodities is more significant, with these volumes increasing from 58.2 per cent of all demand in 2000 to an estimated level of 78.1 per cent anticipated for 2015, as Table 1.23 identifies.

In terms of actual tonnages handled, the estimated total for 2015 is 10.78 million tonnes, which is an improvement of the 10.33 million tonnes for 2014 and almost back to the highest ever figure for the port achieved in 2013 when it noted 10.98 million tonnes.

This factor underlines the degree to which the local export cluster has become a driving force for the port, which provides a relative advantage for ships calling with import cargoes that are then able to gain export loads returning to Asia.

The strength of the Port of Vancouver for exports is a combination of the manufacturing of goods in British Columbia and Western Canada, plus the diversity of transloading facilities in Vancouver and the number of shipping lines calling to the port's container terminals.

Other regions have seen reciprocal decline in proportional importance, with Central & East Canada expected to provide 1.29 million tonnes for 2015, a share of 9.3 per cent and the Alberta & Prairies region contributing an estimated 0.98 million tonnes (or a 7.1 per cent share) for the current year.

It should be noted that the Port of Vancouver's role as an export point for US goods has fallen since the decadehigh total of 6.2 per cent in 2013, with the estimated total for 2015 at 5.3 per cent. This equates to 0.73 million tonnes for 2015F and although it is significantly lower than import volumes moving to US destinations, the Port of Vancouver has a small, but largely stable, US export trade.

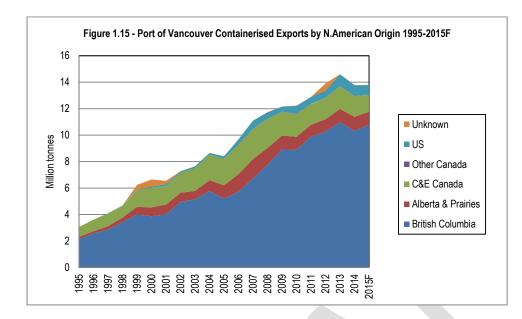
Table 1.23 Port of Vancouver: Containerised Exports by N. American Origin 1995-2015F

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
Million Tonnes																	
British Columbia	2.16	3.87	4.01	4.95	5.15	5.77	5.20	5.72	6.73	7.74	8.92	8.90	9.88	10.27	10.98	10.33	10.78
Alberta & Prairies	0.15	0.67	0.74	0.70	0.63	0.82	1.00	1.34	1.46	1.28	1.05	0.97	0.90	0.94	1.00	1.06	0.98
C&E Canada	0.73	1.49	1.39	1.51	1.72	1.93	2.02	2.21	2.28	2.18	1.79	1.72	1.55	1.61	1.72	1.56	1.29
Other Canada	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.01	0.02	0.02	0.00	0.00	0.00	0.00
US	0.01	0.08	0.14	0.11	0.14	0.13	0.17	0.41	0.63	0.50	0.39	0.60	0.53	0.55	0.90	0.83	0.73
Unknown	0.00	0.52	0.26	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.53	0.01	0.01	0.03
Total	3.05	6.65	6.54	7.28	7.64	8.66	8.41	9.69	11.10	11.74	12.17	12.23	12.89	13.40	14.62	13.79	13.81
Percentage																	
British Columbia	70.7%	58.2%	61.3%	68.0%	67.4%	66.6%	61.9%	59.0%	60.6%	66.0%	73.3%	72.8%	76.7%	76.6%	74.2%	74.9%	78.1%
Alberta & Prairies	5.0%	10.0%	11.3%	9.6%	8.2%	9.5%	11.9%	13.8%	13.2%	10.9%	8.6%	8.0%	7.0%	7.0%	6.8%	7.7%	7.1%
C&E Canada	24.0%	22.4%	21.3%	20.7%	22.4%	22.2%	24.0%	22.8%	20.5%	18.6%	14.7%	14.0%	12.0%	12.0%	11.6%	11.3%	9.3%
Other Canada	0.0%	0.3%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.2%	0.1%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%
US	0.2%	1.2%	2.2%	1.5%	1.9%	1.4%	2.0%	4.2%	5.6%	4.2%	3.2%	4.9%	4.1%	4.1%	6.2%	6.0%	5.3%
Unknown	0.0%	7.8%	3.9%	0.1%	0.1%	0.1%	0.2%	0.2%	0.1%	0.1%	0.1%	0.2%	0.0%	4.0%	7.3%	0.1%	0.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Port of Vancouv er data

The Port of Vancouver's containerised exports by North American origin are further highlighted in Figure 1.15, which clearly shows the dominance of the localised British Columbia market.

Moving forward this region is expected to continue to account for the majority of export container tonnes handled at the port's container terminals.



1.8 Introduction to Container Port Demand Forecasts to 2050

Against the background of a detailed review of the structure of regional and the Port of Vancouver demand, attention is now directed towards the overall development of demand in the markets where the port will be competing. This means developing a series of forecasts covering these developments prior to an assessment of the specific outlook for the container terminals at the Port of Vancouver that is outlined in Section VII. A discontinuity is noted in the approach to forecasting. The model which has driven demand in the period since the mid-1990s has been based on globalisation. That is to say, the migration of manufacturing from North America to East Asia (particularly China) and the resulting scale of containerised imports into North America has been the driving force of Transpacific demand. More recently, the pace of economic development in East Asia has stimulated the level of containerised exports, with this particularly focusing demand on the Port of Vancouver.

Given the long term perspective on demand that is the subject of this study, it is apparent that a simple (if modified) extrapolation of these trends will not provide an adequate picture of future demand levels. In order to accommodate possible developments a twin-track approach has been developed:

- For the period to 2025 the basic structure of globalisation is forecast to continue, with strong import demand growth and also significant export growth driven by Chinese and other emerging Asian trade.
- Beyond 2025 a scenario-based approach has been developed. There are clearly different models for subsequent economic development and these are likely to have divergent impacts on both the volumes and directions of North American trade.

This Section develops the analyses from these two perspectives, while adopting the following broad approach to the container port demand traffic forecasts produced:

- North American demand is derived from North American GDP forecasts and North American TEU growth/GDP growth multipliers, which serves as the basis of forecasts for the Pacific Northwest region.
- The projection for the Pacific West Coast, including the US Pacific South region of Los Angeles, Long Beach and Oakland is also specifically noted as part of the coastal split between the Pacific Northwest

and Pacific South areas, on the basis of share of volumes being maintained in accordance with long-term averages.

- Pacific Northwest regional demand is estimated as a fixed percentage of the forecast North American traffic.
- Pacific Gateway demand derived from Western Canada GDP forecasts and North American TEU growth/GDP growth multipliers, plus an allowance for increase intermodal potential for distant markets.

1.9 Forecast Container Demand Development to 2025

It is necessary to present a picture of the future development of demand on the basis of a 'top-down' macroeconomic analysis and projection. This Section develops such a review for the North American markets as a whole before focusing on the different market components for the Port of Vancouver. The actual development of container volumes at the port will be a function of the overall scale of demand, the competitive position of the port's terminal and the availability of capacity to meet demand on a cost-effective basis.

Globalisation has boosted economic growth and intensified the link between GDP and trade

In recent decades, as economies have expanded, trade has also increased to meet the demands of industry for raw materials and intermediate goods, and the demands of consumers for competitive products. Trade in manufactured goods (and intermediate goods) – the prime constituents of containerisation – has been at the centre of this global economic expansion.

During this period, the fundamental structure of the world economy has altered. The ability to source finished or partially manufactured goods in areas of low costs has been at the centre of the 'globalisation' of industries. Not only has this boosted world output, but it has also intensified the relation between economic output and trade. In the longer run, it will be the sustainability of this pattern of growth that will define the outlook for containerisation, and therefore demand development at Port of Vancouver's container terminals.

The availability of low cost transportation has stimulated globalisation and stimulated demand

The container system has been both a catalyst and a beneficiary of these developments. The availability of lowcost transport effectively eliminates freight charges as a significant consideration in the cost of most higher-value commodities. This allows complex global sourcing patterns to be developed. With the continued availability of low-cost labour in China and other major Asian regions, the migration of manufacturing to these locations seems certain to continue.

Although the period since 2008 has delivered a considerable shock to the world trading system, the resilience of the container sector has been clearly noted, with the business lost between the second half of 2008 and early 2010 now recovered. However, looking forward from the current perspective, it is clear that considerable uncertainty is still noted at the macro-economic level relating to key events, especially those currently occurring.

The overall structure of the market outlook has remained broadly stable in terms of major market drivers and general prospects. From the current perspective (end-2015), there are seen to be some significant changes that may well influence the outlook and that are considered in some detail in the current report. Essentially, these relate to changes in the macro-economic outlook for the markets and also specific trends relating to the container shipping industry itself. The overall impact of these changes has been carefully modelled and factored-into the forecasts here developed.

The following represents a summary of the key macro-economic factors of relevance:

- The outlook for the Chinese economy is considerably more uncertain than was noted in earlier forecasts. It is apparent that economic expansion is slowing as a result of the shifting of demand in favour of domestic consumption. This is unlikely to significantly impact on the structure of trade between to/from North America in the medium term and may well in actually stimulate export volumes via Vancouver as the Chinese economy is rebalanced.
- The cost differential between Chinese manufacturing and local conditions in North America has also reduced, although the advantages of Chinese output remain significant. This has seen increased interest in *'near-sourcing'* of production to, for example, Mexico and the *'reshoring'* of some production into the US itself. To date, the overall impact has been limited and confined to energy intensive primary industry and it should also be noted that the beneficiaries of this have included cheaper sources of production in, for example, Vietnam and Indonesia. For the medium term, the model of increased reliance on Chinese and other East Asian manufacturing is unlikely to be significant modified as major cost differences will be maintained.
- The collapse in commodity prices (especially oil) that has been noted since mid-2014 is a major trend that will influence the structure of trade in the short to medium term. This has a complex impact on the Canadian position. On the one hand, this is exerting a negative impact on the economies of the major oil and commodity producing Provinces (including British Columbia) but, conversely, this has acted as a major stimulus to demand in the US and in central Canada, where consumption of imported manufactured goods has benefitted. This has also resulted in a decline in the value of the Canadian dollar versus its US equivalent and this has further boosted the competitive position of the Vancouver alternative. While the impact of weak commodity prices has been generally negative for the Canadian economy the results have been broadly positive for Vancouver as a container gateway.
- There has been considerable progress on the *Trans-Pacific Partnership Agreement* (TPP) with a full text made public in early November 2015. The primary aim of this agreement will be to further reduce trade tariffs between the signatories. This will provide a further stimulus to trade between the members all of the major Pacific Rim economies apart from China and the US and Canada and will provide some further upside on transpacific containerised trade. The speed of progress on this arrangement was faster than had been anticipated in 2014.

The overall impact of these changes will influence the structure of demand forecasts for the Port of Vancouver. However, it should be noted that these are modifications rather than structural shifts, and the basic cost and market rationale that has been noted for the port remains in place. These issues inform the revision of the forecasts detailed in this study.

Analysis of GDP outlook scenarios as input parameters for the trade forecasting

Given the strong link between GDP and container demand, the starting point for regional demand projections must be a summary of the development trends for the economies under review. These projections have been fully updated and are based upon the position in Q4 2015. A review has been undertaken of published forecasts covering national and provincial GDP developments from a variety of sources. The following sections provide a brief economic outlook, especially a GDP outlook, for Canada and the US, as well as provincial outlooks for British Columbia, the Prairies, and Eastern Canadian provinces, based on published GDP data available from various banks directly.

National economic outlooks - sustained development for Canada and US

The position for Canada is summarised in Tables 1.24. The outlook is for sustained economic development over the remainder of the current decade, with the average growth level ranging between 2.5 per cent in 2016 to 2.0 per cent for 2020 (and beyond – based on current estimates). This data is sourced directly from each of the financial institutions listed and is not attributable to OSC.

Of course, this national figure is sourced from a wide range of different sources and each offers some minor fluctuations but the overall level of increase remains largely consistent and it can be assumed that the total Canadian GDP will see relatively small, but consistent, improvements moving forward.

Table 1.24

Canada - GDP Forecasts

Real % change

Year	BMO Prov.	Scotia Global	TD Prov.	RBC Prov.	CIBC Prov.	IMF	Average
	Econ. Outlook	Forecast	Econ. Update	Outlook	Forecast		
2014	2.4%	2.2%	2.3%	2.5%	2.4%	2.4%	2.4%
2015	1.2%	1.1%	1.2%	1.2%	1.8%	1.0%	1.3%
2016	2.1%	1.8%	2.0%	2.5%	4.9%	1.7%	2.5%
2017		2.3%	1.9%			2.4%	2.2%
2018						2.3%	2.3%
2019						2.1%	2.1%
2020						2.0%	2.0%
2021-2050							2.0%

Source: Collated by Ocean Shipping Consultants

The situation for the US is shown in Table 1.25. The US economy has gathered pace and on average is predicted to grow at 2.6 per cent in 2015 and 3.0 per cent for 2016. Further average increases are anticipated for the remainder of the current decade, albeit by 2020 a figure similar to Canada, of 2.0 per cent per annum, is projected. Again, relatively small but consistent improvements are being noted by the banks providing the data.

Table 1.25 USA - GDP Forecasts

Real % change

Year	BMO Prov.	Scotia Global	TD Prov.	RBC Prov.	CIBC Prov.	IMF	Average
	Econ. Outlook	Forecast	Econ. Update	Outlook	Forecast		
2014	2.4%	1.9%	2.7%	3.0%	2.4%	2.4%	2.5%
2015	2.5%	2.4%	2.5%	2.2%	3.7%	2.6%	2.6%
2016	2.6%	2.5%	2.6%	2.9%	4.4%	2.8%	3.0%
2017	2.3%	2.7%	2.4%			2.8%	2.6%
2018						2.7%	2.7%
2019						2.2%	2.2%
2020						2.0%	2.0%
2021-2050							2.0%

Source: Collated by Ocean Shipping Consultants

Regional economic outlooks, including stability in British Columbia

Although the Port of Vancouver is primarily a gateway for the national market (and, to a lesser extent, for the US) the outlook for the western provinces of Canada is very important as a generator of local demand and as a source of containerised exports. Province-specific GDP forecasts are prepared by several financial institutions and the results of the most recent estimations are summarised in Table 1.26. To show better short-term trends, both 2013 and 2014 data is included, along with estimates for 2017 (based on when available).

A fairly narrow range of projections for the short term is noted, with the following important points being noted:

- Local demand in British Columbia will remain stable, with consistent growth anticipated for 2015 and through to 2017. This is a manifestation of the broader economic recovery now underway.
- The western provinces will record a mixed outlook, with Alberta continuing to benefit from increased energy production and exports, whilst Manitoba and Saskatchewan will record more limited – but still positive demand growth.
- Eastern Canada here represented by Ontario and Quebec will also demonstrate continued economic growth – broadly in proportion to the anticipated national averaged.

The GDP projections for West Canada have been taken as basis as we believe this gives a better approximation than the overall Canadian GDP figures, including for the parts of Canada neighbouring the West Canadian area, which are believed to follow the West Canadian GDP better than the overall Canadian GDP.

It is apparent that the Port of Vancouver is very well placed to benefit from the relatively strong demand anticipated for Canada and, specifically, for the western provinces that comprise key hinterlands for import volumes. This will result in strong and sustained demand growth in the medium term.

Asian demand will remain the key driver of Port of Vancouver exports

Given the importance of containerised exports within the Port of Vancouver cargo base, it is also necessary to summarise the economic development of the key importing regions in East Asia. It has been strong levels of economic expansion that have driven demand for containerised commodities shipped via the port.

There have been wide variations in the year-on-year development of this relation, but in the period since 2000 this has begun to stabilise and this provides a useful tool for the forecasting of demand in these sectors.

Table 1.26

Canada: Short Term GDP Forecasts by Province

Real % change

		2013	2014	2015 F	2016 F	2017 F
BMO - Janu	uary 22, 2016					
	British Columbia	1.9%	3.2%	2.6%	2.5%	2.4%
	Alberta	3.8%	4.8%	-2.8%	-2.5%	2.1%
	Saskatchewan	5.0%	1.9%	-0.5%	0.0%	1.8%
	Manitoba	2.2%	2.3%	2.2%	1.8%	2.1%
	Western Canada (calculated)	3.1%	3.7%	-0.2%	0.0%	2.2%
	Ontario	1.3%	2.7%	2.5%	2.2%	2.3%
	Quebec	1.0%	1.5%	1.6%	1.7%	1.8%
	Canada	2.0%	2.5%	1.2%	1.0%	2.1%
RBC - Dece	ember 2015					
	British Columbia	1.9%	3.2%	2.9%	3.1%	2.9%
	Alberta	3.8%	4.8%	-1.3%	0.9%	2.7%
	Saskatchewan	5.0%	1.9%	-0.6%	2.5%	1.8%
	Manitoba	2.2%	2.3%	1.8%	2.4%	2.6%
	Western Canada (calculated)	3.1%	3.7%	0.6%	2.0%	2.7%
	Ontario	1.3%	2.7%	2.1%	2.5%	2.7%
	Quebec	1.0%	1.5%	1.3%	1.9%	1.7%
	Canada	2.0%	2.5%	1.2%	2.2%	2.7%
TD - Octob	er 2015					
	British Columbia	1.9%	3.2%	2.5%	2.4%	2.1%
	Alberta	3.8%	4.8%	-1.4%	1.2%	1.6%
	Saskatchewan	5.0%	1.9%	-0.8%	1.7%	1.9%
	Manitoba	2.2%	2.3%	2.3%	2.2%	2.1%
	Western Canada (calculated)	3.1%	3.7%	0.4%	1.8%	1.9%
	Ontario	1.3%	2.7%	2.0%	2.4%	2.0%
	Quebec	1.0%	1.5%	1.7%	2.1%	2.0%
	Canada	2.0%	2.5%	1.2%	2.0%	1.9%
ScotiaBank	c - January 13, 2016					
	British Columbia	1.9%	3.2%	2.3%	2.3%	2.4%
	Alberta	3.8%	4.8%	-1.6%	-0.2%	2.2%
	Saskatchewan	5.0%	1.9%	-0.2%	1.0%	2.2%
	Manitoba	2.2%	2.3%	2.2%	2.2%	2.3%
	Western Canada (calculated)	3.1%	3.7%	0.3%	1.0%	2.3%
	Ontario	1.3%	2.7%	2.2%	2.3%	2.4%
	Quebec	1.0%	1.5%	1.6%	1.9%	2.0%
	Canada	2.0%	2.5%	1.2%	1.6%	2.3%

Source: Banks

Medium Term Macro-Economic Outlook

It is clearly necessary to consider how the regional economy will expand over the forecast period – indeed, this will be one of the primary determinants of container port demand in the Port of Vancouver markets. There is now renewed confidence in the outlook for the world economy, but the position remains fragile, with structural weaknesses with regard to trade and government deficits. Given these uncertainties, it is unclear at what rate the world economy will continue to recover and whether the current recovery is sustainable. Therefore, three macroeconomic growth forecasts have been developed to cope with the range of possible outcomes, taking into account the summary core macro-economic forecasts shown in Table 1.27.

The inter-dependencies within the world's economy and foreign trade mean that it is necessary to consider the global and regional economic scenarios that are likely to underpin economic growth, trade and hence port demand both within the region and in the broader relay context. Three cases have been developed:

- The Base Case this represents a consensus view of the position through to 2017, with a continued recovery towards trend growth. From the current perspective this remains the likely outcome.
- The High Case this takes into account positive developments in 2014, followed by a further strong increase and then a return to a somewhat higher rate of economic expansion.
- The Low Case anticipates some further uncertainties at the macro-economic level, such as seen in 2014 and 2015, with the chance of some renewed stagnation. Beyond 2017 a more restrained pace of subsequent expansion as the cost of the downturn is worked through the economy.

Developments at this macro-economic level are critical in determining the position for the regional economies. Significant risks for the world economy remain and play directly through into the region.

	2014	2015	2016	2017	2018	2019	2020	2021-2025
<u>High Case</u>								
West Canada	4.26%	0.35%	1.38%	2.53%	2.53%	2.53%	2.53%	2.53%
Canada	2.81%	1.20%	1.91%	2.77%	2.68%	2.46%	2.31%	2.30%
USA	2.79%	2.96%	3.27%	3.22%	3.08%	2.53%	2.30%	2.30%
Base Case								
West Canada	3.70%	0.30%	1.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Canada	2.44%	1.04%	1.66%	2.41%	2.33%	2.14%	2.01%	2.00%
USA	2.43%	2.57%	2.84%	2.80%	2.68%	2.20%	2.00%	2.00%
Low Case								
West Canada	2.07%	0.24%	0.96%	1.76%	1.76%	1.76%	1.76%	1.76%
Canada	2.07%	0.88%	1.41%	1.93%	1.86%	1.71%	1.61%	1.60%
USA	2.07%	2.18%	2.41%	2.24%	2.14%	1.76%	1.60%	1.60%

<u>Table 1.27</u> <u>Core Macro-Economic Forecasts to 2025</u>

Real % change

Source: Various, incl. Ocean Shipping Consultants

These core macro-economic GDP forecasts are used in the projections of container demand to 2025 under the same scenarios of Base Case, High Case and Low Case. The North American forecasts utilise Canadian/US

GDP growth rates, with Western Canada GDP growth used for the Pacific Gateway projections, with the following essential conditions subsequently applied:

Base Case

- Economic fall-out of the Global Financial Crisis has finally settled and the scope for economic uncertainty over 2016 and 2017 is limited;
- Credit availability continues to improve through 2016 and 2017;
- Continued long-term growth of US economy, accompanied by free-trade policies;
- Euro Zone pressures continue to restrain growth, but uncertainties are contained;
- Economic growth and free trade policies in the EU;
- More flexible economic management within Euro Zone;
- Economic and currency stability in East Asia;
- Renewed attempts to deregulate and restructure Japanese economy;
- Political stability, economic expansion and continuing structural reforms in China;
- Oil price returns to a stable level in the US\$65-75 per barrel range;
- Stable trade framework and continued foreign direct investment in other major Asian economies included.

The High Case

- Economic fall-out now contained and more rapid expansion from 2016 and 2017;
- Credit availability improves sharply during 2016 and 2017 and approaches pre-crisis levels;
- Earlier return to long-term growth of US economy, stimulating earlier expansion in trade and eased credit conditions;
- Economic growth and free trade policies in the EU;
- Euro Zone pressures are successfully managed;
- Japanese economy recovers more strongly than in the Base Case;
- Return to economic and currency stability in East Asia but at an accelerated rate;
- Political stability, economic expansion and accelerated structural reforms in China;
- Oil price stable at relatively high levels;
- Stable trade framework and continued foreign direct investment in other major Asian economies included.

Low Case

- Renewed uncertainty and periods of short term contraction in established economies;
- More uncertainty in the US, leading directly to slower world growth;
- Slower growth in the EU economies especially in the south;
- Renewed inflexibility of economic management and irreconcilable policy objectives within Euro Zone;
- More prolonged stagnation of the Japanese economy, with inadequate structural adjustment;
- Economic uncertainty in China and lower growth;
- Uncertain and volatile development of oil prices with periods of very low pricing;
- More uncertain trade and foreign investment climate in other major Asian economies included.

It remains unclear which development will actually occur, but the details outlined captures the range of possibilities that can be reasonably anticipated and support the core GDP forecasts that are used in structuring the regional import/export demand forecasts for North America shown by Table 1.27.

Under the Base Case the current recovery accelerates in both the US and Canada and the increasing importance of the West Canada region continues over the forecast period. The development of these underlying economic factors will be the primary determinant of demand development for import volumes. The High and the Low Cases represent a range of possible developments around the Base Case which, with changes in the assumed container port multiplier, will determine the overall development of demand at the continental and regional level.

North American and the Port of Vancouver trades remain largely determined by trade with Asia

For North America as a whole, imports remain the dominant category. That is to say, there are far more loaded boxes imported into the markets than are exported and focusing on this link as the primary driver is clearly appropriate. However, in the case of the Port of Vancouver, the importance of the export sector necessitates analysis of some additional macro-economic drivers. As has been noted, the destination of containerised exports is primarily China (and other major) economies). The level of future demand development over the horizon to 2025 will be driven by the pace of continuing expansion in these markets.

Table 1.28 presents a summary of the overall economic development of the top five Port of Vancouver containerised cargo markets for the period since 2004 and includes the latest IMF forecasts for 2015F. The sheer dynamism of the region is apparent, with China leading the way and the regional NICs (Taiwan, South Korea and Hong Kong) all recording sustained growth. The exception is Japan, where much more restricted growth is noted in-line with other developed economies. These countries are classified as "other major Asia." The other major Asian total in Table 1.28 excludes China does utilise a weighted average of the remaining economies shown.

Table 1.28

Key Asian Markets - GDP Development 2004-2015F

Real % change

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
China	10.1	11.3	12.7	14.2	9.6	9.2	10.4	9.3	7.7	7.7	7.3	6.8
Japan	2.4	1.3	1.7	2.2	-1.0	-5.5	4.4	-0.6	2.0	1.6	-0.1	0.6
Taiwan	6.2	4.7	5.4	6.0	0.7	-1.8	10.7	4.1	1.3	2.2	3.8	2.2
South Korea	4.6	4.0	5.2	5.1	2.3	0.3	6.3	3.7	2.0	2.9	3.3	2.7
Hong Kong	8.5	7.1	7.0	6.4	2.3	-2.6	7.0	4.9	1.5	3.1	2.5	2.5
Other Major Asia	3.4	2.5	3.1	3.7	0.5	-3.4	5.8	1.3	2.5	2.5	1.5	1.7

Note: China is excluded from the Other Major Asia GDP totals

Source: IMF

China is the dominant force, but to capture economic developments in these key trading locations with the Port of Vancouver, IMF average data concerning the other major Asia (which excludes China, although China is included in Figure 1.16 for comparative purposes) has been included in this series.

In overall terms, good sustained growth has been noted and it is anticipated that there will be further economic expansion. The overall development of the regional economies over the period is further detailed in Figure 1.16.

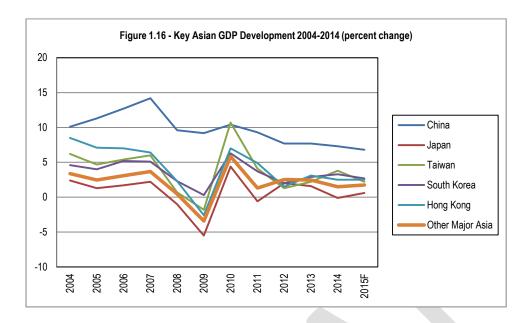


Table 1.29 presents further key data for the other major Asian economies applicable for the Port of Vancouver, including:

- There has been some worsening inflationary pressures noted in the region (of particular note in China too, although China is excluded from this analysis), although these pressures have eased in-line with lower economic growth. This may have the effect of somewhat slowing the overall expansion of demand.
- The trade balance for the region as a whole has narrowed in recent years, to the point where in 2013 to 2015F it has dropped into negative territory. Over most of the period one of the primary drivers of demand was the rapid increase in manufactured goods exports. Growth remains strong, but the process of economic balancing is underway.
- Based on projected developments of 2015, import volumes are higher than that for exports the previous primary driver of demand – although clearly there remains a degree of year-on-year fluctuation occurring as in 2014 export growth was much higher than the import per cent change.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
GDP - %	3.4	2.5	3.1	3.7	0.5	-3.4	5.8	1.3	2.5	2.5	1.5	1.7
CPI - %	4.1	3.7	4.2	5.4	7.4	3.0	5.7	6.3	4.7	4.4	3.9	3.3
Trade Balance - % ca	2.6	3.4	5.6	6.6	5.5	3.8	3.2	4.4	2.9	-5.5	-3.3	-5.7
Exports - %	19.4	11.7	10.6	11.9	5.3	-2.6	19.0	10.4	4.9	4.2	9.8	1.0
Imports - %	15.1	17.2	16.9	13.3	4.8	-8.3	22.9	8.5	4.3	2.5	4.6	6.8

<u>Table 1.29</u> <u>Other Major Asia - Key Indicators 2004-2015F</u>

Source: IMF

Strong link between Asian economic development and containers exported via the Port of Vancouver

A significant link is noted between the other major Asian economies and the level of containerised exports shipped via the Port of Vancouver. This was particularly noted in the late 1990s and the first years of the 2000s, when very strong year on year expansion was recorded. The link is detailed in Table 1.30 for the period 2000 to 2014, with an estimate shown for 2015, based on IMF GDP estimates and January-September 2015 figures for the Port of Vancouver.

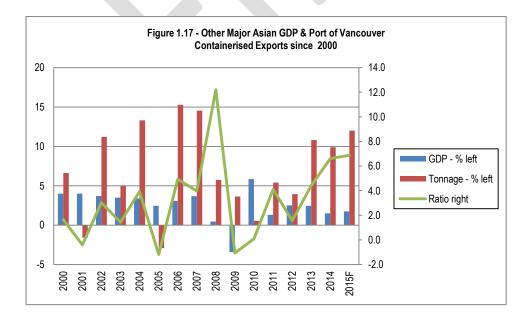
On average the intensity of this link has remained a largely stable relation, with the developments in GDP consistent with the changes in containerised export tonnages shipped via the Port of Vancouver.

Table 1.30
Other Major Asia GDP and Port of Vancouver Containerised Exports 2000-205F4

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
GDP - %	7.0	6.1	7.0	8.4	3.4	2.5	3.1	3.7	0.5	-3.4	5.8	1.3	2.5	2.5	1.5	1.7
Tonnage - %	6.6	-1.6	11.2	5.0	13.3	-2.9	15.3	14.6	5.7	3.6	0.5	5.4	3.9	10.8	9.9	12.0
Ratio	0.9	-0.3	1.6	0.6	3.9	-1.2	4.9	4.0	12.2	-1.1	0.1	4.1	1.6	4.4	6.6	6.9

Source: IMF/Port of Vancouv er/Ocean Shipping Consultants

The stability and strength of the link between the Port of Vancouver and other major Asian economies is further shown in Figure 1.17, with the ratio typically reflecting the growth of both Asian GDP development and the tonnage growth of the Port of Vancouver's containerised exports. The alight drop in the tonnage per cent share in 2014 from 2013 is noted, although the 2015F figure is expecting to see a small rebound. As such, it is reasonable to expect this trend to continue moving forward.



Asian economic development will drive key future trade developments

Given the importance of Asian economic development in determining future export volumes shipped via the Port of Vancouver and the Pacific Gateway region, it is necessary to summarise the range of possible developments over the period to 2025. Short term IMF forecasts for China and the other major Asian economies of relevance to the Port of Vancouver have been collated together with longer term ranges of possible economic developments to be used in the export container demand forecasting process to 2025. The results are summarised in Table 1.31.

Table 1.31

Core Asian Macro-Economic Forecasts to 2025

Real % change

	2014	2015	2016	2017	2018	2019	2020	2021-2025
<u>High Case</u>								
China	8.40%	7.83%	7.25%	6.90%	7.02%	7.28%	7.28%	7.48%
Other Major Asia	1.55%	1.75%	2.27%	2.16%	2.37%	2.58%	2.47%	3.10-3.60%
Base Case								
China	7.30%	6.81%	6.30%	6.00%	6.10%	6.33%	6.33%	6.50%
Other Major Asia	1.50%	1.70%	2.20%	2.10%	2.30%	2.50%	2.40%	3.00-3.50%
Low Case								
China	5.84%	5.45%	5.04%	4.80%	4.88%	5.06%	5.06%	5.20%
Other Major Asia	1.47%	1.67%	2.16%	2.06%	2.25%	2.45%	2.35%	2.90-3.40%

Source: IMF/Ocean Shipping Consultants

With regard to developments over the period to 2025, the main uncertainty is attached to the potential of lower growth within China. It is apparent that economic expansion is slowing as a result of the shifting of demand in favour of domestic consumption. This is unlikely to significantly impact on the structure of trade between to/from North America in the medium term and may well in actually stimulate export volumes via the Port of Vancouver as the Chinese economy is rebalanced.

At the same time the cost differential between Chinese manufacturing and local conditions in North America has also reduced, although the advantages of Chinese output remain significant. This has seen increased interest in *'near-sourcing'* of production to, for example, Mexico and the *'reshoring'* of some production into the US itself. To date, the overall impact has been limited and confined to energy intensive primary industry and it should also be noted that the beneficiaries of this have included cheaper sources of production in, for example, Vietnam and Indonesia. For the medium term, the model of increased reliance on Chinese and other East Asian manufacturing is unlikely to be significant modified as major cost differences will be maintained.

To help address these factors a range of developments around recorded trend levels has been assumed for the balance of the forecast period.

Thorough approach to container forecasting

Containerisation of general and bulk cargoes represents an aggregate demand. That is to say, a variety of individual commodities and finished and semi-finished goods are transported by container. In addition, the imbalance of the Transpacific trades (in total), has seen very low value cargoes increasingly containerised for the eastbound leg where cargo availability is limited. This has resulted in commodities such as steel scrap, waste

paper and other low value goods also entering into inter-continental trade. The approach taken in this study is to relate the development of GDP directly to container port demand in the import/export market, and to use this as a basic driver of demand growth. This allows factors such as increased penetration of the container system into new commodity groups and the imbalance of container port demand (i.e. the requirement to handle empty containers) to be adequately captured.

In summary, the approach is as follows:

- Step 1 The relation between regional GDP and the port range hinterland's GDP is identified. The degree to which this co-efficient has changed over time is defined, with this generally reflecting a declining intensity. As economic development is noted, the trend is that trade as a percentage of the economy begins to stabilise to a mature level. This process is anticipated to continue over the forecast period.
- Step 2 The distribution of demand by seaboard is considered on the basis of underlying distribution costs at the continental level and on the basis of the relative costs of all-water and intermodal services. This is based upon a review of the relative competitive position of the port ranges' container handling facilities in contrast to competing ports. This identifies port capabilities, transit costs, intermodal links, etc. This defines the role of Pacific Northwest ports in the market.
- Step 3 This allows a series of continental and regional demand forecasts to be calculated on the basis of
 overall demand expansion and relative underlying cost structures.
- Step 4 Specific estimates are developed that identify the range of possible demand growth for the Pacific Gateway in each of the markets under consideration. This is based upon the general macro trends that are assessed over the period to 2025.

The actual degree to which the Port of Vancouver will capture a share of these markets is the subject of the specific competition analyses developed later in this Study.

Overview of co-efficients applied to 2025

In developing estimations of the link between GDP development and overall North American container port demand, the following co-efficient multipliers have been utilised within the container forecasts generated:

Overall North American GDP Container Port Demand Multipliers

	Base	High	Low
2015-2017 2018-2020	1.70 1.50	1.70 1.80	1.70 1.30
2021-2025	1.20	1.40	1.10

That is to say, for example, for each percentage increase in GDP noted in the Base Case for the period between 2015-2017 an increase in port demand (container moves across the quay) of 1.70 per cent will be generated. The development and reduction in co-efficient multipliers is a major aspect of demand projections and used for both North American and Pacific Gateway forecasts in this Section. It is noted by OSC from previous analysis that the multiplier will continue to reduce as the economy matures.

With regard to the co-efficients linking containerised exports with other major Asian GDP the following historic relations have been noted:

Other Major Asia GDP and Port of Vancouver Containerised Exports:

1996-2011	1 : 1.27
2000-2005	1 : 0.68
2005-2014	1:0.72

In the forecast market to 2025 it is estimated that a link of 1 : 0.68 will be a sustainable driver in this container trades. These multipliers are used in the Pacific Gateway forecasts in this Section.

1.10 Forecast Container Demand Development 2025-2050

Given the timeframe associated with this study, the maximum *potential* of the market must be a factor in determining the level of forecast demand. Clearly, there must be some limit to the pace of expansion in the developed container markets. In the OECD in general (and North America in particular), the relative maturity of the container sector makes the identification of growth limits of some importance.

At the centre of concerns about the scope for long-term demand growth is the degree to which import markets for container goods will reach saturation and the potential political implications of ever greater import-dependency. That is to say, the consumption of certain commodity groupings is thought to be limited, and the pace of growth ultimately constrained. This is, in some instances, obviously the case. For example, the *per capita* consumption of meat and other food products cannot continue to expand without limit in the North American markets. The scope for import growth must therefore be limited. Furthermore, the development of the world economy beyond 2025 could proceed along one of several different courses, each of which will have different implications for the level of expansion and the direction of trade. Clearly, these different developments will have direct implications for the future level of containerised demand at the Port of Vancouver.

It has also been suggested that the robust development of container demand has been attributable to a 'one-off' period of 'globalisation' in world manufacturing and consumption. Accordingly, the period since 1990 is held to represent a special case and a period of structural adjustment. Having said this, it is clear that this process of globalisation still has further to run and this is reflected in the approach taken to demand projection for the period to 2025.

Core issues that will further impact the world economy over the post-2025 period include:

- The ability of the world economies to expand further in light of major issues such as population growth, climate change and energy availability.
- The linked issue of political stability and the degree to which it will be possible to continue free trade policies will be a major issue. For example, a shift to protectionism would directly impact the volume and direction of containerised trade.
- The location of production and consumption will continue to mature with, for example, increased export
 volumes directed towards East Asia as living standards continue to improve in these markets.
- There may also be technological changes that have unforeseen effects on the development of trade volumes and modalities – although the dominant position of containerisation is not forecast to change significantly.
- Of course, the overall competitive position of the Port of Vancouver in these markets in terms of capacity, intermodal connectivity and efficiency – will also influence demand within each of the identified scenarios.

The only coherent approach to uncertainties over the longer term is to adopt a scenario-based approach to forecasting. Essentially, the economy could develop in a series of divergent directions. Three scenarios have been defined that will have differing implications for the Port of Vancouver's container demand.

Macro-economic scenarios for the North American markets beyond 2025 applied

The following scenarios have been used in the development of post-2025 forecasts for the region:

Continuing Free Trade

In the projections developed for the period to 2025 a range of developments has been defined that entail a broad continuation of the forces that have driven the global economy in the period since the early 1990s. That is to say, the globalisation of production will continue and new, cheaper, sources of imported goods will join China in driving containerised goods flows. It has been this model that has been the primary driver of deepsea container trades in the period since the late 1990s, with recent export demand increases reinforcing these developments.

It is possible that this process will continue over the longer term period to 2050 – albeit at a slower and less intense pace. This would result in a restructuring of the relative economic importance of world regions and have far-reaching economic and political implications.

In qualitative terms, the outlook would have the following characteristics:

- The basic structure of the Port of Vancouver demand would remain focused on increased trade from China (and other Asian markets) serving the North American markets.
- Strong demand in Asian markets would sustain commodity prices, with this particularly benefiting the western Canadian economy with regard to containerised exports.
- Under these conditions, further GDP expansion will be noted, although the long-term sustainable level
 of expansion would be lower than in the period to 2025 under the Base Case for North America.
- There would be continuing further economic expansion in East Asia albeit at a gradually slower pace
 – with this sustaining the level of export demand growth from western Canada.
- There would be some further reduction in the intensity of the relation between GDP development and container port demand, with this position reflecting trends already in place. It is likely that parity between trade growth and container port demand will be reached from the 2030s.
- Strong demand growth will continue on the Transpacific trades and there will be a progressive move towards a more balanced trade structure as demand from east Asia continues to stimulate import growth.
- It is likely that commodity prices will remain somewhat unstable over the period and conflicts over resources will become more common.

The overall outlook will be one of a continued evolution of trade on the basis of developments noted in the past twenty years, with this resulting in continued (but somewhat slower) North American and Pacific Northwest demand. The role of the Port of Vancouver will be determined by the ability to offer a competitive container handling product and by availability of capacity.

This scenario would essentially represent a continuation of the High Case to 2025 demand projection.

A Partially Protectionist World

Recent years have seen worsening trade pressures. The sustainability of the Base Case has been called into question with the major importing regions – both North America and Europe – increasingly questioning the desirability of the wholesale transfer of production capacity to China. In addition, the ability of these regions to continue to pay for ever-larger volumes of imports is questionable. Whilst these pressures are likely to become more significant in the short term the real impact (if they intensify) will be after 2025. A political shift to redirect growth within trading blocs would be the outcome of such a position.

In qualitative terms, the outlook would have the following characteristics:

- It is likely that any such protectionist scenario would see the development of 'Fortress North America' with a commonality of interests between Canada and the US and (probably) the broader NAFTA grouping. Investment would be increasingly directed inwards for these economies.
- Restrictions on trade would typically result in lower than potential trade growth. Interference in the allocation of resources would see lower economic growth.
- In the first few years of this situation, however, a *stimulus* would likely be recorded in the level of North American growth. This would follow from increased investment in domestic industry and the resulting stimulus to demand growth.
- This pattern would see both smaller trade volumes and also a reorientation of demand to within the North American continent. The development of demand would be slower for container ports that have focused on serving the Transpacific trades – such as the Port of Vancouver. This would increase competitive pressures between Pacific Northwest and Pacific South ports for markets which will grow considerably more slowly.
- These conditions would reduce the level of world demand for commodities and energy and also reorientate trade in these goods within the continent. This would reduce the relative economic advantage anticipated for the western Canadian region.

From the current perspective some version of this scenario is seen as a likely outcome given the limitations inherent in a continuation of the current model.

This will represent a continuation of the Base Case projections.

New Economic and Trade Paradigm

Over the timeframe of this study, it is a possibility that the world economy could move forward on a different basis. The environmental pressures that were dominating policy choice – at least until the economic downturn – were driven by concerns over matters such as Climate Change and Sustainability. It is possible that these issues will once again achieve their dominance at the global level. If this is to be the case, these issues are likely to be focused on the post-2025 development of the market.

It is difficult to identify the likely impact of these changes, but in qualitative terms the following matters will emerge:

- There will be policy encouragement (or compulsion) to re-orientate economic activity on a localised basis. This would see considerably slower economic growth, with the emphasis on recycling and other such policies. This would see absolute demand increase more slowly.
- Under these conditions, economic growth would be much more limited in North America and the pace of expansion in the other major Asian markets would be correspondingly slower. The degree to which

other major Asian markets would be able to expand at a pace ahead of demographic pressures would be called into question.

- Container trade between Asia and North America could stagnate under these conditions as the energy costs of delivering goods from Asia will come under increasing policy challenges (particularly with regard to carbon emissions).
- Indeed, the introduction of a putative global carbon tax would directly impact on goods flows in containers and also commodity demand. This will adversely impact on the relative economic advantages of the western Canadian provinces.

This represents a complete paradigm shift and the degree to which this could be realised is likely to be problematic. However, these issues will become increasingly important over the forecast period and do represent a possible (if unlikely) outcome. This scenario would generate the slowest growth for the Port of Vancouver and represent a continuation of the Low Case from 2025. Container demand will be heavily constrained should this scenario be realised.

Table 1.32

Continuing Free Trade' Scenario 2026-2050 - main container demand drivers

	2026-2035	2036-2050
GDP		
Canada	Declines to 2.2% pa	Declines to 1.8% pa
West Canada	Declines to 2.5% pa	Declines to 2.0% pa
USA	Declines to 2.2% pa	Declines to 1.8% pa
Other Major Asia	Grows to 6.0% pa	Consolidates to 4.5% pa
China	Reduces to 6.0% pa	Consolidates to 4.5% pa
Multiplier		
North America - imports	Declines to 1.1	Declines to 1.0
Asia - exports to	Remains at 0.6	Remains at 0.6
Market Share Pacific Northwest - imports	Remains at 15.5%	Remains at 15.5%
Regional Distribution - within N.America		
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained
Proportional Importance of Asia - % of total p	<u>ort demand</u>	
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained

Source: Ocean Shipping Consultants

In contrast to the projections for the period to 2025, the actual impact of these developments on container port demand can only be viewed in a subjective light. The general structure of these scenarios will be reflected in the volume and direction of container port demand but there will be wide variations in each case.

The approach taken to assessing the impact of these developments on regional container port demand is to provide a general estimation of the impact of these changes on the forces driving trade demand. These general indicators are summarised in Tables 1.32 to 1.34 which summarise the key drivers over the period.

Table 1.33

Partially Protectionist' Trade Scenario 2026-2050 - main container demand drivers

	2026-2035	2036-2050
<u>GDP</u>		
Canada	Increases to 2.5% pa	Reduces to 1.2% pa
West Canada	Reduces to 2.5% pa	Reduces to 1.8% pa
USA	Increases to 2.5% pa	Reduces to 1.4% pa
Other Major Asia	Grows to 5.0% pa	Consolidates to 4.0% pa
China	Reduces to 5.0% pa	Consolidates to 4.0% pa
<u>Multiplier</u>		
North America - imports	Declines to 0.8	Declines to 0.7
Asia - exports to	Remains at 0.6	Remains at 0.6
Market Share Pacific Northwest - imports	Remains at 15.5%	Remains at 15.5%
Regional Distribution - within N.America		
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained
Proportional Importance of Asia - % of total po	ort demand	
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained

Source: Ocean Shipping Consultants

Table 1.34

New Paradigm' Trade Scenario 2026-2050 - main container demand drivers

	2026-2035	2036-2050
GDP		
Canada	Declines to 1.8% pa	Declines to 1.0% pa
West Canada	Declines to 2.0% pa	Declines to 1.4% pa
USA	Declines to 1.8% pa	Declines to 1.0% pa
Other Major Asia	Consolidates to 4.0% pa	Reduces to 3.0% pa
China	Reduces to 5.0% pa	Consolidates to 4.0% pa
<u>Multiplier</u>		
North America - imports	Declines to 0.7	Declines to 0.5
Asia - exports to	Remains at 0.6	Remains at 0.6
Market Share Pacific Northwest - imports	Remains at 15.5%	Remains at 15.5%
Regional Distribution - within N.America		
Imports	BC share increases to 45%	BC share increases to 60%
Exports	Current distribution maintained	Current distribution maintained
Proportional Importance of Asia - % of total	port demand	
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained

Source: Ocean Shipping Consultants

The following points should be noted:

 Under the Continuing Free Trade scenario the broader trends noted in the period to 2025 will continue. However, there will be a general slowdown in regional economic growth as full maturity is approximated and there will also be a slowdown in the intensity of the link between GDP and container port demand. This will approach unity by the end of the period. That is to say, trade volumes will move in direct proportion to underlying economic expansion.

In this scenario the distribution of trade in terms of broad trading regions – will remain stable and the current distribution of containers within North America will also be held stable. Indeed, this is a feature of each scenario, with the overall volume of trade being the primary difference under each case.

Under the 'Partially Protectionist' scenario the major difference will be stimulation in local demand in the first years of the period – i.e. between 2026-2036, as local production increases and some is relocated back from Asia. However, the defensive nature of this scenario will see lower overall growth in the balance of the forecast period. The smaller role of Transpacific trade in the North American economy will also see a more rapid contraction in the intensity of the multiplier link. This will fall to lower than parity over the period as growth and trade is partially re-orientated within North America.

The overall distribution of a smaller container trade profile will remain similar to that anticipated for other cases, with the focus being on lower demand growth.

 The 'New Paradigm' situation is difficult to assess, but the key change will be lower overall expansion and trade – with multipliers to growth being lower than in the protectionist case. In addition, there will be further re-orientation in favour of local markets. This will, for example, result in the share of British Columbia within the Pacific Northwest hinterland increasing to a larger proportion. Essentially, this scenario will have a negative impact on the pace of container trade development.

The development of overall container demand has been forecast for the period to 2050 under these conditions.

1.11 Forecast Regional Container Port Demand Forecasts

Having considered the forces that will shape continental and regional demand growth, attention is now directed towards the overall range of possible demand growth under these conditions. The approach taken is as detailed above. That is to say, the overall development of North American container port demand under these trade conditions is defined.

The role of the Pacific Northwest ports within these forecasts is defined and then attention is directed towards the development of demand split between the West and East coasts of North America, with the estimated Base Case share attributable to the US Pacific South (i.e. Long Beach, Los Angeles and Oakland included, but Mexican ports excluded) also outlined to give an indication of the future level of demand over the assessment period.

The next stage is to outline the projected volumes for the Pacific Northwest region too and from this the Pacific Gateway region demand is outlined, which is basically the container volumes for Port of Vancouver and Prince Rupert).

It is this general framework that will shape demand growth at the Port of Vancouver over the study period, but the actual core forecasts for the port are developed (in Section VII) following consideration of specific competition issues (in Section II to Section V, which includes specific cost analysis of the Port of Vancouver and competing facilities in Section V). The perspective of the current analysis is a general overview of the magnitude of demand.

Outlook for the long term North American container port demand will see continued growth

Table 1.35 summarises the anticipated development of North American container port demand over the forecast period to 2025, with further estimations of the level of demand under each of the longer term scenarios to 2050.

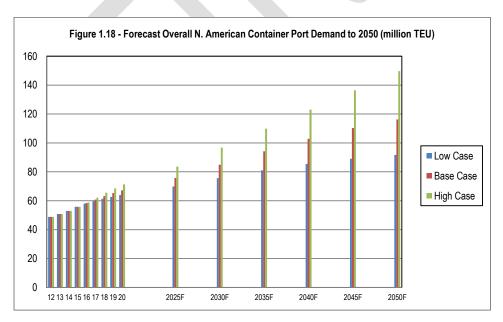
Under the Base Case (regarded as the most likely outcome from the current perspective), total North American container port demand is forecast to increase from the 2015F level of 55.8 million TEU to 75.7 million TEU in 2025. This represents a CAGR of 3.1 per cent based on the 2015F starting point. The continuation of this case over the balance of the study period generates a possible level of container port demand at some 116.3 million TEU in 2050. The overall CAGR for the entire period, of 2015F to 2050 based on these container forecasts equates to 2.1 per cent.

Table 1.35 Forecast Overall North American Container Port Demand to 2050 ion TEU 2011A 2012A 2013A 2015F 2017F 2018F 2019 2020F 2030F 2040F 2050F 2010A 2014A 2016F 2025F 2035F 2045F 85.5 Low Case 45.7 46.3 48.8 50.8 52.9 55.8 59.6 61.3 62.7 64.0 69.8 75.7 81.0 89.0 91.7 Base Case 45.7 46.3 48.8 50.8 52.9 52.9 55.8 55.8 58.4 58.7 60.8 62.1 63.2 65.3 67.2 71.3 75.7 84.9 94.2 102.8 123.0 110.3 116.3 High Case 45 7 46.3 48.8 50.8 65.5 68.5 83.6 96.8 109.9 136.4 149 7

Source: Ocean Shipping Consultants

There is a significant divergence in demand in the different cases and scenarios modeled in this analysis. The range of demand identified at 2025 is placed at a range between 69.8 to 83.6 million TEU per annum and a progressive divergence is noted in the subsequent development of demand.

In general, the development of demand will be driven by the pace of economic expansion and the overall structure of trade – i.e. the degree to which globalisation and inter-regional containerised goods flows will be maintained. There will be a slowdown in the pace of demand growth reflecting the maturity of the relation and of the Transpacific container trades under each of the scenarios. The general outlook is further detailed in Figure 1.18.



Continued container growth for Pacific Coast anticipated

The overall North American container port demand forecasts can then be divided into the Pacific and Atlantic/Gulf coast shares.

As already identified at the start of this Section, the Pacific Coast has maintained a very consistent share of total North American container demand. The historic and existing high traffic volumes and existing infrastructure, together with large local consuming markets in Southern California and ability to serve the rest of the US from the San Pedro ports means that this position will continue.

Between 1990 and 2015F, the Pacific Coast region accounted for an average of 56.0 per cent of total activity and this was consistent with the more recent period of 2000 to 2015F when the share was 55.5 per cent overall. Therefore, moving forward it is reasonable to maintain a split of 55 per cent to the Pacific Coast and 45 per cent to the Atlantic/Gulf region, as Table 1.36 shows.

Table 1.36 <u>Container Volumes per North America Coast to 2050 - Base Case</u> - million TFU

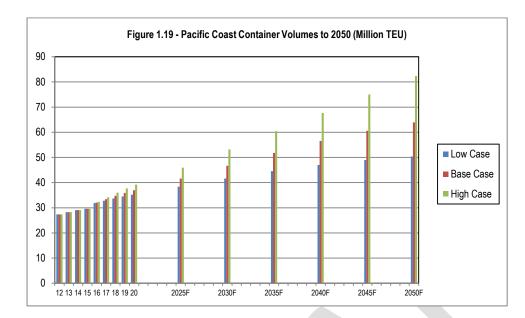
	2010A	2011A	2012A	2013A	2014A	2015F	2016F	2017F	2018F	2019F	2020F	2025F	2030F	2035F	2040F	2045F	2050F
North America	45.7	46.3	48.8	50.8	52.9	55.8	58.4	60.8	63.2	65.3	67.2	75.7	84.9	94.2	102.8	110.3	116.3
Pacific West Coast	25.7	25.9	27.4	28.3	29.1	29.6	32.1	33.4	34.8	35.9	37.0	41.6	46.7	51.8	56.6	60.7	64.0
Atlantic & Gulf	20.0	20.5	21.4	22.5	23.8	26.2	26.3	27.3	28.4	29.4	30.3	34.1	38.2	42.4	46.3	49.6	52.3
US Pacific South*	16.53	16.62	17.59	17.00	17.77	17.76	19.26	20.06	20.85	21.54	22.18	24.98	28.01	31.09	33.94	36.39	38.38
Pacific Northwest	7.14	7.13	7.56	7.79	7.78	8.14	8.89	9.32	9.68	10.07	10.45	11.99	13.46	14.94	16.31	17.49	18.44

Note: * = Pacific South region excludes Mexico, so includes Los Angeles, Long Beach and Oakland only.

Source: Ocean Shipping Consultants

Also included in this breakdown is the share applicable to the US pacific South region (of Long Beach, Los Angeles and Oakland, with the Mexican ports excluded). It can be seen that this component of the Pacific Coast will see the 2015F total of 17.77 million TEU rise to 24.98 million TEU in 2020, with subsequent increases thereafter until 38.38 million TEU is reached in 2050.

The range of projected development for the Pacific Coast is further shown in Figure 1.19, which outlines that in 2025 the Low case to High Case forecasts will be between 38.4 million TEU and 46.0 million TEU. With continued increases anticipated over the forecast period, by 2050 the range will be between 50.4 million TEU and 82.3 million TEU, on the assumption that the region maintains its current share of the overall market as anticipated.



Outlook for the long term Pacific Northwest container port demand within the North American market The next stage of the forecasting exercise focuses attention on the role of the Pacific Northwest within the overall North American market. In assessing these developments the following important points should be noted:

- Asian trades will continue to dominate the overall structure of North American container flows and the location of Pacific Northwest ports in relation to Asia and in terms of intermodal connectivity will continue to favour this port region.
- The strong availability of export cargoes particularly from British Columbia will underline the relative
 position of these ports versus competing terminals in California. As the overall balance of trade with
 Asian moves in the direction of equilibrium, these will be increasingly important considerations.
- The development of the Panama Canal will have significant effects on the overall structure of Asia-North America container flows. It is anticipated that the role of All-Water services between Asia and the North American markets will increase in proportional share as much larger vessels are deployed on the trades. This will, however, be focused on the Californian ports. The importance of these terminals as access points for the broader North American markets will decline as All-Water trades increase market share. These ports will be squeezed between the Pacific Northwest terminals (with their clear advantages) and shipments via Panama.

In order to develop a cautious view of potential demand growth it is assumed that the Pacific Northwest share of the North American markets will remain constant at 15.5 per cent over the forecast period. It may be that there is scope to increase share, but this would represent an upside to core demand developments.

Table 1.37 Forecast Pacific Northwest Container Port Demand to 2050 - million TFU

	2010A	2011A	2012A	2013A	2014A	2015F	2016F	2017F	2018F	2019F	2020F	2025F	2030F	2035F	2040F	2045F	2050F
Low Case	7.1	7.1	7.6	7.8	7.8	8.1	8.8	9.1	9.4	9.7	9.9	11.1	12.0	12.8	13.6	14.1	14.5
Base Case	7.1	7.1	7.6	7.8	7.8	8.1	8.9	9.3	9.7	10.1	10.4	12.0	13.5	14.9	16.3	17.5	18.4
High Case	7.1	7.1	7.6	7.8	7.8	8.1	9.0	9.5	10.0	10.6	11.1	13.2	15.3	17.4	19.5	21.6	23.7

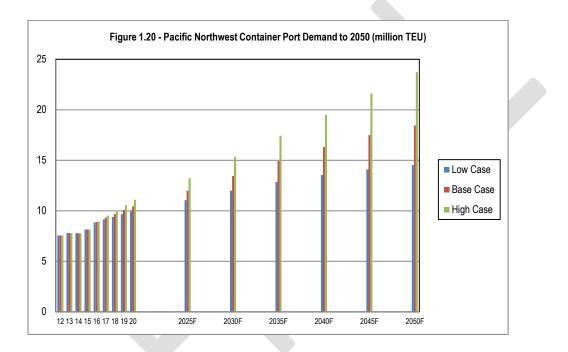
Source: Ocean Shipping Consultants

On this basis, the development of demand for Pacific Northwest ports as a whole has been defined and the results are summarised in Table 1.37 and in Figure 1.20.

It is forecast that under the Base Case total demand shipped via these ports will increase from 7.8 million TEU in 2014 to 10.4 million TEU in 2020 and then reaching 12.0 million TEU by 2025. The longer term Base Case projections indicated a potential demand level of 18.4 million TEU by 2050.

Once again, a considerable range of demand is noted, with demand running at between 11.1 million TEU and 13.2 million TEU in 2025. As follows from the earlier analyses, there is also a wide range of potential developments over the balance of the study period.

In 2050 the range of potential demand for the Pacific Northwest ports is forecast to be between 14.5 million TEU and 23.7 million TEU, with this being determined by the different scenarios defined in this study.



Positive Outlook for the long term Pacific Gateway container port demand in Pacific Northwest range The future development of combined demand at the Pacific Gateway terminals (i.e. Port of Vancouver plus Prince Rupert) is also considered with this being the primary market for the Vancouver terminals.

Here, a different methodology is utilised. Overall import demand is driven not by the overall development of North American GDP but, rather, by the estimated development of both western Canadian GDP. This has been – and is forecast to continue to be – slightly higher than that for the continent as a whole. This will have the effect of driving import demand at a faster pace for this region than is anticipated for the entire market.

The development of import demand by region and by commodity group is summarised in Table 1.38 for the period to 2030. The following should be noted:

• The current distribution of containers imported via Pacific Gateway terminals into different North American regions is forecast to remain fairly stable. The strong development forecast for the western Canadian economy will secure volumes in these markets, but there may be renewed and increased competition from the All-Water eastern ports, although this will be marginal for eastern and central Canada. There may be scope for Pacific Gateway ports to further increase their transit flows to US markets. In general, it has been assumed that distribution will remain stable, but there is seen to be some upside for Pacific Gateway terminals to further extend their market penetration.

It is unlikely that the current split of containerised imports by commodity grouping will be significantly
modified over the period to 2025 (although in the longer term structural changes may influence these
issues). On this basis, it is assumed that the current emphasis on household goods, components and
construction materials will be sustained. The imbalance in goods will broadly continue, thus generating
a flow of imported empties.

The outlook for the Pacific Gateway region where the Port of Vancouver is located is further summarised to 2030 in Figure 1.21, with the split to key overall regions identified. Growth of the US market is clear to see, while West Canada will also remain a key component of the imports. The remaining traffic has been collated into "other Canada" because all of the traffic remains within the country.

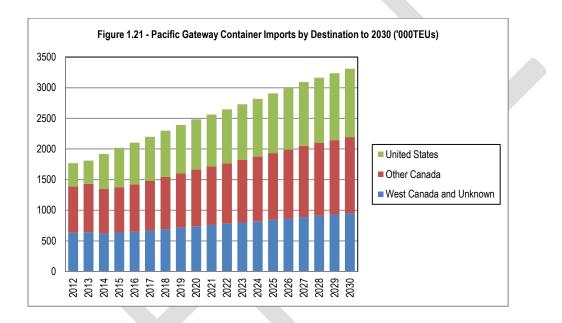


Table 1.38 Pacific Gateway - Base Scenario Import Container Port Demand to 2030 - 000 TEU

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
By Destination																			
West Canada and Unknow n	631.7	641.4	621.0	637.3	650.3	671.8	693.9	716.8	740.5	760.0	780.1	800.7	821.8	843.5	865.3	887.2	909.2	931.1	953.0
Other Canada	755.5	790.0	728.3	740.2	773.4	812.1	851.0	887.8	923.2	954.5	986.6	1,019.8	1,053.9	1,089.0	1,125.2	1,162.3	1,188.3	1,214.6	1,241.2
United States	382.2	380.5	567.3	641.3	680.1	716.9	754.2	787.9	820.5	849.5	879.4	910.2	942.0	974.8	1,008.4	1,042.8	1,067.0	1,091.4	1,116.0
Total	1,769.4	1,811.8	1,916.6	2,018.8	2,103.9	2,200.8	2,299.2	2,392.5	2,484.3	2,564.0	2,646.1	2,730.6	2,817.7	2,907.3	2,998.9	3,092.3	3,164.4	3,237.1	3,310.1
By commodity																			
Household Goods	500.2	502.3	635.4	710.9	741.7	775.8	810.5	843.4	875.8	903.9	932.8	962.7	993.3	1,025.5	1,057.8	1,090.7	1,116.2	1,141.8	1,167.5
Construction & Materials	221.8	234.0	249.0	245.6	256.2	268.0	280.0	291.3	302.5	312.2	322.2	332.5	343.1	354.2	365.4	376.7	385.5	394.4	403.3
Industrial, Auto and Vehicles	185.1	194.4	228.5	255.5	266.5	278.8	291.3	303.1	314.7	324.8	335.2	345.9	356.9	368.5	380.1	391.9	401.1	410.3	419.5
Machinery	133.4	127.3	137.5	138.6	144.6	151.3	158.0	164.5	170.8	176.2	181.9	187.7	193.7	200.0	206.3	212.7	217.6	222.6	227.7
Basic Metals	70.0	53.3	68.7	73.3	76.4	80.0	83.5	86.9	90.3	93.2	96.1	99.2	102.4	105.7	109.0	112.4	115.0	117.7	120.3
Other goods	556.9	609.0	538.8	556.5	580.5	607.3	634.4	660.2	685.5	707.5	730.2	753.5	777.5	802.7	827.9	853.7	873.6	893.7	913.9
Empties	101.9	91.5	58.7	38.5	37.9	39.6	41.4	43.1	44.7	46.2	47.6	49.2	50.7	50.9	52.5	54.1	55.4	56.6	57.9
Total	1,769.4	1,811.8	1,916.6	2,018.8	2,103.9	2,200.8	2,299.2	2,392.5	2,484.3	2,564.0	2,646.1	2,730.6	2,817.7	2,907.3	2,998.9	3,092.3	3,164.4	3,237.1	3,310.1

(includes empties)

Source: Ocean Shipping Consultants

A parallel forecast has been developed that focuses on the development of exports handled by Pacific Gateway ports. Here, the emphasis is clearly on the commodities grown and manufactured in British Columbia (and, to a lesser extent, the other western Provinces) and it is apparent that the location of these clusters favours the Port of Vancouver in contrast to Prince Rupert.

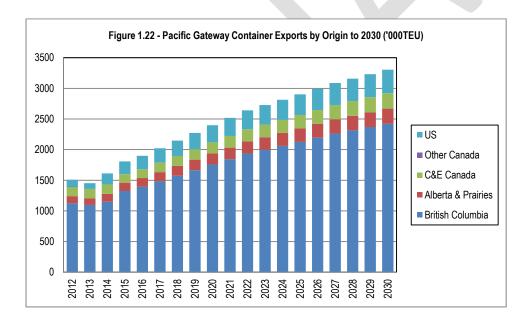
There is some scope to increase penetration of the eastern markets for export commodities but the overall balance is forecast to continue to be dominated by current commodities sources on the same pattern as noted at present.

The progressive penetration of containerisation into these trades is now largely complete and it is not anticipated that demand will be further influenced by these considerations. This means that lumber/wood pulp and specialty crops will remain the key drivers of demand in terms of commodities.

The actual level of year-on-year demand growth will be driven by demand from the Asian markets – specifically China, and the current and stable link between GDP in these markets and overall demand growth is forecast to continue in the period to 2030 and beyond.

There will be strong and sustained demand growth in this sector, although these commodities will remain vulnerable to short term disruptions at the macro-economic level in East Asia.

Base Case export demand forecasts for the Pacific Gateway region are summarised in Table 1.39 and also in Figure 1.22, with the highly dominant position retained by British Columbia expected to continue moving forward.



Ocean Shipping Consultants

Table 1.39

Pacific Gateway - Base Scenario Export Container Port Demand to 2030 - 000 TEU

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
By Origin																			
British Columbia	1,124.2	1,096.2	1,150.6	1,326.0	1,392.9	1,481.5	1,573.7	1,665.1	1,758.0	1,844.9	1,936.2	1,998.1	2,061.8	2,127.4	2,194.4	2,262.8	2,315.5	2,368.7	2,422.1
Alberta & Prairies	115.9	110.5	128.2	135.6	142.5	151.5	161.0	170.3	179.8	188.7	198.1	204.4	210.9	217.6	224.5	231.5	236.9	242.3	247.8
C&E Canada	151.6	152.8	153.3	136.9	143.8	153.0	162.5	171.9	181.5	190.5	199.9	206.3	212.9	219.6	226.6	233.6	239.1	244.5	250.1
NW Territories	-	-	-	-	-	-	-	-	-	· · ·	-	-	-	-	-	-	-	-	-
Other Canada	1.9	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
US	114.1	94.4	181.0	210.7	221.3	235.4	250.0	264.5	279.3	293.1	307.6	317.4	327.6	338.0	348.6	359.5	367.9	376.3	384.8
Unknown	0.9	96.2	1.4	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.4	4.6	4.7	4.9	5.0	5.1	5.3	5.4
Total including Empties	1,508.6	1,550.1	1,614.4	1,812.1	1,903.5	2,024.6	2,150.7	2,275.6	2,402.5	2,521.3	2,646.1	2,730.6	2,817.7	2,907.3	2,998.9	3,092.3	3,164.4	3,237.1	3,310.1
By commodity																			
Lumber	373.1	388.3	341.6	286.6	294.4	302.0	310.2	319.2	328.3	338.6	349.6	361.3	373.5	386.1	399.0	412.2	425.7	439.5	453.6
Woodpulp	204.2	212.0	176.8	154.9	159.1	163.2	167.7	172.5	177.4	183.0	188.9	195.3	201.8	208.6	215.6	222.8	230.1	237.5	245.1
Specialty Crops	167.8	215.9	233.3	184.2	189.2	194.1	199.3	205.1	210.9	217.6	224.6	232.2	240.0	248.1	256.4	264.9	273.5	282.4	291.5
Meat, Fish & Poultry	48.1	46.0	45.7	39.0	40.1	41.1	42.2	43.5	44.7	46.1	47.6	49.2	50.9	52.6	54.3	56.1	58.0	59.9	61.8
Basic Metals	49.3	39.6	34.9	31.7	32.6	33.4	34.3	35.3	36.3	37.5	38.7	40.0	41.3	42.7	44.1	45.6	47.1	48.6	50.2
Other Goods	330.9	375.5	370.4	523.2	537.4	551.3	566.3	582.6	599.3	618.2	638.2	659.6	681.8	704.8	728.3	752.5	777.2	802.4	828.1
Empties	335.3	272.8	411.8	592.5	650.9	739.5	830.6	917.4	1.005.5	1.080.3	1.158.5	1.193.2	1.228.5	1,264.5	1.301.2	1.338.3	1.352.9	1.366.7	1,379.8
Total including empties	1,508.6	1,550.1	1,614.4	1.812.1	1,903.5	2,024.6	2,150.7	2,275.6	2.402.5	2,521.3	2,646.1	2,730.6	2,817.7	2,907.3	2,998.9	3,092.3	3,164.4	3,237.1	3,310.1

Source: Ocean Shipping Consultants

Results for long term outlook for the Pacific Gateway container port demand

The longer term development of Pacific Gateway demand obviously becomes increasingly speculative, but estimates have been derived on the basis of longer term economic development under each scenario and on the basis of the key assumptions detailed earlier in the Section.

It is forecast that total Pacific Gateway container port demand to be handled by ports in this region is expected to increase to between 7.2 million TEU to 11.8 million TEU at the end of the study period, although the core Base Case forecasts are estimated to reach 9.1 million TEU in 2050.

Under the Base Case and starting from 2010 a CAGR of 4.8 per cent is forecast for the period to 2025, with this slowing to 1.8 per cent between 2025 and 2050.

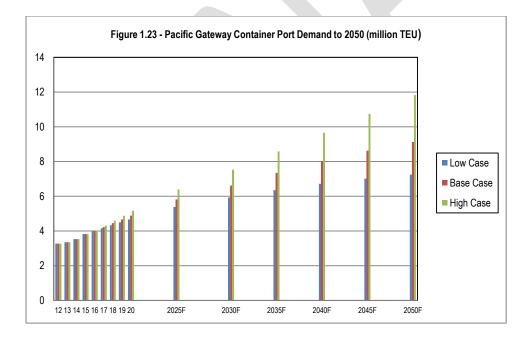
These developments are further summarised in Table 1.40 and in Figure 2.7.

Table 1.40 Forecast Pacific Gateway - Vancouver + Prince Rupert - Container Port Demand to 2050 - million TEUs

	2010A	2011A	2012A	2013A	2014A	2015F	2016F	2017F	2018F	2019F	2020F	2025F	2030F	2035F	2040F	2045F	2050F
Low Case	2.9	2.9	3.3	3.4	3.5	3.8	4.0	4.2	4.3	4.5	4.7	5.4	5.9	6.4	6.7	7.0	7.2
Base Case	2.9	2.9	3.3	3.4	3.5	3.8	4.0	4.2	4.4	4.7	4.9	5.8	6.6	7.3	8.0	8.6	9.1
High Case	2.9	2.9	3.3	3.4	3.5	3.8	4.0	4.3	4.6	4.9	5.2	6.4	7.5	8.6	9.7	10.7	11.8

Includes empties

Source: Ocean Shipping Consultants



Future container flows by region and port range sees widespread coverage from Pacific Northwest ports Of interest to Pacific Gateway ports and other facilities in North America is the likely flow of containers to specific port ranges, which is where the major consumption areas are located.

On the basis of noted historic developments and current estimated shares per region and port range, Table 1.41 takes into account the projected total North American forecasts to 2025 and attributes a share accordingly. It can be seen that the Pacific Northwest has the greatest spread amongst a higher number of the specified regions,

whereas the North Atlantic port range, for example, is expected to continue serving much more limited geographic areas. Table 1.42 outlines the anticipated share for 2050, again following the same approach and allocation process.

Table 1.41 Estimated Container Flows by Region and Port Range 2025F mTEU

		Port Rang	e		
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific Northwest	Total
West Canada				1.14	1.14
East Canada	1.64			1.42	3.06
California			11.31		11.31
Washington/Oregon			0.41	1.84	2.25
Other West			1.05	0.15	1.21
Rocky Mountains			1.89	0.60	2.49
Plains/Great Lakes	1.22	0.88	11.05	3.93	17.08
Northeast	10.01		3.32	0.42	13.74
Southeast		11.35	2.91	1.29	15.56
Southwest		4.63	3.09	0.11	7.82
Total	12.87	16.86	35.04	10.91	75.69

Source: Ocean Shipping Consultants

Table 1.42

Estimated Container Flows by region and Port Range 2050F

		Port Rang	le		
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific Northwest	Total
West Canada				1.75	1.75
East Canada	2.52			2.18	4.70
California			17.38		17.38
Washington/Oregon			0.63	2.82	3.45
Other West			1.62	0.23	1.85
Rocky Mountains			2.91	0.92	3.82
Plains/Great Lakes	1.87	1.36	16.97	6.04	26.24
Northeast	15.37		5.10	0.64	21.11
Southeast		17.44	4.47	1.99	23.90
Southwest		7.11	4.74	0.17	12.02
Total	19.77	25.91	53.84	16.77	116.29

Source: Ocean Shipping Consultants

1.12 Key Conclusions - Factors determining the degree of realisation of this potential demand

The degree to which the Port of Vancouver's potential demand will be realised (and the role of the port within the Pacific Gateway market place) will be determined by the following notable factors:

- The overall capacity available at the Port of Vancouver to meet potential demand.
- Shifts in the development of deepsea containerisation vessel sizes and market issues.
- The competitive position of container terminals facilities in terms of marine accessibility, including such items as water depth and berth lengths.
- The relative costs and capacity of intermodal links to/from the broader hinterland in contrast to
 other port options able to serve the same hinterland regions

In order to develop specific forecasts for the Port of Vancouver within this profile these issues are considered to define a Strengths, Weaknesses, Opportunities and Threats analysis of the competitive position of the port.

This analysis is then used to refine the specific forecasts for the port. Section VII contains these projections in more detail.

SECTION II – COMPETITIVE DEVELOPMENTS AT OTHER CONTAINER PORTS

2.1 Introduction

The development of container demand at the Port of Vancouver will be determined by various factors, but the availability and type of competing capacity will be a key issue. This Section provides a detailed analysis of the structure and capabilities of container terminals on the Pacific West Coast (of North America) and assesses how these will develop over the forecast period.

Specific emphasis on the potential development of Prince Rupert as the primary local competitor (in addition to more distant hinterlands) to the Port of Vancouver is included, while an overview of the other Pacific Northwest and Pacific South ports is provided as these ports are all competitive options for serving other regions in North America beyond the more localised areas.

On this basis, the following key items are assessed further in order to help better determine the competitive position of the Port of Vancouver and its noted future development plans for additional container terminal capacity:

- Current and planned container terminal capabilities and investment.
- Anticipated scale, timing and development of container terminal capacity
- Development of longer-term historic productivity in each of the regional ports.

2.2 Existing and Forecast Capabilities of Regional Container Terminals

An assessment of the infrastructure and superstructure of the facilities at ports on the West Coast of North America is helpful in better understanding the competitive capabilities of the various facilities. For ease of reference, the ports are split to the Pacific Northwest region (covering Portland, Tacoma, Seattle, Port of Vancouver and Prince Rupert) and the Pacific South (Long Beach, Los Angeles and Oakland).

Table 2.1 provides a summary of the development of container handling facilities on this seaboard since 1995 and includes the position for the end of 2015. Three indicators of aggregate capability are to be noted, specifically:

- Terminal area the land area devoted to container operations.
- Quayage length of quays dedicated to container handling and that are typically equipped with container gantry cranes.
- Number of quayside container gantry cranes currently available.

Expansion in capability is noted, although the ongoing projects are putting some pressure on facilities, notably in the Pacific South region.

The total area of Pacific West Coast container terminals reached some 2173 hectares for 2015F, representing an increase on the 1431 hectares for 2000. Although this growth equates to a 34.2 per cent rise, it should be noted that the total in 2012 was 2255 hectares and 2247 hectares in 2013. The decrease is representative of unavailable working areas due to various large-scale construction projects and re-configuration of existing berths.

With respect to amount of quay dedicated to container handling, there has been a steady increase between 2000 and 2012, rising from 30,178m to 38,318m. However, as noted, there has been a reduction on the amount of berthing available for ships in the period since, with 2015F offering 35,786m in total.

The number of container gantry cranes has also, generally, risen, from the 2000 total of 203 units through to 267 for 2015F. However it is important to note that within this increase it is the investment in a higher number of larger super post-Panamax models to handle the largest vessels that is a key trend.

For any port wishing to remain competitive, it needs to be able to offer equipment of this specification to help keep pace with overall demand and the shift towards larger ships.

The share of Pacific Northwest ports within the North America West Coast ports has developed as follows since 1995:

- Container terminal area from 35.6 per cent in 2000 to 31.6 per cent by 2013 but down slightly to 29.6 per cent for 2015F (although the 2015F total is impacted by the Terminal 5 modernisation plans at Seattle). Overriding the healthy performance of Canadian container ports, this trend essentially reflects stronger investment arising from more rapid demand development of the southern US ports, relative to that of the northern US ports on the Pacific seaboard.
- Length or container quayage from 38.5 per cent in 2000 to 34.4 per cent by 2013 and down to 30.9 per cent for 2015F (again somewhat impacted by Seattle shutting Terminal 5 for container operations in 2015).
- Number of quayside container gantry cranes from 38.9 per cent in 2000 to 34.1 per cent by 2013 and 32.6 per cent for 2015F.

These relative developments remain a key factor in helping to determine the competitive position of the Port of Vancouver in the forecast period. The individual port and terminal facilities in the Pacific Northwest and Pacific South regions are assessed separately within Section 3.3 and Section 3.4, respectively.

This is an important part of the process because it makes it possible to better understand the quality of the current and future facilities at the Port of Vancouver in both its localized market and also against those ports in Southern California where competition exists for more distant hinterlands.

At the same time, it is also prudent to fully assess the Port of Vancouver as a standalone competitive option and not just as a Pacific Northwest container port, ostensibly so that it is not just included amongst other facilities in the Pacific Northwest region that do not offer comparable quality of infrastructure (i.e. such as Portland).

This enables a clearer assessment of the Port of Vancouver's competitive strengths and weaknesses to be better provided.

	Area - hectares	Quayage - metres	Quay gantry cranes
Pacific Northwest			
1995	457	10130	61
2000	509	11633	79
2005	628	11407	79
2012	675	11841	94
2013	708	12010	94
2015F	643	11042	88
Pacific South*			
1995	782	17846	115
2000	922	18545	124
2005	1488	25099	172
2012	1546	25311	173
2013	1539	25035	182
2015F	1530	24744	180
Total			
1995	1239	27976	176
2000	1431	30178	203
2005	2116	36506	251
2012	2255	38318	267
2013	2247	37045	276
2015F	2173	35786	268

Table 2.1	
North America Pacific West Coast Containerport Development,	1995-2015F

* = ex cludes Haw aiian ports.

Source: Ocean Shipping Consultants

2.3 Pacific Northwest Ports and Terminals

The major container ports in the Pacific Northwest region are the Port of Vancouver and Prince Rupert in Canada and the US ports of Seattle and Tacoma (which have recently joined together to form the Northwest Seaport Alliance to swap information such as rates of return, planning, utilisation and operating costs/charges, to better handle the bargaining power of major shipping lines) and Port of Vancouver.

In addition, the port of Portland also handles some containers, and can be regarded as a niche operation that operates in a somewhat different sector of the market, but should be included for completeness. The loss for 2015 of all of Hanjin Shipping's container traffic means that the port is presently only handling negligible traffic.

Although Seattle and Tacoma are now jointly marketing the two ports together, for the purposes of this analysis the container terminal facilities are outlined individually for more in-depth clarity.

Seattle

Following the amalgamation of Terminals 25 and 30 in 2009, there are now four container terminals in Seattle, collectively occupying just over 210 hectares and providing 3,761m of container quays. Berth depth is reasonably competitive with other regional ports, with most berths offering 15.2m.

The status of the port's container handling facilities is summarised in Table 2.2, although it should be noted that the Terminal 5 modernisation plan is now underway and this terminal is shut for container ships and operations. This project is expected to provide a 1.0 million TEU per annum terminal that will be able to, more crucially, receive 2 x 18,000 TEU ships. Construction is due to commence in 2017 and scheduled for finish by 2020.

Until the new Terminal 5 facility is fully operational, Seattle's total container facilities are reduced to 140.8 hectares in total, with 2,877m of quay available and the number of cranes reduced from 27 to 21.

The ability to access on-dock rail remains an important consideration for two of the major terminals at Seattle:

- APL's 70-hectare Global Gateway North facility at Terminal 5, operated by Eagle Marine. It
 incorporates a 12 hectare intermodal yard with six tracks, where two trains with 27 five-platform double
 stack railcars each can be assembled for direct access to the Union Pacific Railroad (UPRR) and
 BNSF railway, and a further two trains with the same capacity can be parked on sidings. The
 modernization programme is expected to improve these facilities.
- Occupying 79 hectares, Terminal 18, managed by Stevedoring Services of America (SSA), has 1353m of berths for container handling (and a 136m breakbulk berth), with 15.2m depth. The terminal has similar on-dock capacity as Terminal 5. A total of six super post-Panamax cranes with 64m outreaches were installed during late 2011 and 2012, taking the complement of quay gantry cranes to ten.

The former Terminal 30 was converted from a container terminal to a cruise terminal in 2003, but then returned to container handling in 2009, when it was amalgamated with Terminal 25, to create a new terminal for China Shipping. It is also operated by SSA. Although the terminal is only 28h in size, the near-dock BNSF/UPRR intermodal facility lies conveniently behind it. The quay length is 823m and offers a water depth of 15.2m alongside.

Hanjin'sT46 facility has 700m of berths with 15.2m depth. There is scope to add a third berth. Since 2002, six panama container gantry cranes have been replaced by five post-Panamax units, three of which are Super-Post Panamax cranes with 22-row outreaches. The terminal does not have a direct rail link, being dependent on the near-dock BNSF/UPRR facility alongside the adjacent Terminal 30.

However, in 2014 the facility successfully persuaded MSC to switch from T18 and while it will not bring any additional container traffic to the port overall, it is a boost to the T46 operators.

Nevertheless, the modernisation programme for Terminal 5 does highlight an issue for the facilities at this port in that they are still relatively small and limited in terms of size.

<u>Table 2.2</u>

Seattle: Container Handling Facilities - Mid 2015

Terminal	Area	Berthage	Depth	Quay gantry	On-dock rail	Major customers
	- h	- m	- m	cranes - no.	rail	
Terminal 5	(Currently closed	for container i	modernisation. Air	ning for 1m TEl	J by 2020 and ability
Global Gateway North (APL)		to b	erth 2 x 18,00	00 TEU ships. Co	instruction to sta	rt 2017.
Terminal 18 SSA Inc.	79.3	1353	15.2	10	Yes	APL, CMA CGM, ANL-US Lines, CSCL, Hamburg Sud, Hapag Lloyd Hyundai, MOL, NYK, OOCL, Zim
						Maersk, Safmarine, Matson, UASC
Terminal 30	28.3	823	15.2	6	near-dock	CMA CGM, CSCL, Hamburg Sud
SSA Marine/China Shipping						PIL, UASC
Terminal 46	33.2	701	15.2	5	near-dock	Hanjin, MSC,
Total Terminals International						K Line, Yangming, COSCO
2015F Total	140.8	2877		21		
2013	210.4	3761		27		
2012	212.8	3628		27		
2005	198.7	3171		20		
2000	na	4053		25		

Source: Ocean Shipping Consultants

Outlook for Seattle: Primary focus on Terminal 5 modernisation

The Terminal 5 modernisation plan represents the major focus relating to container activities at Seattle and once completed in 2020 it will allow the port to offer a larger facility, due to be capable of handling two large (18,000 TEU) ships. There are two other known but delayed plans to expand, namely:

- Extra 500m of quay for Terminal 18.
- Expansion potential for Terminal 46

However, these are more minimal projects and don't overcome the port's inability to offer larger container terminals for bigger container ships.

Recently the port has worked on infrastructural projects aimed at improving the flow of traffic to/from the hinterland, such as the East Marginal Way grade separation and the Alaskan Way viaduct.

Moving forward, the development of the Northwest Seaport Alliance with Tacoma will dictate which projects are undertaken but the fundamental issues that have to a large extent plagued the port and the areas that need investment in recent years, which includes the ability to offer large-scale terminals with good on-dock rail connectivity to distant hinterlands in North America, remains the same.

Some relevant Northwest Seaport Alliance projects are included within the Tacoma assessment below, while Section IV concentrates on the intermodal facilities and investment plans for the port.

Tacoma

There are currently five container terminals at the port of Tacoma, covering a combined area of 221.1 hectares and total quay of 3,258m, as Table 2.3 shows. Berth depth has been uniformly increased and is now at 15.5m.

Table	2.3

Tacoma: Container Handling Facilities - Mid 2015

Terminal	Area	Berthage	Depth	Quay gantry	On-dock	Major customers
	- h	- m	- m	cranes - no.	rail	
Olympic Container Terminal (Yangming)	22.0	335	15.5	4	Yes	Yangming, K Line, Hanjin, Cosco
Husky Terminal ITS (K Line)	37.6	823	15.5	4	Yes	K-Line, COSCO, Hanjin Mitsui-OSK, Yangming
Washington United (Hy undai Merchant Marine)	49.8	793	15.5	6	Yes	APL, HMM, Hapag-Lloyd NYK, OOCL, Zim
APM Terminal	54.6	671	15.5	5	near-dock	Maersk Line, Matson
Pierce CountyTerminal Ports America (Evergreen)	57.1	636	15.5	7	Yes	ANL-US Lines, Evergreen Hapag Lloyd, Hamburg Sud
2015F Total	221.1	3258		26		
2013	214.0	3310		26		
2012	211.4	3306		26		
2005	194.9	2880		22		
2000	na	2270		23		

Source: Ocean Shipping Consultants

Hyundai Merchant Marine's Washington United and Evergreen's Pierce County terminals have their own intermodal yards, with capacity for 52 and 78 double stack container railcars, respectively. The Washington United Terminal quay was extended by 183m in 2011 to accommodate longer vessels. In mid-2012, the Grand Alliance joined HMM's existing alliance partners at the terminal. The other terminals are served by two near-dock intermodal yards, used by both BNSF and UPRR. On-dock rail connections have been extended to all but one terminal (the APMT facility):

- The ITS (K Line) Husky Terminal and Yangming's Olympic Terminal have on-dock access to the North Intermodal Yard, which can handle 76 double stack container railcars.
- The APM Terminal is served by the adjacent South Intermodal Yard, which can accommodate 30 doublestack container railcars on ramp tracks and 37 on interchange tracks. In 2009, Maersk stopped calling Tacoma in favour of joint services with CMA CGM out of Seattle. However, in 2010, the lease on its Tacoma terminal was extended for six years, for continued use by cabotage operator, Horizon Lines. NYK planned to move to the facility in 2012 but instead used the Washington United Terminal along with its partners. (In 2009, the carrier cancelled plans for a new East Blair Terminal.)

An overpass was opened in 2011 to separate trains and vehicular traffic at Lincoln Avenue.

Outlook for Tacoma: Optimising existing areas to try to attract the larger carrier alliances and vessels The port's ten-year strategic plan, announced in 2012, included redevelopment of its central peninsula to handle the largest vessels efficiently, including widening and deepening waterways as necessary. There are also plans to expand rail capability to handle 1.5-mile long trains and provide a second rail crossing over the Puyallup River. There are also several known expansion possibilities for container handling at the port, which could be activated if warranted by demand, even though existing traffic levels are much lower than existing terminal capacity, giving an estimated capacity utilization of under 60 per cent. These potential projects include:

- Phase II of the Washington United Terminal is intended to add 66 acres (26.7h) to the terminal area (53 acres for container handling and 13 acres to expand the rail capability), providing an additional 0.36m TEU/year of container handling capacity.
- There is scope to expand Yangming's Olympic Terminal from 21.6 to 30.75 hectares.
- The acquisition of the former Kaiser Aluminium site supplied 83 acres for possible development into a cargo terminal, not necessarily for containers, though originally conceived as such.
- SSA and the native American Puyallup tribe have a longstanding agreement to develop a two-berth container terminal on 180 acres of land. Until and unless a container-line customer is found, however, development seems unlikely.

Whether these projects are undertaken will be dictated by overall demand but also by the strategy to be adopted by the newly formed Northwest Seaport Alliance with Seattle.

Following an official launch in August 2016, the two-port agency outlined some key components of its strategic plan to move forward in November 2015, with the specific aim of increasing competitiveness against other ports with excellent facilities and critical mass of volumes (such as the Port of Vancouver and Los Angeles/Long Beach). Key items included:

- Upgrading of terminals is urgent, with the focus on handling larger ships than the recent 11,400 TEU ship that had called.
- In addition to the Terminal 5 modernisation project, redevelopment of the General Central Peninsula and Pier 4 in Tacoma could add almost 2.0 million TEU of extra capacity.
- Improved delivery of transportation services, including intermodal rail the first step is establishing an
 operations service centre, which is targeting working on closer performance metrics with Class 1
 railroads.
- Stronger emphasis on environmental stewardship (albeit that this initiative along is unlikely to generate any additional container traffic).

Improving intermodal services and connectivity to the North American transcontinental network will help increase the overall competitiveness of these two ports. However, upgrading marine terminals will only make them more appealing to shipping lines if the focus is on the ability to handle larger ships – simply increasing capacity is not the approach needed, but instead making sure the correct type of facilities are offered to meet shipping line needs will improve the chances of growing container traffic. For example, it is important to have larger cranes, deeper water and long quays for bigger ships but if the supporting intermodal facilities are inadequate to meet the larger consignment sizes then the overall competitiveness of the terminals will continue to be significantly comprised – this is a good synopsis of the competitive position between the Port of Vancouver and the US Pacific Northwest facilities.

Yet even then there remain no guarantees that extra volumes will be attracted as other ports, such as Vancouver, Prince Rupert, Los Angeles and Long Beach are also working to improve their own respective competitiveness. The attractiveness of some East Coast North American ports also places further pressures on the Seattle-Tacoma facilities too which needs to be noted.

Portland

Located on the Columbia River, Portland is some distance from the sea and is also restricted with regard to vessel sizes. Over 2010-11, the navigation channel was deepened from 12.2 to 13.1m. The port has enjoyed a particular export role, based on the agricultural output of the region and linked to barge services on the Columbia/Snake River systems.

Given the vessel size restrictions, the port's role will continue to rely on development of the existing customer base, where possible, and will remain of peripheral significance to the broader Pacific Northwest market.

As Table 2.4 indicates, there are two container terminals at Portland, with Terminal 2 operated by SSA and in 2011 Manila-based ICTSI took management and operating control of Terminal 6 under a 25-year lease.

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Major customers
Terminal 6 ICTSI	31.6	869	13.1	9	Yes	Westw ood
2015F Total	84.6	1480		11		
2013	84.6	1480		11		
2012	53.8	1480		11		
2005	49.9	1567		9		
2000	49.9	1567		9		

<u>Table 2.4</u> Portland: Container Handling Facilities - Mid 2015

Source: Ocean Shipping Consultants

While the existing infrastructure has not altered significantly in recent years, there has been no need to do so, especially since Portland lost the majority of its container demand form the start of 2015 when Hanjin Shipping decided to stop calling to the port. Throughout 2013 and 2014 there was regular press speculation that this shipping line would stop calling to the port due to which it described as a lack of volume demand, especially on a local basis. With the continued cascading to larger vessels it is not possible to gain better economies of scale if the ships are not sufficiently full. Consequently by the end of 2014 Hanjin Shipping did announce its decision to cease calls and as a result container volumes at the port plummeted.

This decision was made after considerable speculation that the South Korean shipping line would cease to call due to a lack of sufficient demand. According to the port this service brings an average of 1600 containers per week (around 80 per cent of total container port traffic) and has been a port customer since 1994.

Outlook for Portland: Ample scope to expand but loss of major customers for 2015 means no terminal expansion envisaged

There is ample scope to expand container volumes within existing capacity, so there is little requirement for terminal expansion and the position is not going to move going forward. To date, the Hanjin Shipping traffic has not been replaced and this is reflected by the port's 2015F total for containers of less than 30,000 TEU, while capacity available is conservatively estimated to be as much as 0.8 million TEU per annum.

Port of Vancouver

The Vancouver Port Authority, Fraser River Port Authority and North Fraser River Port Authority amalgamated in 2008, forming the Vancouver Fraser Port Authority (Port of Vancouver).

As Table 2.5 shows, all container terminals (importantly) have on-dock rail provision and water depth at the Port of Vancouver terminals is amongst the best in the region at between 15.5 and 15.9m.

The 1997 development of a new container handling operation at the Deltaport site at Robert's Bank ensured deep water, good intermodal provision and competitive handling rates and helped enable the Port of Vancouver to recapture Canadian cargoes from other competing ports and extend its hinterland into eastern Canada and the US.

Terminal	Area - h	Berthage	Depth	Quay gantry	On-dock rail	Major customers
	• //	- m	- m	cranes - no.	Idii	
Delta Port	85.0	1100	15.9	10	Yes	COSCO, CSCL, CMA CGM
TSI						Evergreen, Hanjin, Hapag-Lloyd
						HMM, MSC, Maersk Line,
Vanterm	21.0	610	15.2-15.5	6	Vaa	NYK, OOCL, PIL, UASC, Zim
TSI	31.0	619	15.2-15.5	6	Yes	COSCO, CSCL, Evergreen Hanjin, HMM, K Line, MSC
101						MOL, Yangming
Centerm	28.0	647	15.0	6	Yes	COSCO, Hanjin, HMM
DPW						K Line, MOL, APL,
	00.4	704	44 7	4	Mar	Westwood, Yangming
Fraser Surrey Docks Macquarie	28.1	701	11.7	4	Yes	CSCL, CMA CGM, CCNI Gearbulk, H-Sud, Hapag Lloyd
Macquane						MOL
2015F Total	172.1	3067		26		
2013 (including Fraserport)	175.4	3099		26		
2012 (including Fraserport)	172.6	3067		26		
2005 (including Fraserport)	152.4	2634		23		
2000 (including Fraserport)	na	2862		18		

<u>Table 2.5</u> Port of Vancouver: Container Handling Facilities - Mid 2015

Source: Ocean Shipping Consultants

The development of the high-quality Deltaport terminal helped sustain strong growth in container volumes until 2007, when the port faced competition from a new deep-sea container terminal at Prince Rupert port.

Although there was a dip in container volumes at the Port of Vancouver's terminals in 2009 to 2.15 million TEU, traffic has since rebounded and growth has continued thereafter, rising to 2.71 million TEU for 2012 and then up to 2.83 million TEU for 2013. Further growth in 2014 and projected for 2015 means that the port is expected to surpass the 3.0 million TEU barrier for the first time.

Outlook for the Port of Vancouver: Expansion in capacity by reconfiguration and construction of new terminal – the need to keep pace with container growth and markets served remains the challenge

Future port plans centre on increasing Centerm's capacity from 2018, intermodal improvements to boost capacity at the existing Deltaport terminal and development of a second container terminal on reclaimed land adjacent to Deltaport at Roberts Bank. These initiatives are intended to handle anticipated demand growth to 2030 and are further shown in Table 2.6, though the exact details relating to items such as number of cranes may change:

- Centerm is adding 0.6 million TEU in total to increase terminal capacity to an estimated 1.5 million TEU per annum from 2018.
- By reconfiguring the intermodal yard, road access and rail tracks, (DTRRIP) the port authority will
 increase capacity at the existing Deltaport Terminal by 0.6m TEU per annum by the end of 2017.
- The planned second terminal would also have three berths and increase total Deltaport capacity by a further 2.40 million TEU per annum by 2023.

These projects will bring needed extra capacity to the Port of Vancouver and are required to allow the port to continue to keep pace with recent demand and growth levels, especially as the port sees good import demand for more distant hinterland markets in North America.

Section VII outlines the Port of Vancouver forecasts in more detail.

<u>Table 2.6</u>

Port of Vancouver: Planned Container Handling Facilities

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Year
Contorm consoity or papaian						
Centerm capacity expansion						
+0.6m TEU per annum						From 2018
Deltaport capacity expansion						
+0.6m TEU per annum capacity					Yes	2016-2018
Roberts Bank Terminal 2						
+2.4m TEU per annum	+81	+3 berths		+10	Yes	2023

Source: Ocean Shipping Consultants

Prince Rupert

The Fairview Container Terminal at Prince Rupert opened in 2007 and the current operational capacity in 2014 is noted by the port to be 0.85 million TEU per annum.

Container throughput across the 360m container quay reached 0.40 million TEU in 2011 and 0.56 million in 2012, but fell back by 28,500 TEU during 2013 before seeing an improvement to almost 0.62 million in 2014 and a projected 2015 total of just under 0.81 million TEU.

There are already noted plans for expansion at the facility. Upon acquiring the facility in April 2015 for C\$580 million (US\$457 million), new owner DP World confirmed that by mid-2017 the facility will have a capacity of 1.35 million TEU per annum. After that there is scope to expand to 2.45 million TEU per annum, although the exact date is yet to be made public and is likely to be subject to demand. As a conservative estimate, by around 2025 seems likely and will see an expansion of the facility by 32 hectares and the quay extended by 800m.

The current facilities are detailed in Table 2.7, with the planned expansion included within Table 2.8.

Table 2.7

Prince Rupert: Container Handling	g Facilities - Mid 2015

Terminal	Area	Berthage	Depth	Quay gantry	On-dock	Major customers
	- h	- m	- m	cranes - no.	rail	
Fairview Container Terminal DP World	24	360	18.7	4	Yes	Cosco, K-Line, Hanjin, Yangming
2015F Total	24	360		4		
Source: Ocean Shipping Consultants	6					
Table 2.8						
Prince Rupert: Planned Container	r Facilities, to 202	<u>25</u>		1		
Terminal	Area	Berthage	Depth	Quay gantry	On-dock	Year
	- h	- m	- m	cranes - no.	rail	
Fairview Container Terminal	32	440	18	4	Yes	2017
Capacity build-up to 2.45m				+5		by 2025*

Note: * = estimated, DP World has not confirmed a specific date.

Source: Ocean Shipping Consultants

While Cosco and Hanjin have been the major users of the port since its original opening, in October 2015 Prince Rupert did secure a service from the 2M Alliance of Maersk Line and MSC, replacing the slot arrangements that had been in force with the CKYHE Alliance. However, this does mean that the traffic brought by the 2M Alliance is not new.

Another potential development that could help increase volumes is a sharing of slots by CMA CGM on COSCO ships. Yet this arrangement may be short-lived with the December 2015-announced decision of Cosco and China Shipping to merge, the existing CKYHE Alliance group is expected to change, with the joint Chinese service offering taking over.

Moreover, the reliance upon Cosco for such a high proportion of its demand for Prince Rupert remains a major risk for the port. If, for example, China Shipping was to obtain the terminal operator concession for the Roberts Bank Terminal 2 Project, then the need (or requirement) for containers and ships going to Prince Rupert could cease.

While this is just a speculative opinion, it does highlight the high-degree of risk involved with any port being so overly-reliant upon one customer – an issue not faced by the Port of Vancouver which has a far more balanced and risk-adverse customer base.

2.4 Summary of Pacific Northwest Container Handling Capacity Development

Table 2.9 summarises the foregoing container port investment plans for the Pacific Northwest region, along with associated capacity additions.

Scheduling becomes increasingly less certain over time, with later stages of development largely dependent on the pace of demand growth achieved by the ports, which includes their ability to serve more distant hinterland demand regions in North America.

On this basis, noted investment and capacity plans are forecast to 2025 for the major container ports in the Pacific Northwest region. The development of Roberts Bank and the second phase at Prince Rupert remain the major investment programmes.

The Terminal 5 modernisation programme represents the remaining noted investment at other ports and while it is possible that further capacity activity may be undertaken at Seattle-Tacoma over the next 10 years, the specific details are yet to be confirmed.

Port	Project Summary	Annual Capacity (m TEU/annum)	Year
Port of Vancouver	Roberts Bank - Deltaport reconfiguration (DTRRIP)	0.60	2016-2018
	Roberts Bank - Terminal II development	2.40	By end 2023
	Centerm development	0.60	By end 2017
	Fraser port capacity not included for planning purposes	-0.15	By end 2017
Prince Rupert	Container terminal expansion - in stages	0.50	2017
		1.35	2017-2021*
	Full build-out anticipated	2.45	2025**
Seattle	T5 modernisation programme	1.00	2015-2019

Table 2.9 Pacific Northwest - Noted Planned and Committed Port Investment to 2025

Notes: * = estimated. ** = DP World has not confirmed any timescales, so estimated.

Source: Ocean Shipping Consultants

Container handling capacity in Pacific Northwest anticipated to expand by 17.5 per cent over 2015-2020 Based on the known or confirmed regional expansion plans, it is anticipated that container handling design capacity for the entire port range will increase from around 12.0 million TEU per annum in 2010 to almost 15.2 million TEU per annum by 2020, as Table 2.10 highlights.

To show the individual contribution, the Northwest Seaport Alliance facilities of Seattle and Tacoma are shown individually.

m TEU per annum	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Port of Vancouver	3.65	3.65	3.65	3.65	3.65	3.85	4.05	4.25	4.70	4.70	4.70
Prince Rupert	0.50	0.50	0.50	0.50	0.85	0.85	0.85	1.35	1.35	1.35	1.35
Seattle	2.85	2.80	3.25	3.55	3.55	2.95	2.95	2.95	2.95	2.95	3.95
Tacoma	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
Subtotal	10.40	10.35	10.80	11.10	11.45	11.05	11.25	11.95	12.40	12.40	13.40
Portland	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Others (incl. Alaska)	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Total	12.00	11.95	12.40	12.70	13.20	12.80	13.00	13.70	14.15	14.15	15.15

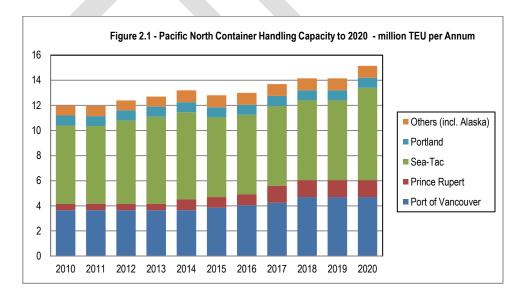
<u>Table 2.10</u> North America Pacific Northwest Container Handling Capacity to 2020

Source: Ocean Shipping Consultants from published port information

Leaving aside the estimated capacity at Portland an in serving Alaska, with the Port of Vancouver actively planning to raise its annual capacity from 3.65 million TEU to 4.70 million TEU per annum by 2020, it is clear that this port will remains at the centre of the region's overall expansion.

The proposed development at Prince Rupert is also important, although the full design capacity is not expected to be reached until some point in the next decade and only then it is still subject to cargo demand warranting the investment to 2.45 million TEU per annum. This shorter-term capacity outlook for the region is shown graphically in Figure 2.1.

The Northwest Seaport alliance facilities of Seattle and Tacoma are now shown collectively in this graphic to highlight the total capacity offered, which is in-keeping with the operating practices adopted by the two ports, although it is important to fully understand that this is the total capacity representative of nine different (and relatively small) terminals.



With total capacity in the Pacific Northwest range at the end of 2015 projected to be at 12.8 million TEU per annum and the Port of Vancouver offering some 3.85 million TEU per annum, the Vancouver terminals are projected to retain a share of 30.1 per cent of total. If other ports, such as Portland are excluded, this figure

increases to 34.8 per cent of the regional total. Moreover, the continued investment at the Port of Vancouver has seen the projected 2015F total reflect a rise on the amount attributable to the port for 2013.

Moving forward to 2020, the share held by Port of Vancouver terminals will remain largely stable for the wider Pacific Northwest region, as Table 2.11 confirms, increasing slightly to 31.0 per cent. Prince Rupert is also listed for comparative purposes. The lack of development at the US ports in the Pacific Northwest is driving the larger share retained by the Pacific Gateway ports of Port of Vancouver and Prince Rupert.

Table 2.11 Growing Share of Port of Vancouver & Prince Rupert Capacity, 2013, 2015 and 2020

	2013	2015F	2020
Port of Vancouver share	28.7%	30.1%	31.0%
Port of Vancouver share excl Portland & Alaska	32.9%	34.8%	35.1%
PR share	3.9%	7.7%	8.9%
PR share excl Portland & Alaska	4.5%	6.6%	10.1%

Source: Ocean Shipping Consultants

2.5 Container Port Productivity

As presented in Table 2.12, terminal productivity is considered from the following perspectives:

- Throughput per unit of berth TEU per metre of berth per annum.
- Throughput per unit of terminal area TEU per hectare of terminal per annum.
- Throughput per quayside gantry crane TEU per gantry crane per annum.

The results indicate the following key conclusions:

- Productivity at the Port of Vancouver is significantly higher than that at the US ports in the range, and this applies to all three measures used. This is despite the inclusion of the multipurpose facilities at Fraser Port in the aggregate, which can be expected to have lower productivity than the dedicated deep-sea facilities at the Port of Vancouver.
- Productivity at Prince Rupert's single container berth has continued to increase since the port opened its container terminal and there is particular pressure with respect to the high productivity levels per crane – there are only four container gantry cranes until the phase two expansion occurs. This further investment is needed if the port hopes to sustain demand growth.

Table	2.12	

North America Pacific Northwest Container Handling Productivity Summary, 2007-2015F

	2007	2008	2009	2010	2011	2012	2013	2015F
TEU per hectare of termina	al area							
Port of Vancouver	16375	16352	12471	14567	14525	15468	16146	17969
Prince Rupert	696	7578	11051	14307	17103	23536	22350	33654
Seattle	9933	8579	7446	10054	9555	8891	7585	40050
Tacoma	9524	9209	7312	6884	6982	7996	8839	10056
Portland	5217	4923	3494	3632	3666	3393	3306	337
Range average	10638	10342	8532	9891	9819	10387	10376	11776
TEU per metre of containe	r berth							
Port of Vancouver	947	946	817	811	809	875	912	1008
Prince Rupert	46	505	737	954	1140	1569	1490	2244
Seattle	622	538	437	590	561	520	424	502
Tacoma	616	596	495	466	447	517	571	593
Portland	176	166	118	122	133	124	121	19
Range average	619	602	510	567	558	594	585	685
TEU per container gantry o	crane							
Port of Vancouver	113433	108352	93585	96704	96424	104352	108673	118873
Prince Rupert	4176	45469	66306	85842	102618	141215	134100	201925
Seattle	75904	65557	63384	85583	84731	69840	58993	
Tacoma	80206	77556	59456	55980	56775	65813	72754	77430
Portland	26013	22314	15837	16464	17950	16655	16227	2591
Range average	77567	73696	64296	72107	72798	75085	74732	85978

Note: From 2015 Seattle & Tacoma report volumes/facilities as the Northwest Alliance.

Source: Ocean Shipping Consultants

2.6 Pacific South Terminals

The focus of competition for the Port of Vancouver for local traffic is predominantly Prince Rupert, with other Pacific Northwest ports a potential option for ocean carriers and shipping serving more distant North American hinterland markets.

On this basis it is also necessary to consider the broader West Coast region. This region (and indeed the whole West Coast Pacific range) is dominated by the twin ports of Long Beach and Los Angeles – which serve the entire North American hinterland via intermodal shipment as well as the local Californian market. Further volumes are shipped through Oakland, whose significance is primarily for the immediate San Francisco area.

With overcapacity prevailing on the Europe-Far East trades, March 2012 saw the cascading of the first 12500 TEU vessels to the Pacific and US west coast, spearheaded by calls at Long Beach and Oakland by the *MSC Fabiola*. This trend has continued since and while the start of 2014 saw the joint MSC/CMA CGM PRX service linking the US West Coast with China utilised vessels up to 13830 TEU (although the average size of vessels on the string is 12411 TEU), CMA CGM has already confirmed via its website that it will be calling in Los Angeles with 18,000 TEU vessels. It is reasonable to expect other ocean carriers to do likewise with similar sized ships.

In order to better identify the quality of facilities, infrastructure and noted investment plans, the ports of Long Beach, Los Angeles and Oakland are considered in more detail on an individual basis.

Long Beach

Key specifications of container terminals at Long Beach are summarised in Table 2.13. There are six container terminals, all being dedicated to one or more lines or consortia and each generally the result of a legacy terminal development by the shipping line in the past to ensure access to its own facility and capacity.

The total land area currently being used for container handling at this port at the end of 2015 is almost 510 hectares, with 7,752m of container quays, served by 66 container gantry cranes.

These totals exclude Pier E – formerly 38.3 hectares and 640m of quay – on which works are in process, as part of the Middle Harbor redevelopment – further information on this large-scale development is outlined below.

There is no change to the infrastructure and major equipment position since 2012, reflecting the lack of recent large-scale development at the port. In fact, the most recent investment involved developing the Pier T facility but it was finalized approximately 10 years ago.

The main access channel is dredged to 23.1m, while berth depth is between 15.2m and 16.8m for terminals A, F J and T. However, there is less water depth for both Pier C & G – the former is used for Matson's cabotage services. Importantly, all terminals except Pier C also have on-dock rail access, definitely required for a container port looking to serve more distant hinterland regions with high volumes of traffic.

Terminal	Berths	Area	Berthage	Depth	Quay gantry	On-dock	Major customers
		- h	- m	- m	cranes - no.	rail	
Pier A SSA/MSC	A88-A96	80.9	1097	15.2	10	Yes	CMA CGM, MSC, Maersk Line, Zim
Pier C SSA (Matson)	C60-C62	28.3	549	12.8	3	No	Matson, Horizon
Pier F: LBCT DOCL*	F6-F10	41.3	838	15.2	7	Yes	OOCL, Hapag Lloyd, NYK
Pier G TS (K Line)	G226-G236	99.6	1945	11.0-12.8	17	Yes	APL, Cosco, Evergreen Hanjin, Hyundai, K Line, MOL Yangming
Pier J PCT SSA/Cosco/CMA CGM	J243-J247 & J266-J270	103.6	1799	12.8-15.2	15	Yes	Cosco, Evergreen, Hanjin K Line, Yangming, ANL ANL, CMA CGM, MSC, PIL
Pier T TI (Hanjin)	T132-T140	155.8	1524	16.8	14	Yes	Hanjin, Cosco, Evergreen, HYK, K Line, Yangming ANL, CMA CGM, Maersk Line
2015F Total		509.5	7752		66		
2013		509.5	7752		66		
2012		509.5	7752		66		
2005		515.0	8392		70		
2000		339.4	6390		44		

<u>Table 2.13</u> Long Beach: Container Handling Facilities - Mid 2015

Note: * = Lease ended December 2011, termnal redevelopment part of Middle Harbor project (see Table 3.14), although operations continue.

Source: Ocean Shipping Consultants

Outlook for Long Beach: investments on terminal expansion, new on-dock infrastructure, bridge replacement and increasing "green" initiatives

Long Beach port plans involve investment which will total an estimated US\$4.5bn over the course of the current decade, including:

 The US\$1.2bn redevelopment of the Middle Harbor, which will combine Piers D, E and F into a single, larger terminal, is the port's major container terminal investment project at present. Work on the first phase – upgrading Piers D/E – commenced in spring 2011 and is expected to start being operational in early 2016.

Phase II is targeted for completion in 2019. When fully built up, the 123h new terminal will have capacity to handle 3.3 million TEU per annum (some 2.2 million TEU per annum more than offered by the individual terminals prior to amalgamation). In April 2012, the port signed a 40-year lease agreement for the new terminal with OOCL, whose lease on its existing Pier F facility expired in 2011.

- The port is also planning to spend around US\$650m plan to convert the site of a former oilfield into a 64.7h container terminal with 1,000m of quay. This terminal will become Pier S and is expected to take around five years to be completed for operations.
- Continuing modernisation and "green" initiatives of K Line's Pier G as part of a programme which started in 2000. A new on-dock rail yard was completed in 2012 and almost doubled the terminal's ondock rail capacity. This initiative also aims to provide additional shore power facilities and container yard space and is due to be finished in 2020.

Other projects will include the US\$1bn replacement of the Gerald Desmond Bridge (which is insufficiently high for the largest transpacific containerships to pass beneath), rail network improvement and the provision of shoreside power (cold ironing) to Piers A, G, J and T, following its recent installation at Pier C. Shore power will also be included in the Middle Harbor development.

At Pier T, TTI (Hanjin Shipping) has known plans to use a small vacant area of around four hectares to install a grain transloading facility to ship grain in otherwise empty containers. MSC has recently acquired a share of TTI, giving this liner company direct access to deepwater terminals that are not constrained by the air draught limitations of the inner terminals, thereby allowing the deployment of larger vessels.

At Pier T, MSC purchased a stake in the terminal in early 2013, which followed a similar acquisition in November 2012 for CMA CGM when it bought a 25 per cent stake of Pier J, which has been operated as a joint venture between SSA and Cosco.

Table 2.14 offers a summary of the planned expansion at container terminals at Long Beach moving forward over the remainder of the current decade. Longer-term initiatives are not yet known, though these highlighted projects are expected to provide sufficient container capacity leading into the middle of the next decade for the port.

<u>Table 2.14</u>

Long Beach: Planned Container Handling Facilities

Terminal	Area	Berthage	Quay gantry	On-dock	Year
	- h	- m	cranes - no.	rail	
Middle Harbor Redevelopment - reconfig (OOCL)	uring of Piers	D, E & F			
Phase I - Pier D/E upgrade net 0.8m TEU per annum capacity		450m		Yes	2016
Completion to 3.3m TEU per annum (net 2.2m TEU per annum)	123.0 3 berths for 13000 TEU ships		22-row outreach	Yes	By 2020
Pier S (oifield redevelopment) adds 1.2m TEU per annum	64.7	1000			2018+

Source: Ocean Shipping Consultants

Los Angeles

In the Pacific South range, container handling capabilities at the port of Los Angeles have been expanded very vigorously over the past decade, including:

- The land area devoted to container handling has increased from 386 to 711 hectares and container quayage from under 6,472m to around 10,000m.
- The number of container gantry cranes has risen from 47 to 78 over the period, which includes a greater proportion of larger units.

Key specifications and major customers of container terminals at Los Angeles are presented in Table 2.15, with the following summary:

- There are nine container terminals, including a vacant (but relatively small) Port of Los Angeles facility.
- On-dock rail access is available on all tenanted terminals apart from MOL's Trans-Pacific Terminal.
- Water depth ranges between 13.7m (Yangming's West Basin CT, Evergreen and NYK's Yusen Terminals) to 16.8m for the APM's Pier 400 facility.
- At least one berth at the other terminals, except APL's, has been deepened to 16.2m in a dredging
 programme which commenced in 2006.
- In late 2010, California United Terminals (operated by a subsidiary of Hyundai Merchant Marine) moved from Long Beach to Los Angeles, taking a (small-sized facility) sublease at APM's terminal.

Table	2.15

Terminal	Berths	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Major customers
West Basin China Shipping	100-109	55.0	762	16.2	8	Yes	China Shipping, Yangming UASC, CMA CGM
West Basin SSA (Matson)	121-131	75.3	762	13.7	5	Yes	China Shipping, K Line Yangming, Cosco, Hanjin, Zim
<i>Tra-Pac Terminal</i> Mitsui OSK Lines	136-147	74.0	1646	13.7-16.2	10	No	MOL, APL, OOCL Hyundai, Hapag Lloyd
Port of Los Angeles Container Terminal	206-209	34.8	665	12.2-13.7	4	No	N/A - v acant
Yusen Terminals NYK Line	212-225	74.9	1768	13.7	8	Yes	NYK, OOCL, Hapag Lloyd MOL, Hyundai
Evergreen Terminal	226-236	83.0	975	13.7	8	Yes	Evergreen, Hanjin Cosco
Pier 300 - Global Gateway APL	302-305	118.2	1219	15.2	16	Yes	APL, MOL, Hapag Lloyd, Hyundai, NYK, OOCL
Pier 400 APM Terminals	401-404	159.0	1609	16.8	14	Yes	Maersk Line, Safmarine, MSC, Horizon, Cosco
California United Terminals (Pier 400 sublease-Hyundai)	405-406	36.8	594	16.8	5	Yes	Hy undai, APL, MOL Hapag Lloy d, NYK
2015F Total		711.0	10000		78		
2013		688.8	10226		80		
2012 2005		693.8 630.0	10441 9734		82 65		
2005		630.0 385.7	9734 6472		65 47		

Source: Ocean Shipping Consultants

Outlook for Los Angeles: Deepening and expansion, focus on on-dock and near-dock rail capacity The port's ten-year plan to 2020 contains investment totaling US\$3bn, which is intended to:

- Complete the channel/berth deepening programme to 16.2m for all berths.
- Expand handling capacity.
- Expand on-dock and near-dock rail capacity.
- Improve traffic flow, with road and bridge improvements within the port.

Key container terminal expansion projects in the period to 2020 are summarised in Table 2.16 and comprise the following notable developments:

- A continuing programme at MOL's Trapac Terminal, which saw a berth extension completed in spring 2011, and added 57 acres of land and an on-dock rail capability in 2014, with berth and channel deepening to 16.1m during 2015. In addition, the terminal operator is installing the first automated straddle carriers in the US.
- Redevelopment of APL's Global Gateway South Terminal with the addition of 22.7h (56 acres) and 380m of quay. With work starting in 2014, the project is expected to boost capacity to 3.2m TEU/year by 2027.

Beyond 2020, a second phase of development at Trapac will add another four hectares of land.

The major project, however, will be the construction of Pier 500, to provide a new 200-acre container terminal. This is expected to take at least 10 years to come to fruition and represents a highly-significant cost to undertake in view of the need to build out on a landfill basis and not use any existing land-based infrastructure. Nevertheless, it remains a noted potential initiative for the future, assuming the costs can be funded.

Terminal	Area	Bert	thage	Depth	Quay gantry	On-dock	Year
	- h		- m	- m	cranes - no.	rail	
Trapac Terminal automation:							
0.5 million TEU per annum	23.0			16.2	5	Yes	2015
0.1 million TEU per annum	4.0						2025
Pier 300 Global Gateway (Berth 306)							
1.55 million TEU per annum	22.7		381.0	16.8	12	Existing	By 2027
Pier 500							
Longer-term potential expansion	81.0						After 2021

<u>Table 2.16</u>

Los Angeles: Planned Container Handling Facilities

Source: Ocean Shipping Consultants

Oakland

The current key container terminal specifications at Oakland are presented in Table 2.17.

Although offering extensive container handling capabilities – with a total area of 310 hectares and almost 7,000m of container berths – the port of Oakland plays a secondary role on the US West Coast and is highly dependent upon the greater San Francisco markets. There is no on-dock rail capacity to facilitate intermodal movements, with rail connections supplied by two near-dock facilities.

The consolidation of terminals has provided seven larger facilities, all but two (the cabotage terminals) offering 15.2m depth alongside. Access channel depth was increased from 14m to 15.2m from late-2009 and the port is now on the calling rotation of the MSC/CMA CGM PRX schedule that does deploy vessels up to 13830 TEU. However, Oakland primarily acts as an export gateway and does not benefit from the significant Asian import traffic volumes that are discharged at Long Beach instead.

Table 2.17

Oakland: Container Handling Facilities - Mid 2015

Terminal	Berths	Area	Berthage	Depth	Quay gantry	On-dock	Major customers
		- h	- m	- m	cranes - no.	rail	
Outer Harbor Terminal Ports America	20-26	84.9	1714.0	12.8-15.2	10	No	CCNI, Hapag Lloyd, H-Sud, Horizon, Maersk Line, US Lines, K Line, Yangming, Hanjin, Cosco, MOL, HMM, APL, Evergreen
TraPac Terminal MOL	30-32	26.6	662.0	15.2	4	No	APL, HMM, MOL
Berth 33-34 - Vacant	33-34	13.2	433.0	433	0	No	N/A - v acant
Ben E Nutter Terminal STS/Ev ergreen	35-38	23.5	931.0	15.2	4	No	Evergreen
OICT - West Gate SSA Terminals	55-56	48.6	731.5	15.2	4	No	Hanjin, Cosco, K Line, Yangming
OICT - East Gate SSA Terminals	57-59	60.6	1091.0	15.2	6	No	CMA CGM, CSCL, MSC, NYK, OOCL, Zim
Matson Terminal SSA Terminals	60-63	32.1	836.0	12.8	4	No	APL
Charles P Howard SSA	67-68	20.4	593	12.8	4	No	Matson
2015F Total		309.9	6992		36		
2013		309.9	6992		36		
2012		309.9	6631		36		
2005		303.4	6631		37		
2000		200.7	4860		29		

Source: Ocean Shipping Consultants

Outlook for Oakland: no immediate terminal expansion plans

With projected throughput in 2015 yet to fully surpass the 2006-07 peaks, there are no immediate terminal expansion plans at Oakland. In 2007 the port handled 2.38 million TEU, which had recovered after the Global Financial Crisis to reach 2.34 million TEU by the end of 2013 but by the end of 2015 a total of 2.27 million TEU emphasises that demand levels have plateaued again.

There are known, albeit longstanding, plans to redevelop the inner harbour but these are not going to be undertaken until volume growth utilises existing terminal capacity, so are not anticipated in the near future and highly likely to be after Terminal 2 at Roberts Bank is operational.

Pacific South Container Handling Capacity Development

Aggregating the container port investment plans in the Pacific South, Table 2.18 presents the anticipated container handling capacity in this range of ports to 2020. It can be noted that relatively little additional capacity is anticipated over the course of the current decade, with 25.14 million TEU forecast for 2020.

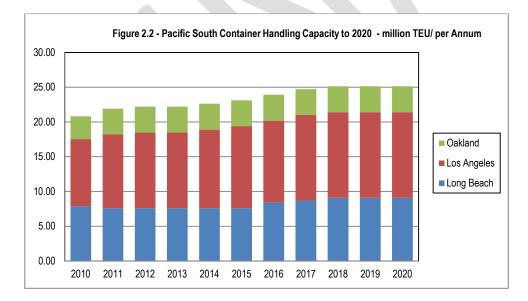
Table 2.18
North America Pacific South*: Container Handling Capacity to 2020

m TEU/year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Long Beach	7.90	7.60	7.60	7.60	7.60	7.60	8.40	8.70	9.10	9.10	9.10
Los Angeles	9.65	10.60	10.90	10.90	11.30	11.80	11.80	12.32	12.32	12.32	12.32
Oakland	3.27	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72
Total	20.82	21.92	22.22	22.22	22.62	23.12	23.92	24.74	25.14	25.14	25.14

* excludes Hawaii

Source: Ocean Shipping Consultants

Between 2012 and 2020, container handling capacity at Pacific South ports will have increase by 13 per cent to 25.14 million TEU per annum, as also charted in Figure 2.2, with relatively little change to the estimated shares applicable to each of the three ports. Moving forward it is also likely that the two San Pedro ports will be seeking to maximise the most efficient use of the facilities and space available through automation before seeking to invest further – subject to union negotiations and subsequent approval, of course.



2.7 'Design' and 'Effective' Capacity

Container terminal capacity is invariably quantified in terms of the numbers of containers that can be handled by the facilities under consideration in a given period. This represents the maximum capacity of the terminal and is the metric that has been used in the current analysis. Providing there is a general balance between berth length and terminal area, this tends to represent the maximum that the terminal can handle across the quay in a given period.

In reality, of course, the position is more complex. It is not possible to aim for full berth utilisation and the capacity of a particular terminal will be dependent upon the specific market in which the terminal is operating. For example, there is a considerable difference noted between common-user and line-owned/operated terminals. In the latter case, the line can maximize the capacity of the terminal by controlling the arrival and departure of vessels. For common-user terminals, there is a greater need to meet short term customer requirements and a less certain vessel arrival profile is noted.

Typically, it has been found that common-user terminals, like those operated in the Port of Vancouver, will see difficulties at other stages of the transport chain begin to emerge when demand reaches much in excess of around 80 per cent of 'design' capacity. For example, vessels may be queuing for berths or there can be landside congestion.

Calculation of these issues can never be definitive given the importance of local and often temporary market issues. However, in this study it is estimated that utilisation rates of around 85 per cent represent a maximum efficient (or 'effective') use of a container terminal. This is an important consideration when defining when new capacity will be required as a period of 100 per cent utilisation would likely represent an inefficient terminal that would be in danger of losing market share.

The choice of 85 per cent may be seen as conservative – with congestion difficulties frequently encountered at lower utilisation levels.

2.8 Key Conclusions – Implications for the Port of Vancouver

It is apparent from these analyses that only limited expansion is anticipated at Pacific West Coast terminals as a whole. Demand increases have been accommodated by improved productivity, but there is very little scope to further improve capacity by this means – particularly in Canadian ports.

It is also apparent that there has been a programme of depth improvements in the major Californian ports and in the Pacific Northwest and this has allowed larger vessels to enter the trade – this is an important factor as the cascading of container vessels continues to occur in the Transpacific, with the current largest ships now in the 13,830 TEU-size range but at the start of 2016 vessels as large as 18,000 TEU are likely to be calling more regularly.

The water depth available at the Port of Vancouver remains an important competitive factor in being able to handle large container ships in the Transpacific trades at the load factors anticipated over the forecast period. However, it is also imperative that container terminal and intermodal capacity are sufficient to continue to meet future demand.

SECTION III - TRENDS IN CONTAINER SHIPPING

3.1 Introduction

The Port of Vancouver enjoys considerable shipping advantage over most of the competing Pacific West Coast ports insofar as it can berth the largest existing and anticipated container vessels. The trend has been towards the development of much larger vessels in recent years and the Port of Vancouver will be well placed to handle such container ships.

This Section looks at:

- Recent changes and development of vessel sizes for the largest deepsea trades.
- Specific developments of the Transpacific trades, including provision of existing liner services and sizes
 of vessels in use, including future ships in service on the Pacific Northwest trades and potential impacts
 of shipping line consolidation following recent developments (i.e. 2M Alliance, Ocean Three, CMA CGM
 acquisition of NOL/APL, Cosco/China Shipping merger some of this merger and alliance activity is yet
 to be fully realised, hence only reasonable outcomes can be assessed at the time of writing at the start
 of 2016).
- The potential for greater competition as a result of larger ships calling to East Coast ports to serve the US Midwest via the Suez Canal.
- The competitive position of the Port of Vancouver versus competing regional terminals for shipping line customers.

3.2 Container Vessel Sizes and Fleet Development

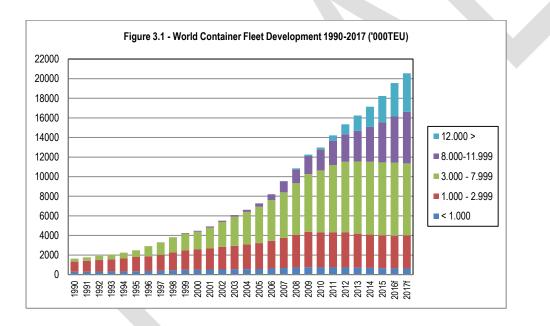
The shift to larger vessels has been the most significant feature for deepsea containerization in recent years. The search for scale economies is at the heart of this drive. On a tonnage-mile basis, the savings from larger vessels are significant and also one of the few factors that can be directly controlled by shipping lines. Furthermore, as soon as one major operator advances to the next size echelon, the competitive nature of the shipping industry invariably forces other operators to follow suit. The net effect has been an increase in both average vessel size and the size of the largest vessels deployed.

This process has also seen a considerable increase in the capacity of the container fleet as all major operators have introduced much larger vessels. This has resulted in a miss-match between supply and demand and has resulted in a very weak shipping market.

The largest vessels that are on-order have a length (LOA) of 400m, a beam of 59m and a design draught of around 15.5m – although full draught by weight will seldom be used. Berthing of these vessels will be possible with careful management at the Port of Vancouver and at Prince Rupert. Larger vessels are also under consideration with designs for vessels of 22,000TEU and even 24,000TEU proposed. The proposed dimensions of such vessels will result in either broader or longer vessels, although draught is not anticipated to be deeper.

The trend in favour of larger vessels is well established and has accelerated since 2004. The share of 8,000 TEU+ vessels increased from 0.2 per cent of the containership fleet at the beginning of 2004 to 37 per cent at present. The very largest vessels are typically deployed on trades between East Asia and Europe. This trend has also seen the deployment of much larger vessels onto the Transpacific trades, with vessels of up to 14,000TEU deployed on some rotations. The oversupply of these largest classes of vessels is now resulting in pressure to re-deploy these vessels on other trades and the Transpacific will be a primary candidate for further deployment of these units. There is likely to be pressure to deploy further larger vessels on these trades, where water depth and other considerations permit such operations.

The development of the world fleet is summarised in Figure 3.1, with projections to the end of 2017 included on the basis of the current orderbook for new vessels.



All of the major shipping lines have now committed to the development of the largest classes of container vessels in the 18,000TEU+ size range, with these vessels generally offering variations on a typical design profile of an overall length of around 400m with a bean of up to 59m. The draught of these vessels when fully-loaded is in the range of 15.2-15.5m, with this indicating a required water depth of up to around 16.5m.

There are also further pressures to develop yet larger containerships and there have also been conceptual assessments of even bigger vessels (c. 22-24,000TEU), which will potentially be up to a further 50m in length than the current largest vessels.

OSC has been heavily involved in discussions with Lloyd's Register (and shipping lines) concerning the likely dimensions of this new class of vessel and it seems possible in principle to fit 22,000TEU into a vessel with a length of 400-433m. This is the same as for the 18,000TEU vessels with the addition of 4 x 20' bays and two cross-decks, with the same beam and draught as the 'EEE' class vessels. These are likely to be introduced over the next five to ten years into the Asia-Europe trades, resulting in tonnage that is currently deployed on the main arterial routes having to be cascaded to the secondary trades, thereby increasing the average size of vessels

deployed on these trade lanes. The generational development of container vessels to date is summarised in Figure 3.2.



Figure 3.2 – Development of Container Vessel Dimensions

It is also possible that these larger vessels will be deployed on some Transpacific trades – where sufficient terminal capacity is available. There are constraints to these developments:

- A design constraint for all modern designs of container ship is the height to which containers may be stacked. In the container holds and on deck, the greatest stack height is constrained by the strength of the containers, so the lowest box is not crushed and there is not an unacceptable constraint on the weight of containers which can be carried in each stack.
- The twin island configuration is used almost universally in order to maximise the container capacity within the constraints of bridge visibility requirements.

This assessment has not identified any major technical obstacles to the development of ships of 20,000 TEU and above.

Current large container ships have breadth consistent with carriage of 22 or 23 stacks abreast on deck. The capacity then becomes a function of vessel length. It is considered that vessel capacity increases by greater length alone is already nearing the upper limit at c400m. As ever, more boxes will be squeezed into the current breadth limit, but it is unlikely that vessel capacity will exceed 22,000TEU without increasing the breadth.

There are many options available to ship owners who wish to progress to container ships with capacities greater than those in service today. In addition, it is possible for some existing ships to be lengthened to provide increased capacity. Some of the options have been evaluated here and indicative vessel dimensions deduced.

Maximum vessel size is a compromise between increasing breadth (with consequent challenges for the terminals) and increasing length (with challenges for the bending strength of the ship that will determine the optimum). It is unlikely that very small values of L/B will predominate, so the lesser values of length are unlikely to represent the upper limits which we will be seen on ship length. Equally, ship length comes at a price, so it is unlikely that high L/B values will dominate. So, on this basis, it would seem that 450 metres LOA is a realistic

upper limit for vessel length in the foreseeable future – so the design of berths for the very largest anticipated container ships should be predicated on the, i.e. a vessel length of 450m.

The dimensions of large container vessels and their likely future development are summarised in Table 3.1.

<u>Table 3.1</u>

Design Development of Large Containerships

	TEUs	Length	Beam (m)	Maximum	Noted Required	
		overall (m)	draught* (m)		berth depth (m)*	
First generation: 1968	1,100					
Second generation: 1970-80	2-3,000	213	27.4	10.8	12.0	
Panamax: 1980-90	3-4,500	294	32.0	12.2	12.8-13.0	
Post-panamax : 1988-95	4-5,000	280-305	41.1	12.7	13.5-14.0	
Fifth generation: 1996-2005	6,400-8,000	300-347	42.9	14.0-14.5	14.8-15.3	
Super post-panamax : 1997->	8,000-11,400	320-380	43-47	14.5-15.0	15.3-15.8	
Ultra large container ships: 2006->	14,500	380-400	56.4	15.5	16.4	
New-panamax: 2010	12,500	366	49.0	15.2	16.1	
Triple E-Class	18,270	400	59.0	15.5	16.4	
CSCL 19,100 Class	18,400	400	58.6	15.5	16.4	
MSC Oscar	19,244	400	59.0	15.5	16.4	
Proposed Vessels:						
New generation 1	22,000	430	59.0	15.5	16.4	
New generation IIA	24,000	450	59.0	15.8	16.6	
New generation IIB	24,000	430	61.5	15.5	16.4	

* Maximum draught is rarely realised, even when vessels are fully laden, so required berth depth is less in practice.

Source: Ocean Shipping Consultants

The development of 22,000TEU vessels will be by means of increasing length, with 430-433m being the likely dimension. There are seen to be two options for 24,000TEU vessels – either further lengthening, with a slightly deeper draught or a shift to broader vessels on a length of up to 430m. This would entail an additional row of containers.

It is realistic to anticipate that 22,000TEU vessels with a length of around 430m+ and 23 rows wide will be deployed on the Asia-Europe trades and may have a role on the Transpacific trades at some point in the future. The shift to 24,000TEU+ vessels will be more complex and would involve significant infrastructure and container crane investments.

Container vessel size development driven by search for economies of scale

This shift to larger vessels has been the most significant feature for deepsea containerisation. The search for scale economies is at the heart of this drive. On a tonnage-mile basis, the savings from larger vessels are significant and also one of the few factors that are directly controlled by ship operators.

Furthermore, as soon as one major operator advances to the next size echelon, the competitive nature of the shipping industry may force other operators to follow suit. The net effect is a rise in both average vessel size and the size of the largest vessels deployed.

Current expansion of the Panama Canal will boost ship size developments as well

Currently, there is a further, one-off boost motivating ship size development in some trades, namely the expansion of the Panama Canal, which will permit larger vessels to cross between the Pacific and Atlantic Oceans from late 2016.

The maximum dimensions for vessels that will be allowed through the new locks will be 369m LOA x 49m beam x 15.2m maximum draught. This implies considerable margins relative to the actual dimensions of the locks, and it may be that new-Panamax (NPX) vessel dimensions will be progressively enhanced, as has been the case for Panamax dimensions. This will improve the economics of the All-Water services between Asia and North America and will have some negative impact on the market share of Californian ports. As is considered in detail in this study, these effects will not be manifested at either Vancouver or Prince Rupert.

Factors defining the upper limits of the size of container vessels

It is apparent that the size of container vessels is now approaching a peak. Factors which define upper limits are:

- Scale of demand: This is the most obvious determining factor. Attempts to increase ship size beyond
 that called for by market demand result in half-empty vessels, trading with the costs, but not the benefits
 of scale. This explains why, for example, the largest general cargo vessels are much smaller than the
 largest tankers or dry bulk carriers. Similar considerations apply to container ships. Filling the largest
 container ships used for transshipment requires networks of feeders and/or interlining mainline services
 to concentrate demand.
- At-sea versus in-port costs, long versus short hauls, and number of port calls: economies of scale are reaped whilst vessels are at sea, since it costs less per cargo ton to ship a large cargo than a small cargo. However, the per-tonne costs of loading and unloading do not decline similarly with increasing cargo size, as it is difficult significantly to speed up per-tonne or per-container handling speeds, so larger vessels benefit from only limited economies, if any, whilst in port. Scale economies are therefore at their greatest when the sea-time/port-time ratio is maximised.
- Limits to scale economies and diminishing returns: There are diminishing returns from increasing vessel size beyond certain limits – to obtain the same percentage increases in economies of scale it is necessary to expand vessel size by increasingly large margins.
- Available ports: The largest vessels can only be accommodated at very few ports, and possibly only
 when partially loaded, thus negating the theoretical benefits to be gained by scale economies, but not
 the higher costs of the vessels. The opportunities for utilising such vessels are therefore limited.
- Terminal and hinterland transport infrastructure:
 - As well as the necessary access parameters, terminals have to install the requisite cargo-handling technology, such as larger quayside cranes for containers. To cope with the increasing overall and consignment volumes being moved across the quay, yard systems have had to evolve also, to keep up the flow between quay and yard.
 - Except in the case of transshipment, it is not only necessary to have the requisite terminal development, but the hinterland transport infrastructure also has to be capable of handling terminal throughput – and particularly peak demand.

Limits to Scale Economies for Container Ships

The progressive decrease in unit transport costs to be gained with increasing vessel size has been the major driving force in the strategies of container ship operators. However, the potential savings decline as vessel sizes increase.

There are significant scale economies, as ship sizes are increased to around 14,500 TEU. Although additional gains can be made beyond this stage, very large increases in capacity have to be incorporated in order to make worthwhile further savings.

In order to find the optimal vessel size to minimize trading costs, all costs related to the trade have to be considered. Direct trading costs comprise:

- Capital costs the cost of financing the vessel.
- Operating costs the various cost sectors involved with operating and manning the vessel.
- Fuel costs the fuel consumption in-port and at-sea, with this varying in line with fuel price, speed and consumption.

Tables 3.2 and 3.3 summarise the daily trading costs for large deepsea vessels in terms of vessel capacity in the current market, updated based on current confirmed data at the end of 2015.

All of these costs are related to the size of the vessel, with significant scale economies noted for each sector as the size increases. Indeed, this has been the driving force associated with the introduction of larger vessels over the past twenty years.

Table 3.2 Deep-Sea Containership Capital and Operating Costs 2014

	2000TEU	3500TEU	4500TEU	6800TEU	8500TEU	10800TEU	12500TEU	14500TEU	18300TEU
Capacity - TEUs	2000	3500	4500	6800	8500	10800	12500	14500	18300
Capital Costs									
New build Price - mUS\$	27.5	38.0	45.0	67.0	76.5	93.0	114.0	130.0	163.5
Daily Capital Charge - \$	11,337	15,666	18,552	27,622	31,539	38,341	46,999	53,595	67,406
Operating Costs									
Manning - US\$/day	3,200	3,650	3,650	3,650	3,650	3,650	3,650	3,700	3,950
Repair & Maintenance - US\$/day	1,096	1,568	1,734	2,456	2,903	3,105	3,220	3,350	3,650
Insurance - US\$/day	655	936	1,035	1,466	1,733	1,933	2,133	2,350	2,550
Admin/Other Charges* - US\$/day	1,000	1,100	1,100	1,200	1,200	1,200	1,300	1,475	1,650
Total	5,951	7,253	7,519	8,773	9,486	9,888	10,303	10,875	11,800
TOTAL	17,288	22,920	26,071	36,395	41,025	48,229	57,302	64,470	79,206
\$/TEU	8.64	6.55	5.79	5.35	4.83	4.47	4.58	4.45	4.33

Note: * = Estimates for twin-engine Maersk design.

Source: Ocean Shipping Consultants

Table 3.2 presents a summary of current capital and operating costs for the different specified vessels. The following should be noted:

Capital costs can be calculated in various different ways, with each specific newbuilding deal invariably unique. However, a common calculation has been made that converts original purchase price into a daily capital charge. Of course, this will fluctuate in line with market conditions prevailing in the shipbuilding sector when a particular vessel was ordered. However, representative prices have here been adopted to allow some direct comparisons. The surge in ordering for ULCSs that was noted in 2007-2008 resulted in firm pricing for these vessels, with typical contracts placed at between \$160-

173m per unit. Prices have since fallen back and it is reported that Maersk were able to secure their EEE Class vessels at a unit price of some \$190m, though OSC is aware that in end-2015 known orders by the likes of UASC/China Shipping are putting this size of vessel much nearer \$160m.

The scale economies are apparent. Capital charges per TEU of vessel capacity fall from around \$4.06 per day for 6800TEU vessels to just \$3.68 for the 18,000TEU+ classes.

It must be stressed that the returns available in pushing vessel capacity decline as vessel sizes increase. There will be only limited returns beyond 18,000TEU even for a line that has the market presence to justify such vessels. However, having decided to commit to the largest vessels there is little reason not to maximize potential benefits.

Table 3.3 Sample Fuel Consumption Levels and Bunker Bills End-2015

	2000TEU	3500TEU	4500TEU	6800TEU	8500TEU	10800TEU	12500TEU	14500TEU	18300TEU
Capacity - TEUs	2000	3500	4500	6800	8500	10800	12500	14500	18300
Fuel Costs									
HFO - US\$/tonne	239	239	239	239	239	239	239	239	239
MDO - US\$/tonne	461	461	461	461	461	461	461	461	461
Consumption At Sea	18 knots	18 knots	19 knots						
HFO - tonnes/day	32.8	50.3	53.5	79.5	98.6	113.0	136.5	153.5	163.5
MDO - tonnes/day	2.0	2.5	2.5	2.8	2.8	3.0	3.2	3.2	3.2
Consumption In Port									
HFO - tonnes/day	0	0	0	0	0	0	0	0	0
MDO - tonnes/day	2.0	2.8	2.8	2.8	2.8	3.0	3.2	3.2	3.2
Fuel Costs At Sea - US\$/day	8,761	13,174	13,939	20,291	24,856	28,390	34,099	38,162	40,552
Fuel Costs In Port - US\$/day	922	1,153	1,153	1,291	1,291	1,383	1,475	1,475	1,475

Note: * = Estimates for twin-engine Maersk design.

Source: Ocean Shipping Consultants

Operating costs have been derived from the OSC database. This comprises actual costs for operating
a vessel (excluding liner management and agency costs) and covers manning, repair and maintenance
(converted to a daily rate to include periodic special survey), insurance (both hull and machinery and
protection and indemnity) and other various miscellaneous charges.

Detailed consideration of these costs is outside the scope of the current paper, but it is clear that manning costs do not escalate significantly in relation to vessel size. Repair and maintenance are linked to original capital value – all of the vessels in the fleet sector are relatively young, so no information has become available concerning any special difficulties as the vessels age. Insurance is linked to vessel and cargo values and, therefore, increases in fairly close relation to vessel size. The balance of costs is relatively minor and does not move rapidly upwards as size increases.

The net effect is, once again seen to be considerable scale economies, but it must be noted that these costs are low in comparison to capital charges and certainly in relation to fuel costs. Nevertheless, these savings transfer directly to the owner's bottom line and have been a significant driver of vessel size increases.

Fuel charges are highly dependent upon speed of trading and also the prevailing costs of fuel. Table
 3.3 presents a picture of fuel charges for vessels trading at the speeds recorded. For comparison

purposes fuel costs have been based on current prices for IFO and MDO for the 18,300TEU design trading more slowly at 19 knots to reflect the impact of slow steaming.

Table 3.4

Sample Calculation - Annualised Asia to Europe Vessel Costs Per Slot

- 3 East Asian ports and 3 North American ports

	4500TEU	6800TEU	8500TEU	10800TEU	12500TEU	14500TEU	18300TEU
Capacity - TEU	4800	6800	8500	10800	13000	14500	18300
No. containers - round trip	8640	12240	15300	19440	23400	26100	32940
Port time - handling (days)	2.40	3.40	4.25	5.40	6.50	7.25	9.15
Port time - access (days)	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Canal Time	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Port Time (days) Sea Time	5.40	6.40	7.25	8.40	9.50	10.25	12.15
Round trip - nautical miles	12200	12200	12200	12200	12200	12200	12200
Speed - knots	19	19	19	19	19	19	19
N. miles per day	456	456	456	456	456	456	456
Sea Time (days)	26.75	26.75	26.75	26.75	26.75	26.75	26.75
Contingency (+ 5 per cent)	28.09	28.09	28.09	28.09	28.09	28.09	28.09
Voyage Time	33.49	34.49	35.34	36.49	37.59	38.34	40.24
Voyages per annum	10.45	10.15	9.90	9.59	9.31	9.13	8.70
Slots per annum - TEUs	100322	138003	168354	207168	242072	264722	318323
Vessel costs at sea - US\$/day	40010	56686	65881	76619	91400	102632	119758
Vessel costs in port - US\$/day	27224	37685	42315	49612	58777	65945	80681
Vessel sea costs - US\$	1,070,447	1,516,599	1,762,602	2,049,893	2,445,358	2,745,851	3,204,048
Vessel port costs - US\$	147,008	241,187	306,787	416,740	558,379	675,939	980,278
Canal charges	275,850	275,850	275,850	275,850	275,850	275,850	275,850
Voyage Costs - US\$	1,493,305	2,033,636	2,345,239	2,742,484	3,279,588	3,697,640	4,460,176
Annual Service Costs - US\$	15,605,369	20,635,812	23,225,374	26,303,478	30,534,489	33,753,338	38,791,747
Annualised Costs per slot - US\$	155.6	149.5	138.0	127.0	126.1	127.5	121.9

Source: Ocean Shipping Consultants

It is apparent that the daily fuel costs for an 18,300TEU vessel trading at 19 knots are around 19 per cent cheaper than an NPX (12500-13,000TEU) on a per container basis. Fuel prices are very volatile and are directly related to the price of oil. It should be note that for most of 2014, when oil prices were high, the daily fuel bill, for example, for a 14,500TEU vessel at 19 knots was over US\$75,000 per day. Under these conditions there was a great incentive to slow vessels. The costs have since fallen sharply, but it remains unclear at what level oil prices will stabilize in coming years.

Of course, the slower vessel will not be offering the same annualised container handling capacity as the same vessel trading at a faster speed and these trade-offs need to be calculated, but the overall importance of fuel costs is clearly apparent.

Table 3.4 presents a summary of vessel costs for a typical Transpacific voyage and underlines the overall costs per container for different sizes of vessels. The pressure to introduce larger vessels (where possible) is apparent from this review of direct costs.

Trade-off between additional engine capital costs and speed: ultimate size of container vessels is likely to be between 20,000-22,000TEU

The technical issues relating to powering containerships are complex and lie outside the scope of this study. However, significant work has been undertaken by Lloyd's Register on this subject, in which OSC has been involved, and some of the findings are summarised here. There is a non-linear relation between energy requirement and speed, in which the energy requirement (and therefore fuel bills) increases with the cube of speed – the so-called 'cube rule'. This means that there is a much more severe penalty for increasing the speed of a vessel from 24 to 25 knots, for example, than there is from 19 to 20 knots. This creates additional sensitivity to fuel price rises, with sharp increases in bunker prices leading immediately to pressure to cut vessel trading speed.

Although it is possible to increase an engine's power by adding cylinders or boosting the capacity of each cylinder, further issues relating to propeller size also have to be addressed. The diameter of the propeller must be increased significantly, if power is to be converted to drive, which creates problems for casting and, more importantly, there are cavitation issues for such massive units. This makes a twin-propeller design necessary, if the required speeds are to be achieved.

Energy consumption by vessel speed and size has been considered at some length for vessels that are currently operational, and the results are summarised in Table 3.5.

<u>Table 3.5</u> <u>Power Requirements for Large Containerships by Vessel Size and Speed</u> MCR Ps (MW)

Knots	6800TEU	8500TEU	10800TEU	12500TEU	14500TEU	18300TEU
18	26.1	28.9	33.4	35.7	37.7	40.9
19	30.7	34.0	39.3	42.0	44.4	48.1
20	35.8	39.7	45.9	49.0	51.7	56.1
21	41.4	45.9	53.1	56.7	59.9	64.9
22	47.6	52.8	61.1	65.1	68.9	74.7
23	54.4	60.3	69.8	74.4	78.7	85.3
24	61.8	68.6	79.3	84.6	89.4	96.9

Sources: Lloyds Register, Ocean Shipping Consultants

From this analysis it can be seen that:

- There is a very steep increase in energy consumption for larger vessels even 14,500 TEU vessels are not always able to trade at 25 knots.
- Any requirement for powering above 100MW creates a requirement for two engines and resulting twinskeg design. This significantly alters the scale economy calculations.

It is apparent from this that vessels larger than 20,000TEU do not offer significant additional savings. The requirement either to increase available power to provide a competitive trading speed or to reduce capital and hence transport costs by slowing down the vessel means that only limited additional gains can be secured.

This conclusion confirms that the ultimate size of container vessels is likely to be between 18,000-20,000TEU (and possibly somewhat larger). The ability to berth these vessels will be an important feature of the Port of Vancouver's competitive position over the forecast period.

Ultra-Large Container Ships (ULCS) over-capacity will remain for at least the short-term

The primary response by carriers to the recent severe overcapacity in the container shipping sector, combined with until recently high fuel prices, has been to absorb capacity by slowing trading speeds. This has the multiple benefits for the carrier of reducing fuel costs, turning costly idle vessels into performing assets and, by managing overcapacity, supporting freight rates.

By reducing speed from a typical 23 knots before the recession to as low as 14 knots in 2009, carriers were able to limit the number of idle vessels and reduce overcapacity significantly. The continuance of slow speeding in 2010 served to reduce the number of laid-up vessels to a small rump, thus dramatically limit the impact of underlying overcapacity.

In a climate of lower oil prices it is unclear whether slow steaming will continue. Whilst slow steaming may make economic sense when there are spare vessels available to add to a string, this is not the norm when there is no supply/demand imbalance. Slow steaming can also impose costs on customers, who may be forced to finance additional loads in the supply pipeline, in order to meet their requirements. Indeed the current slow steaming trend has generated complaints from shippers, although for the short-term at least it is a concept likely to remain within the industry. Further ordering of larger vessels of the 18,000 TEU and larger classification has precipitated more over-capacity and sustained the slow steaming policy.

It is OSC's view that it would be dangerous to adopt a policy based on particular steaming speeds at any one time. Whilst carriers may keep slow speeding in their armory as a way to manage overcapacity and low freight rates, they will find reasons to speed vessels up when demand catches up with capacity, and their attention reverts from repairing their balance sheets and bottom lines to maintaining their market shares.

The development of the ULCS fleet is further summarised in Table 3.6, which includes confirmed data (as available at the end of 2015) and relating to the estimated position up to 2018.

It is anticipated that the capacity of ULCS vessels (here defined as 12,000TEU and larger) will increase from a current level of around 3.4m TEU to around 5.6m TEU at the end of 2018 – an increase of 65 per cent. By this period around 25 per cent of total container fleet capacity will be in this size range. It is clear that demand is extremely unlikely to match this pace of growth and a further prolonged period of overcapacity is anticipated.

This represents a continuing transformation of terminal requirements for the Asia-North America trades, in which a greater proportion and larger vessels will need to be catered for at container terminals.

In essence, those ports unable to successfully receive these units will become far less competitive to ocean carrier operators. This will be central to the rationale for the further development of deepwater capacity at the Port of Vancouver.

<u>Table 3.6</u>

Forecast ULCS* Fleet Development to 2018

	No. Of ULCS	ULCS (>12,000)	Total fleet	ULCS share
	vessels	000TEU capacity	000TEU capacity	TEU capacity
Existing fleet				
End-2014	193	2694.0	18244.0	14.8%
<u>Orderbook (sch</u>	eduled delivery)			
2015	37	743.7	1452.0	51.2%
2016	33	532.0	1184.5	44.9%
2017	47	795.9	1176.9	67.6%
2018	50	829.4	895.6	92.6%
<u>Forecast fleet (e</u>	end)			
2015	230	3437.7	19696.0	17.5%
2016	263	3969.7	20667.0	19.2%
2017	310	4765.6	21250.0	22.4%
2018	360	5595.0	22450.0	24.9%

End-y ear

* - Ultra Large Container Vessels = 12,000TEU and larger

Source: Ocean Shipping Consultants/Clarksons

3.3 Analysis of the Transpacific Trades

Within this overall framework of larger vessels being ordered and entering service, the specific development of shipping deployments on the Transpacific trades is of immediate relevance to the Port of Vancouver's container demand development. With the bigger ships entering service, the berthing of the largest vessels and ensuring adequate equipment is available to service them will remain the critical issue for the port's competitive position.

As a general overview the following points should be noted for the Transpacific, although the Pacific Northwest where the Port of Vancouver and the Pacific South (covering the San Pedro ports) regions are not differentiated individually:

- 40' containers are dominant for the Transpacific trades. This is a legacy of the emphasis on these sizes
 of containers by major US operators since the early 1980s. This means that there will be a shortage of
 smaller units which will be loaded by weight rather than volume and will be in demand for the Port of
 Vancouver exports.
- There is a severe net imbalance favouring eastbound containers on these trades i.e. there are many westbound empty movements. Once again the position of the Port of Vancouver is structurally different.
- On average. loaded containers are much heavier westbound than eastbound, but this effect is masked by the number of westbound empties.

It is apparent that although very large vessels will be deployed, with the current 14,000TEU vessels likely to increase during 2016 and deployment of up to 18,000TEU vessels in the very near future. For example, CMA CGM has already confirmed on its website that it is planning to introduce a newbuild, the *CMA CGM Benjamin Franklin*, which has a capacity of 17,859 TEU, onto the operator's Yangtse service which links the ports of Shanghai, Ningbo, Pusan, Los Angeles, Oakland, and back to Shanghai. According to CMA CGM's online

service schedules (in early December 2015), this new vessel is scheduled to make its first call at Los Angeles on December 26th 2015, making it the largest ship to ever call a U.S. port (to date).

Clearly, with continued weaker demand and freight rates in the Asia-Europe market, it seems clear that some of the major liner companies are already be looking at deployment issues in the Transpacific. This is especially pertinent for CMA CGM which has agreed to purchase NOL/APL as part of its clear desire to increase exposure and share to the Transpacific trades.

3.4 Transpacific Container Services

Table 3.7

As a general overview, Table 3.7 summarises the current capacity of the leading container shipping lines as of mid-2015. The size of overall number of vessels and TEU operated by the three largest shipping lines is evident and further helps to show the size of the 2M Alliance of Maersk Line and MSC, but also the size of the new entity to be created by the CMA CGM acquisition of NOL/APL which was announced at the start of December 2015.

Line	No.	TEU	On order	TEU
Maersk Line	606	2,907,270	6	109,620
MSC	497	2,539,354	30	357,000
CMA CGM	448	1,649,675	25	268,800
Hapag-Lloy d	186	980,354	5	46,500
Evergreen	197	953,946	4	34,032
Cosco	163	825,405	10	119,500
China Shipping	135	673,578	3	57,300
Hanjin Shipping	98	608,459		
Mitsui OSK	112	602,134	12	180,900
APL/NOL	94	562,346		
Hamburg Sud	111	533,365	3	31,500
OOCL	98	531,577	10	155,552
NYK Line	107	501,424		
Yangming	87	401,920	5	23,310
PIL	162	380,499	7	27,223
НММ	57	377,705		
K Line	70	363,901	10	138,700
UASC	54	362,492	16	257,800
Zim	80	331,968		
Total	3362	16,087,372	146	1,807,737

Container Vessel Fleets Deployed by Leading Operators in mid-2015

Source: Ocean Shipping Consultants / Clarksons

The following represents a summary of developments by some of the major liner operators over the past year, with confirmation of known future fleet expansion programmes also outlined. All of these shipping lines are either existing or potential future operators in the Transpacific trades, with many the subject of operating and alliance changes recently or to come in 2016

 Maersk Line – in 2014 the operator increased its total capacity operated by almost 324,000 TEU, primarily due to the delivery of another nine Triple E class ships of 18,340 TEU each. The company also continues to be active in the charter market, including taking 14 units of between 4,900-5,500 TEU for likely use in African and ISC trades. In 2015 a further seven Triple-E ships are due for delivery, along with four charter vessels of 9,000-10,000 TEU. It had been rumoured that additional expanded EEE vessels will be ordered soon but the weaker financial for 2015 has seen this strategy altered.

- MSC between the start of 2014 and 2015 MSC's operated fleet rose by 171,640 TEU, although two 15,900 TEU ships were also taken on charter. However, a massive 30 new ships and total capacity of 357,000 TEU are due for delivery in 2015, which includes 6 x 19,200 TEU units and a further 4 x 15,900 TEU vessels on long-term charter.
- CMA CGM the French Line's fleet increased by just over 147,500 TEU during 2014, which included nine long-term charter newbuildings in the 9,200-10,600 TEU size range. In fact, the company is planning to add a total of 28 ships of this size between 2014 and 2016 and in 2015 alone it is taking delivery of 25 new vessels for a total of 268,800 TEU slots. The acquisition of NOL/APL will boost the size of the fleet being operated but not the orderbook (NOL/APL has not been active in this respect recently).
- Hapag-Lloyd the merger with CSAV has resulted in a fleet rationalisation process but in 2015 the newly-merged company will receive 5 x 9,300 TEU units (originally ordered by CSAV), which comprises the full extent of its orderbook.
- Evergreen in 2014 the fleet operated rose by almost 107,500 TEU as this Taiwanese-based operator continued to aggressively increase its expansion programme, which included 8 x 13,800 TEU units and a further 9 x 8,500 TEU ships. There are few planned deliveries for 2015 but there are already 6 x 18,000 TEU units confirmed as being chartered from 2017.
- Cosco the final 4 x 13,400 TEU vessels arrived in 2014, originally ordered in 2008, with the company's next additions (of 5 x 14,500 TEU and 5 x 9,400 TEU) not due until the end of 2016 at the earliest. Unconfirmed international press reports suggest that this operator and Yangming could soon order a further 11 units of 20,000 TEU each.
- China Shipping this company's fleet has increased by almost 124,400 TEU in the past two years, with two units each of 18,900 TEU delivered at the end of 2014 briefly the largest container vessels in operation. The operator is currently expecting to introduce a further three ships, each of 19,100 TEU.
- Mitsui OSK added 54,670 TEU to its fleet in 2014, including 2 x 13,900 TEU units chartered from G6 partner APL and 4 x 10,000 TEU ships on charter. However, it is the company's confirmed orders for 6 x 20,150 TEU vessels that are most noteworthy because these were the first 20,000 TEU units to be officially confirmed in the industry. Of the six ships, four are being purchased from Samsung Heavy Industries at a cost of US\$154.9m each, with the remaining two units arriving on charter. The cheaper purchase price is believed to have influenced the ocean carrier to purchase and not charter all six ships. The shipping line has also stated that the G6 Alliance is likely to need two loops of over 18,000 TEU vessels in the Asia-Europe trades to stay competitive. Press reports indicate that OOCL is the most likely remaining G6 member likely to match MOL's fleet expansion programme to allow the alliance to remain competitive.
- UASC the Dubai-headquartered operator has been especially active in expanding its fleet, spurred by its involvement in the Ocean 3 alliance with CMA CGM and China Shipping. In the past two years UASC has increased its fleet slots by almost 91,500 TEU, of which 84,000 TEU were introduced in 2014 alone. Almost all ships being added to its fleet are in excess of 15,000 TEU and there is still a noted 257,800 TEU on order.
- Hanjin Shipping & NOL/APL both operators saw their respective fleets shrink in 2014, reflecting the continued difficult operating activities being faced. In particular, by the start of 2015 APL is operating almost 79,000 TEU of fewer slots than the same position one year earlier

- Zim minimal change has occurred recently in the company's shipping fleet, with any units being scraped being replaced by chartered tonnage.
- OOCL on April 1, 2015 it was confirmed that Hong Kong-listed Orient Overseas (International) Ltd, parent company of OOCL, is to order 6 x 20,000 TEU vessels at Samsung Heavy Industries, at a reported cost of US\$158.6 million each. The ships are planned for delivery in 2017 and with this order it will take the total number of units of this size classification up to 52 globally amongst all shipping lines, according to Clarksons data.

Before assessing the individual operating strategies of the ocean carriers (on an individual and alliance/partner basis), it is worthwhile offering some additional perspective on the Transpacific trades.

Table 3.8 outlines the recent development of average ship sizes on the Transpacific trades in comparison to other major routes for the period 2010 to the end of 2015 (which is estimated). There has been continued and consistent improvement in average ship size, even for this short assessment period, on the key trades that are all served by ports on the West Coast of North America. As already stated, the trend is expected to continue.

<u>Table 3.8</u>

The Development of Average Vessel Sizes on Key Container Trades 2010-2015F

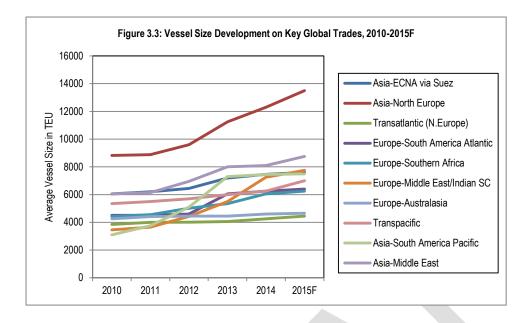
- position at end of year (TEU)

	2010	2011	2012	2013	2014	2015F	Current largest
							vessel
Asia-ECNA via Suez	6058	6200	6450	7200	7465	7600	9300
Asia-North Europe	8822	8880	9600	11250	12300	13500	19200
Transatlantic (N.Europe)	3850	3995	4010	4050	4250	4450	5892
Europe-South America Atlantic	4500	4500	4600	6050	6250	6400	8760
Europe-Southern Africa	4425	4555	5015	5350	6050	6250	10350
Europe-Middle East/Indian SC	3450	3650	4425	5500	7250	7750	11250
Europe-Australasia	4250	4415	4450	4450	4600	4650	5906
Transpacific	5350	5500	5700	6000	6250	7000	14000
Asia-South America Pacific	3100	3750	5100	7300	7450	7500	13100
Asia-Middle East	6050	6150	6950	8000	8100	8750	14100

Source: Ocean Shipping Consultants

The dominance in terms of ship size for the Asia-Europe routes can also be clearly noted by Figure 3.3, where the sustained increase in average vessels used further shows the aggressive ordering, and then deployment, patterns of the major ocean carrier customers.

The decision by CMA CGM to switch an 18,000 TEU ship to the Pacific West Coast does represent a significant change in liner rationale because it places a much larger vessel onto a Transpacific service than is currently utilised.



Container Lines and Alliances – Rationale for Transpacific Services

The Transpacific represents one of the major container trading routes on a global basis and will continue to be a primary option for the movement of cargoes between Asia and North America. As such, it will always offer significant appeal to liner operators.

The approach and rationale adopted by the ocean carriers is an important consideration for competing ports, including the Port of Vancouver, so it is worthwhile better understanding the shipping lines and alliances involved and the ports that are utilised on the West Coast of North America.

Since 2008, as a result of the beginning of the world economic slowdown, coupled with the start of the introduction of new, larger tonnage, major shipping lines decided to reorganise their services. As far as the Transpacific services were concerned, this meant a major change in the way that many of the leading shipping lines looked to meet the needs of this routing. The likes of Maersk Line, MSC and CMA CGM decided to embark upon an (at the time) unheard of level of co-operation, while ssimilar Vessel Share Agreements (VSAs) and slot swap agreements were also struck between G6 members as well as members of the CKYH Alliance and what used to be regarded as 'outsider' shipping lines, such as Evergreen and Zim.

All shipping lines had the common aim of ensuring that their new larger vessels would be filled. In this way, they could justify the order of the new, bigger tonnage by taking the maximum possible advantage of the economies of scale, albeit at the expense of a slight loss of individual identity when it came to any service differentiation.

As a result of the various VSAs and slot swap deals, it has become increasingly less clear exactly which services each line actually operates, since each of the lines involved obviously markets the service as its own. However, unless otherwise stated, the services mentioned in following shipping line reviews are operated by that specific line and details of any partnerships and/or slot charter arrangements are noted separately.

Development of new alliances - more liner mergers to come

The much closer working arrangements noted in the Transpacific in recent years between major shipping lines is indicative of the position on a global basis. Moreover, the progression has continued towards the development of new, large-scale more formal alliances.

With the proposed P3 Alliance (consisting of Maersk Line, MSC and CMA CGM) failing to gain regulatory approval in China, the immediate response was for Maersk Line and MSC to create the 2M alliance, subsequently leaving CMA CGM to set-up the Ocean Three grouping with China Shipping and UASC. These alliances joined the existing G6 grouping (APL, Hapag Lloyd, MOL, NYK Line and OOCL) and the CKYHE

partnerships of Cosco, K Line, Yangming, Hanjin and Evergreen), all of which regard the Transpacific as one of the key East-West trade lanes to be served.

However, the container shipping line alliances are only now, at the time of writing (December 2015) entering a period of likely change and consolidation, based on the following ongoing developments, though there will obviously be further clarifications and fall-out occurring moving forward over the first few months of 2016:

- Cosco/CSCL The Chinese Government has been a long-term advocate of a merger between COSCO and China Shipping (CSCL), which has taken longer than expected due to the complexity of the shareholdings but has finally been announced (subject to regulatory approval. It has already been confirmed that the container shipping will largely be undertaken by Cosco, with China Shipping concentrating on other activities. This merger will have further ramifications for both the CKYHE alliance and the Ocean Three alliances, where Cosco and CSCL respectively currently operate on the Asia-Europe strings.
- Temasek Holdings sold its controlling share of NOL/APL to CMA CGM for US\$2.4bn. As a result, CMA CGM immediately announced that although the APL brand will continue, and retain a strong presence in Singapore, but the liner operator is to be removed from the G6 Alliance. With regulatory approval for the sale expected to take most of 2016 then the G6 will remain largely unchanged until then.
- A merger of the Japanese lines NYK, K-Line and MOL should also not be discounted. This too could have implications for both the G6 and CKYHE alliance groups.
- Neither of the Korean carriers, Hyundai Merchant Marine or Hanjin Shipping continues to see weak financial results, making it very difficult to be able to compete with the major shipping lines on a global basis. Each of the lines has been divesting non-liner shipping assets to raise funds and a merger of the two liner shipping companies is recommended by the Korean Government.
- Both Hapag-Lloyd and Zim Line are seeking public share offers to help to raise capital, which may see them interested in acquisitions too. Press speculation has linked Hapag Lloyd with joining the Ocean Three alliance, while Zim has long been believed to be seeking entry to an operating partnership.

In terms of size of Transpacific market and to help put some of the potential future alliance changes into some context, during Q3 2015, the following weekly summary can be noted for shipping line alliances, which is based on TEU slots offered on scheduled/published services:

•	CKYHE:	150,000 TEU per week.
•	G6 Alliance:	75,000 TEU per week.
•	Ocean Three Alliance:	43,000 TEU per week.
•	2M Alliance:	40,000 TEU per week.

However, on the basis of individual shipping lines, irrespective of any alliance participation, the following outlines some notable weekly slots operated:

•	CMA CGM:	27,600 TEU per week.
•	APL:	16,900 TEU per week.
•	CMA CGM/APL:	44,500 TEU per week.
•	Cosco:	33,350 TEU per week.
•	China Shipping:	13,350 TEU per week.
•	Cosco/China Shipping:	46,700 TEU per week.
•	Evergreen:	39,000 TEU per week.

As this short synopsis indicates, the CMA CGM acquisition of APL is going to place this combined ocean carrier as one of the largest individual operators in the Transpacific, while the Cosco/China Shipping merged entity will create 46,700 TEU of slots per week, based on current vessels operated.

Moreover, the TEU space provided by the major alliances is also significant but is also going to see some changes moving forward, so from a port perspective it remains crucial to be the preferred choice of key shipping line customers.

Based on current timescales, it is likely that the full extent of the shipping line alliance re-organisation will not come into full effect until the second half of 2016, at the earliest. As a result of these developments and likely future changes occurring during 2016, there may be some minor changes to ports used but it will mainly be the partnerships between shipping lines that will change. For example, the overall need and/or desire to continue to serve the Port of Vancouver's local markets will carry on, as will the requirement to serve key North American hinterlands such as Toronto and the US Midwest.

On this basis, the same port gateways will be served, meaning that ports with good quality infrastructure and efficient and cost effective supply chains and intermodal rail access will remain in high demand. The Port of Vancouver definitely falls into this category of port facility.

Transpacific Services reflect desire of major operators to continue to call to Pacific Northwest For ease of reference the Transpacific services in operation in Q3 2015 have been split into the following:

- Services that call to ports in the Pacific Northwest region (Table 3.12).
- Services that call to ports in the Pacific South region (Table 3.13).
- Services that call to ports in both the Pacific Northwest and Pacific South regions (Table 3.14).

As Table 3.9 shows, there are a wide-range of different shipping lines/ alliances calling to the Pacific Northwest region in Q3 2015, with the Ocean Three, G6 and 2M alliances all represented.

Table 3.9

Line/Alliance	Service	Average Ship	Largest Ship
		TEU	TEU
Ocean Three	Columbus/AAE1-ANW1/AUC1-AW	8665	11388
G6 Alliance/Zim	NP1	9092	10062
G6 Alliance	NP3	8553	8749
	NP2	8547	8562
2M (Maersk/MSC)	AE3-TP9/Great Sea-Eagle	5215	7200
CKYH grouping	YPN/PNY	6428	6588
	HPN/PNH	5588	5932
	KPN/PNW	5667	5888
	CPN/PCN	5569	5816
Evergreen	TPN	6057	6332
Westwood*	Westwood loop 1	2295	2546
Westwood**	Westwood loop 2a	1500	1500
Westwood**	Westwood loop 2b	1500	1500

Transpacific Services per Major Shipping Line/Alliance - Pacific Northwest Region Q3 2015

Notes:

All services are weekly frequency unless stated otherwise.

* = 14-day frequency.

** - 28-day frequency also carrying bulk cargoes (may call other ports on inducement).

Source: Ocean Shipping Consultants

However, with four weekly calls, the CKYH (currently without Evergreen included – though the Taiwanese shipping line is a partner on Asia-Europe services, so it is possible that it could join the Transpacific trades too in time) is currently offering the most services, although the ships used and annualised TEU slots per annum are not the largest in the region.

Nevertheless, it is clear that all major alliances and independent carriers are calling on a weekly basis to the Pacific South area, a fact that is not expected to change moving forward.

For services calling to just the Pacific South region and calling to Los Angeles, Long Beach and Oakland, Table 3.10 offers a summary of activity in Q3 2015. The general increase in average/larger ships calling over the Pacific Northwest region can be noted across almost all services, while the higher number of total services is indicative of the bigger volumes moving through the area's ports in overall terms.

Table 3.10

Transpacific Services per Major Shipping Line/Alliance - Pacific South Region Q3 2015

Line/Alliance	Service	Average Ship	Largest Ship
		TEU	TEU
2M (Maersk/MSC)	AE6-TP6/Lion-Pearl	12986	14036
	AE12-TP2/Phoenix - Jaguar	7932	9074
CKYH grouping	MD1/PM1	9993	10114
	PSX	9513	10000
	PSW/PS 2	7867	8626
	CALCO B/PSW5	4432	4432
Cosco/K Line/Wan Hai	SEA/CALCO-C/ CAL	8924	9469
Evergreen	HTW	5652	5652
	CPS	8329	8452
G6 Alliance	SC1	8785	9200
	SC2	8475	8888
	SE2	8307	8800
	CC1	6644	6800
	CC4	6487	6622
	CC2	5821	5888
	PA2	4752	5087
G6 Alliance (APL only)	CC3	5217	5762
G6 Alliance/Hanjin	SE3-SGX/PSG	6697	7455
Grand Alliance	JPX	3606	4252
K Line/Wan Hai/PIL	CALCO-D/CCD/ TP3	5772	6552
Vlatson	CLB1	2758	2890
IOL/K Line	JAS/PS3	4903	5043
Dcean Three	PRX/AAS2/ AWS4	11338	11388
	Bohai Rim/AAC/ AWS2	9940	10036
Ocean Three/PIL/Yangming	Yangtse/AAC3/ AWS1/ASW/AS2	8978	10036

Source: Ocean Shipping Consultants

Demand for access to major ports in California, for both local markets and use of intermodal rail services ensures that all leading container shipping lines and alliances are calling, with most offering multiple weekly calls.

There is also some segregation too, with some of the operators still offering individual services, such as MSC on its USA West Coast Express and MOL/K Line providing the joint JAS/PS3 string to/from Japan. These services are really legacy offerings that have been in place for a considerable time and are provided due to specific needs of individual line's and customers.

In time, it is likely that these strings will also be included in the joint venture/alliance partnerships, especially once vessel upsizing occurs and the individual line needs to seek better economies of scale from larger tonnage. In addition, some shipping lines do also choose to provide calls at ports in both the Pacific Northwest and Pacific South regions as part of the same schedules. While these services are quite limited in the total number provided they are very well-established and are expected to continue to be offered, especially because the current slower steaming allows additional ships to be placed into the service. Based on the position in Q3 2015, these examples are shown in Table 3.11 and are offered by Cosco/K line/Wan Hai, Evergreen, MSC and the G6 Alliance.

Table 3.11

Transpacific Services per Major Shipping Lines/Alliances - Pacific Northwest & South Regions Q3 2015

Line/Alliance	Service	Average Ship	Largest Ship
		TEU	TEU
2M (Maersk/MSC)	TP12-TP8/Empire -New Orient	8776	9411
Cosco/CSCL	CEN/AAN	8921	10020
Evergreen	TPS	6925	7024
G6 Alliance	PA1	4903	5041

Source: Ocean Shipping Consultants

As the summary Tables 3.9 to 3.11 show, there are a number of existing liner services calling to the Pacific Northwest, Pacific South and, in some cases, both regions. Each of the region's scheduled services is shown in much more details in Table 3.12 (Pacific Northwest), Table 3.13 (Pacific South) and Table 3.14 (Pacific Northwest and Pacific South).

Based on the deployment of all the major shipping lines and alliance partnerships, there is approximately 288,250TEU available on the Transpacific Services on a weekly basis. This is based on the following breakdown:

•	Pacific Northwest:	72,404 TEU, compared to 65,309 TEU offered one year earlier.
•	Pacific South:	184,108 TEU, higher than the 173,081 TEU in Q3 2014.
	Pacific Northwest & South:	29,561 TEU, down on the 42,443 TEU available in Q3 2014.

The fact that direct services to the Pacific Northwest and Pacific South have increased TEU vessel space while the slots provided on schedules calling in both areas has fallen (and was much smaller anyway) indicates that the trend for direct port calls in a single region will continue to be the preference of the majority of shippers. The other noted comparison between the schedules involves the size of ship.

While it is to be expected that the Pacific South ports will see more services (and generally larger ships) because there is a larger critical mass of activity, the actual average of the largest ships on each routing option isn't that different, as the following notes:

•	Pacific Northwest:	7,188 TEU.
•	Pacific South:	8,159 TEU.
•	Pacific Northwest & South:	7,874 TEU.

Table 3.12 Key Transpacific Liner Services - Pacific Northwest Region, Q3 2015

Operator/grouping	Operation	Actual operator	Ports called	Freq. (days)	RV (days)	No. of ships	Average teu	Annualised operational capacity (teu)	Largest ship (teu)
G6 Alliance/Zim	NP1	G6 Alliance. Zim	SIN, LCH, DCB, HKG, YTN, <mark>VAN, T</mark> AC, <u>SEA,</u> PUS, KHH, SIN	7	49	7	9.092	474,060	10.062
G6 Alliance	NP2	G6 Alliance	HKG, YTN, KHH, SHA, PUS, TAC, SEA, VAN, YOK, PUS, KWY, HKG	7	42	6	8,547	445,682	8,562
G6 Alliance	NP3	G6 Alliance	SHA, PUS, VAN, TAC, VAN, TOK, NGY, KOB, QIN, NBO, SHA	7	49	7	8,553	445,978	8,749
2M (Maersk/MSC)	AE3-TP9/Great Sea- Eagle	Maersk	YOK, NGY, PUS, SHA, NBO, YTN, SIN, IKF, AMB, CNZ, ILK, ODS, NOV, CNZ, AMB, PSD, TPP, HKG, YTN, SHA, PUS, VAN, SEA, YOK	7	105	15	5,215	271,935	7,200
Evergreen	TPN	Evergreen	HKG, YTN, KHH, SHA, NBO, TAC, VAN, TOK, OSA, PUS, QIN, HKG	7	42	6	6,057	315,847	6,332
Ocean Three (CMA CGM/CSCL/UASC)	Columbus/AAE1- ANW1/AUC1-AWN1	CMA CGM, CSCL, UASC	HKG, YTN, HCM, PKG, HFX, NYJ, PMH, SAV, PKG, HCM, HKG, YTN, SHA, NBO, PUS, <mark>SEA, VAN</mark> , SHA, HKG	7	126	18	8,665	451,812	11,388
CKYH grouping	CPN/PCN	Cosco	HKG, YTN, SHA, PRV, VAN, NBO, HKG	7	42	6	5,569	290,401	5,816
CKYH grouping	HPN/PNH	Hanjin	SHA, PUS, PRV, SEA, VAN, PUS, KWY, NBO, SHA	7	42	6	5,588	289,801	5,932
CKYH grouping	YPN/PNY	Yangming	SHA, PUS, TAC, VAN, PUS, NBO, SHA	7	35	5	6,428	335,174	6,588
CKYH grouping	KPN/PNW	K Line	HKG, YTN, NGY, TOK, TAC, VAN, TOK, NGY, KOB, KHH, XMN, HKG	7	42	6	5,667	295,494	5,888
Westw ood	Westwood loop 1	Westw ood	PUS, OSA, NGY, SMZ, TOK, EVE, TAC, VAN, TAC, TMK, PUS	14	42	3	2,295	59,825	2,546
Westw ood*	Westw ood loop 2a	Westw ood	PUS, OSA, NGY, SMZ, TOK, EVE, TAC, <mark>VAN</mark> , LVW, PLD, <mark>VAN</mark> , SEN, HNK, SMZ, YOK, TOK, PUS	28	56	2	1,500	19,500	1,500
Westw ood*	Westwood loop 2b	Westw ood	PUS, OSA, NGY, SMZ, TOK, EVE, TAC, VAN, TAC, HNK, SMZ, PUS	28	56	2	1,500	19,500	1,500

Note: * = Bulk/container service, also calls other ports for bulk cargoes - capacity is assumed maximum container allocation. Ports shown in coloured font for easy reference only.

Source: Ocean Shipping Consultants from published shipping line schedules

<u>Table 3.13</u> Key Transpacific Liner Services - Pacific Southwest Region, Q3 2015

Operator/grouping	Operation	Actual operator	Ports called	Freq. (days)	RV (days)		Average teu	Annualised operational capacity (teu)	Largest ship (teu)
K Line/Wan Hai/PIL	CALCO-D/CCD/ TP3	K Line, Wan Hai, PIL	XMN, LGB, QIN, SHA, XMN	7	42	6	5,772	300,969	6,552
G6 Alliance	SE2	G6 Alliance	LCH, HCM, HKG, LAX, <u>OAK</u> , HKG, LCH	7	49	7	8,307	433,158	8,800
G6 Alliance	CC1	G6 Alliance	SHA, KWY, PUS, LAX, <u>OAK</u> , PUS, KWY, QIN, SHA	7	42	6	6,644	346,428	6,800
G6 Alliance	CC2	G6 Alliance	SHA, PUS, LGB, NBO, SHA	7	35	5	5,821	303,503	5,888
G6 Alliance (APL only)	CC3	G6 Alliance	QIN, SHA, XGG, PUS, YOK, LAX, <u>OAK</u> , DHR, YOK, PUS, NAH, QIN	7	42	6	5,217	272,029	5,762
G6 Alliance	CC4	G6 Alliance	SHA, NBO, LAX, <u>OAK</u> , SHA	7	35	5	6,487	338,261	6,622
G6 Alliance	SC1	G6 Alliance	CWN, YTN, KHH, LAX, <u>OAK</u> , KHH, XMN, CWN	7	42	6	8,785	458,058	9,200
G6 Alliance	SC2	G6 Alliance	DCB, HKG, YTN, KHH, LGB, KHH, XMN, HKG, DCB	7	42	6	8,475	441,937	8,888
CKYH grouping	MD1/PM1	Cosco, Hanjin	SIN, HCM, HKG, SHA, PUS, LGB, <u>occ.OAK</u> , PUS, QIN, SHA, NBO, HKG, YTN, NSA, SIN, PIR, SPE, GOA, BCN, VLC, PIR, SIN	7	112	16	9,993	521,080	10,114
G6 Alliance	PA2	G6 Alliance	PUS, BLB, MIT, MIA, JAX, SAV, CHS, NYJ, NFK, JAX, MIT, BLB, LAX, OAK, TOK, KOB, PUS	7	70	10	4,752	247,767	5,087
CKYH grouping	PSX	Hanjin	sha, Kwy, Pus, Lgb, <u>Oak</u> , Pus, Kwy, Sha	7	42	6	9,513	496,052	10,000
Cosco/K Line/Wan Hai	SEA/CALCO-C/ CAL	Cosco, K Line, Wan Hai	HKG, YTN, LGB, YTN, HKG	7	42	6	8,924	465,332	9,469
CKYH grouping	PSW/PS 2	Yangming	HKG, YTN, KHH, KEE, LAX, OAK, PUS, KWY, KEE, KHH, HKG	7	49	7	7,867	410,185	8,626
CKYH grouping	CALCO B/PSW5	K Line	sha, NBO, LGB, <u>DAK</u> , TOK, YOK, NGY, SHA	7	42	6	4,432	231,097	4,432
Ocean Three (CMA CGM/CSCL/UASC)	Bohai Rim/AAC/ AWS2	CSCL, CMA CGM	SHA, NBO, LAX, <u>OAK</u> , QIN, LYG, SHA	7	49	7	9,940	518,307	10,036
Evergreen	HTW	Evergreen	SHK, YTN, LAX, <u>OAK</u> , TAI, XMN, SHK	7	42	6	5,652	176,827	5,652
Evergreen	CPS	Evergreen	SHA, NBO, LAX, <u>OAK,</u> TOK, QIN, SHA	7	42	6	8,329	434,315	8,452
Grand Alliance	JPX	Grand Alliance	KOB, NGY, TOK, SEN, LAX, <u>OAK</u> , TOK, NGY, KOB	7	35	5	3,606	188,048	4,252
G6 Alliance/Hanjin	SE3-SGX/PSG	NYK, Hanjin	SIN, LCH, YTN, LAX, OAK, PUS, SHA, NBO, YTN, SIN, JEA, BAH, DMM, PKG, SIN	7	84	12	6,697	349,205	7,455
2M (Maersk/MSC)	AE6-TP6/Lion-Pearl	MSC	SHA, XMN, CWN, NSA, YTN, TPP, SNS, ANR, HAM, WHH, RTM, FXT, ANR, LEH,	7	119	16	12,986	637,321	14,036
2 (SLL, JEA, SIN, CWN, HKG, YTN, XMN, LAX, OAK, VST, NBO, SHA	·			.2,000	001,021	. 1,000
Matson	CLB1	Matson	SHA, LGB, HNL, GUM, XMN, NBO, SHA	7	35	5	2,758	143,800	2.890
MOL/K Line	JAS/PS3	MOL. K Line	KOB, NGY, SMZ, TOK, LAX, <u>OAK</u> , TOK, KOB	7	35	5	4,903	255.677	5.043
Ocean Three (CMA CGM/CSCL/UASC)	PRX/AAS2/ AWS4	CMA CGM	NSA, HKG, YTN, LGB, <u>OAK</u> , FUQ, XMN, CWN	7	49	7	11,338	591,211	11,388
2M (Maersk/MSC)	AE12-TP2/Phoenix - Jaguar	Maersk	PUS, SHA, NBO, CWN, SIN, PSD, HFA, KOP, TRS, RJ, PSD, KAP, SLL, TPP, HCM, YTN, NBO, SHA, LGB, <u>OAK,</u> VST, PUS	7	105	15	7,932	413,594	9,074
Ocean Three (CMA CGM/CSCL/UASC)/ PIL/Yangming	Yangtse/AAC3/ AWS1/ASW/AS2	UASC, CMA CGM, PIL, Yangming	SHA, NBO, PUS, LAX, <u>OAK.</u> SHA	7	42	6	8,978	468,165	10,036

Note: Ports listed in coloured font for easy reference only.

Source: Ocean Shipping Consultants from published shipping line schedules

Section III – Trends in Container Shipping

Table 3.14 Key Transpacific Liner Services - Both Pacific Northwest & Pacific South Regions, Q3 2015

Operator/grouping	Operation	Actual operator	Ports called	Freq. (days)	RV (days)	No. of ships	Average teu	Annualised operational capacity (teu)	Largest ship (teu)
G6 Alliance	PA1	G6 Alliance	SHA, PUS, KOB, NGY, TOK, TAC, <mark>VAN, <u>Oak</u>,</mark> LAX, MIT, SAV, NFK, NYJ, HFX, SOU, ANR, BRV, RTM, HFX, NYJ, NFK, SAV, MIT, LAX, <u>Oak</u> , YOK, SHA	7	105	14	4,903	221,239	5,041
Cosco/CSCL	CEN/AAN	Cosco, CSCL	sha, PRV, LGB, <u>Oak</u> , XGG, QIN, Sha	7	42	6	8,921	465,158	10,020
Evergreen	TPS	Evergreen	HKG, KHH, TAI, LAX, <u>OAK</u> , TAC, KHH, YTN, HKG	7	49	7	6,925	361,097	7,024
2M (Maersk/MSC)	TP12-TP8/Empire-New Orient	Maersk, MSC	SHA, NBO, KHH, CWN, HKG, YTN, SIN, SLL, NYJ, NFK, BAL, SLL, CMB, TPP, QIN, SHA, PUS, PRV, LGB, SHA	7	119	16	8,812	432,439	9,411

Note: Ports listed in coloured font for easy reference only.

Source: Ocean Shipping Consultants from published shipping line schedules

3.5 Competitive Threat from North American East Coast Ports

The movement of containers from Asia across the Transpacific to major container ports on the West Coast of North America, before onward carriage via intermodal rail to key consuming hinterlands such as the US Midwest (including such locations as Chicago, Columbus etc.) is an established trade route. This is where the Port of Vancouver (and Prince Rupert) compete to serve distant US and Canadian hinterlands.

Virtually all major Transpacific lines offer landbridge services, either through direct contracts with the railroads or through third-party wholesalers like Pacer Stacktrain. Section 4 provides an assessment of key North American intermodal options, while Section 5 offers an in-depth competitive cost analysis comparing the Port of Vancouver with other North American port options for serving key markets.

Hence North America has a large-scale intermodal network provided by a number of different major railroad operators. The networks provided are all well-established and provide good geographic coverage from all coasts and encompass some form of service to/from the locations of most major container ports.

Yet there are also two other viable alternative options for serving these same distant markets in North America via ports on the East Coast of North America using wither the Panama or Suez canal.

Both sailing options continue to be used and are regarded as options to the traditional landbridge routing via the West Coast of North America, with the origin of cargo traditionally dictating the route taken – North Asia mostly using the Panama Canal and South East Asia mostly preferring the Suez Canal, with the dividing line being, approximately, the Port of Singapore.

Therefore, with the Port of Vancouver seeing (growing) container volumes moving to more distant locations, such as around Chicago and Toronto, as shown visually in Figure 3.4, it is important that the threat posed by key ports on the East Coast of North America, such as New York/New Jersey, Virginia and Savannah/Charleston is better understood.

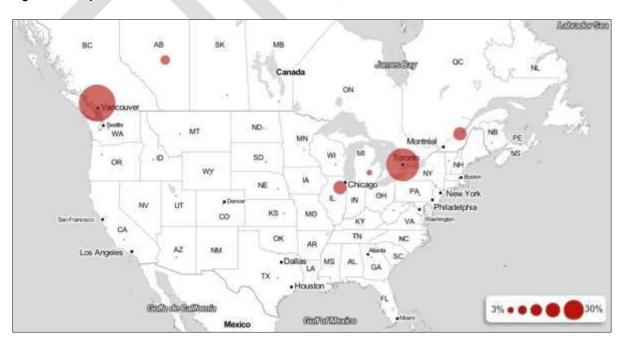


Figure 3.4: Import Destinations for the Port of Vancouver, 2015F

Source: Ocean Shipping Consultants, Port of Vancouver data

For container terminals located on the US East Coast there are several important criteria which will influence the ability to serve key hinterland markets such as the US Midwest. These consist of the following:

- Favourable economics for transportation of cargo between destination and source.
- Sufficient and capable port infrastructure.
- Efficient inland connectivity from port to/from inland cargo destination/origin.

It is also important to put the ability of competitive ports into context. Some factors are within a ports control and some are not, as Table 3.15 identifies.

While this list is not meant to be exhaustive and should be regarded as only outlining the typical factors, it nonetheless offers a good insight into the position for ports generally seeking to serve the same hinterland markets. Hence it applies to the Port of Vancouver, Prince Rupert and all container facilities in North America seeking to serve key markets such as the US Midwest.

<u>Table 3.15</u>

Typical Factors Within/Outside Port Operator Control

Factors Within Operator Control	Factors Outside Operator Control
Water depths - at berths/in channels	Vessel size/type
Ship waiting/queuing	Vessel arrival patterns
Size/age/maintenance of cranes	Size of container ex change per vesse call
Dedicated/priority berthing agreements	Split of 20ft/40ft, tanks and other items
Number of cranes allocated to ships	Tidal/w eather restrictions
Working hours	Landside delivery/collection patterns (except for pre-booking)
Container flow between quay and yard, including equipment used Use of IT	Geographic location
Amount of equipment allocated to each quay crane	
Capacity development	

Source: Ocean Shipping Consultants

The objective of this assessment is not to offer an overly in-depth analysis of all competitive factors regarding US East Coast ports seeking to serve key demand regions like the US Midwest markets but a general overview of the more important competitive factors enabling them to be alternative options to the Port of Vancouver and other Pacific West Coast ports.

The main areas of interest are quality of infrastructure and equipment and water depth (comparing the current position with ability to receive larger ships in the future), with any notable future capacity development plans. The subject of hinterland connectivity is addressed as part of the intermodal cost analysis provided in Section 5.

Table 3.16 provides a summary of the berth lengths and number/size of cranes available at each major port on a per terminal basis for the East Coast of North America. There is a range of different sizes of terminals and ports, from the large-scale facilities at New York/New Jersey, Virginia, Charleston and Savannah to the likes of Boston and Halifax.

Compared to the West Coast of North America there are many more ports and terminals to compete for traffic on the eastern seaboard, although in terms of currently offering Super Post Panamax there are limited opportunities available.

Port	Terminal	Operator	Berth Length	Total Cranes	Nu	umber of Crar	nes
			(m)	Per Port	Panamax	Post	Super Post
						Panamax	Panamax
Montreal	Bickerdike	Empire Stev edoring	357		2		
	Racine	MGTP	2381	15	5		
	Maisonneuv e	Termont	827	15	2	2	
	Cast	MGTP	740		4		
Halifax	Fairview Cove	Ceres Corp	660	9		3	
	South End Contr. Term.	Halterm	981	9	4	2	
Boston	Conley Contr. Term.	Massport	1850	6		6	
NY/NJ	APM Terminals	APM Terminals	1829			11	4
	Maher Terminals	Maher Terminals	2204		12	11	
	Global Terminal	Global Terminal	549	64	2	6	
	NYCT	NYCT	918		3	6	
	PNCT	Ports America	1481			9	
Baltimore	Seagirt	Ports America	953			7	4
	Dundalk Contr. Term.	Ports America	1736	24	9		
	North Locust Point	Ceres Global	366	24	1		
	South Locust Point	Mary land Port Admin.	974		3		
Philadelphia	Packer Av e Marine Term.	Greenwich Terminals LLC	1158	7	2	3	
	Tioga Marine	Delaw are River Stevedores	1164	7	2		
Virginia	Virginia Int'I Gateway	Virginia International Term.	1230	00			8
	Norfolk International Term.	Virginia International Term.	1290	22			14
Wilmington	Port of Wilmington (NC)	NCSPA	2062	9	5	4	
Charleston	Colombus Street	SCSPA	1181		1	2	
	Wando Welch Term.	SCSPA	1159	21			12
	North Charleston	SCSPA	762			6	
Savannah	Garden City	Georgia Ports Authority	2955	23		11	12

Table 3.16 Comparison of Berth & Crane Facilities at ECNA Container Ports - Mid 2015

Note: Ports in Florida excluded as no competitive overlap to serve target hinterlands.

Source: Ocean Shipping Consultants

Clearly, only a few ports have sufficient depth to be in a position to successfully receive the increased size of vessels able to transit the enlarged Panama Canal (the Suez Canal does not have such limitations).

This means that in terms of water depth, New York/New Jersey and Virginia are the prominent competing ports from the US Northeast region, with Savannah and to a lesser extent Charleston, although some of the known developments are longer-term and still subject to regulatory and other processes being overcome.

In terms of investment in larger cranes, the ports of Savannah and Virginia have undertaken significant investment in the biggest cranes, with terminals at both facilities offering the highest number of Super-Post-Panamax units.

Surprisingly, New York/New Jersey only has four cranes of this size at present. However, it should be noted that the size of ships that have been calling to the US East Coast region have been limited, although there is an apparent slowness too by which ports are gearing-up with bigger crane units too.

There are a higher proportion of Post-Panamax cranes at ports in the region, with almost all facilities having at least some capability in this size classification.

However, as vessels increase in the future, especially from Asia through both the Suez and Panama canals, there will be a need for additional cranes of the Super-Post-Panamax variety, especially when the following general guidelines are understood:

- Panamax cranes generally 13 rows across a ship, meaning vessels mostly in the 4500 TEU size classification, although some tonnage up to 4900 TEU does exits.
- Post-Panamax cranes generally 17 rows across a vessel, for ships in the 5000-10000 TEU size range, although some of the newer, larger vessels can be 18 rows across too.
- Super-Post-Panamax with a minimum of 18 rows across vessels, the ships served are mostly in the 12500-13000 TEU size classification, although some newer cranes are potentially able to reach to 27 rows on a vessel, enabling them to serve the largest container tonnage planned at present.

The other basic criteria that positively influences competitiveness, and will remain a crucial factor moving forward, will be water depth. A lack of suitable depth has long been a major issue for many ports on the east coast of North America.

In terms of water depth and the ability to receive larger vessels, especially those in service from Asia and utilising the Suez Canal (and enlarged Panama Canal), Table 3.17 offers confirmation of the existing position at all ports handling containers on the eastern seaboard (including Halifax) that might be considered as able to serve the US Midwest region based on geographic location.

Port	Terminal	Water Depth at Berth	Water Depth Range in Channels (m)		
			2015	2020	
Halifax	Fairview Cove	16.8	40.4.04.0	40.4.04.0	
	South End Contr. Term.	11.9-16.2	18.1-21.3	18.1-21.3	
Boston	Conley Contr. Term.	13.7	18.2	18.2	
NY/NJ	APM Terminals	13.7-15.2			
	Maher Terminals	13.7-15.2			
	Global Terminal	13.1	15.2-16.2	15.2-16.2	
	NYCT	13.7			
	PNCT	12.2-15.2			
Baltimore	Seagirt	13.7-15.2			
	Dundalk Contr. Term.	10.4-13.7	45.0	(5.5	
	North Locust Point	11.0	15.2	15.2	
	South Locust Point	10.4			
Philadelphia	Packer Ave Marine Term.	12.2	10.0		
	Tioga Marine	11.0	12.2	13.7	
Virginia	Virginia Int'I Gateway	15.0		45.0.45.0	
	Norfolk International Term.	15.0	15.2-15.8	15.2-15.8	
Charleston	Colombus Street	12.3			
	Wando Welch Term.	13.7	13.7-14.3	13.7-14.3	
	North Charleston	13.7			
Savannah	Garden City	12.8-14.6	12.8-13.4	14.3-14.9	

Table 3.17

Water Depths at Berths and in Channels at ECNA Container Ports, 2015-2020

Source: Ocean Shipping Consultants

With respect to future changes to water depths in the region, a summary is provided in Table 3.18. For consistency of approach, the same range of ports is included, with the following key conclusions to be noted:

- New York/New Jersey's biggest issue, and potential threat, remains the completion of the Bayonne Bridge project. Once finished its overall competitive will be increased.
- Virginia is already offering deeper water and has the ability to continue to be the deepest water container port on the seaboard.
- Short-term, Savannah is more limited in terms of water depth, though the port's strong intermodal capabilities and on-site warehousing continues to help drive growth.
- Charleston is a limited option for the US Midwest markets.

Table 3.18

Summary of Improvements & Development at ECNA Container Ports, 2015-20
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Port	2015	2020	2025	
Halifax	Berth depth to r	emain 13.7/Access channel depth to remain 18.2m		
Boston	Berth depth to remain	11.9-16.8m/Access channel depth	to remain 18.1-21.3m	
NY/NJ	50ft Deepening Project scheduled	Bay onne Bridge raising	No known additional plans	
	to be completed. NYCT	scheduled to be finished		
	expansion finished, Maher			
	upgrades done			
Baltimore	No changes	No depth changes, but safety	No known additional plans	
		issues for ships resolved		
Philadelphia	No changes to water depths.	Access channels deepened to	No know n additional plans	
	SouthPort expansion underway	13.7m. SouthPort project		
		completed		
Virginia	No changes	Elizabeth River channel	Likely that permits activated to	
		deepened to 13.7. Further	deepen from 15.2 to 16.7 in	
		infrastructure improvements at	additional channels	
		APMT		
Charleston	Feasibility studies completed re	Subject to budget/approvals and	If work commences, then	
	widening/deepening access	feasibility study, no work likely to	possible that additional depths	
	channels	have started. Jasper Port could	may be in place - but cannot be	
		have some capacity on offer	confirmed. Jasper Port operating	
Savannah	Savannah Harbour work	Savannah Harbour dredging work	No known additional plans	
	underway. Garden City	should be completed. Garden		
	expansion work on-going	City expansion increases		
		capacity		

Source: Ocean Shipping Consultants

Competing ECNA ports for US Midwest will remain as New York/New Jersey, Virginia and Savannah Table 3.19 offers a summary Strengths, Weaknesses, Opportunities and Threats analysis of the current container ports located on the US East Coast (with Halifax also included).

Clearly, the existing competitive status quo is not expected to alter in the future with the major facilities at New York, Virginia and Savanah to remain the real competitive alternatives, largely on the basis of the following:

- New York/New Jersey large local population to serve, improving infrastructure and remaining as a "must-call" port in the region.
- Virginia offers the deepest water and largest cranes already, plus has good intermodal rail connectivity options via Norfolk Southern.
- Savannah continues to successfully grow container volumes, offers intermodal rail access to key US Mid West markets and successfully leverages growing distribution networks located at the port through highly pro-active and effective business development and marketing initiatives.
- All other ports offer little, if any, significant competitive threat.

Table 3.19

Strengths, Weaknesses, Opportunities & Threats Analysis for ECNA Container Ports

Port	Strengths	Weaknesses	Opportunities	Threats
Halifax	Good water depth	No local consumption to	Short-term congestion from	Better located ports with
		entice more cargo	NY/NJ congestion	critical mass
	Rail access - albeit that only	Reliance upon discretionary		
	one rail provider	cargo - struggles to attract		
		Always has spare capacity -		
		stagnant volume grow th		
Boston	Good geographic location in	Very minor container port -	Potential MSC grow th	
	US Northeast	will not alter in future		
NY/NJ	Massive local consumption -	Bayonne Bridge air-draught	Deepened key channels to	Delays to Bayonne Bridge
	ships call anyway	issues	15.2m (50ft)	height increase
	Remains a "must-call" port	Expensive port to call -	Bay onne Bridge due to be	Chronic congestion issues in
	on almost all liner schedules	THCs can be high	raised from 151ft to 215ft by	2013
			Q2 2017	
	Improving rail facilities -			
	ExpressRail			
Baltimore	Deep water of 15.2m (50ft) in	Up river location	Short-term benefit from	
	channels		NY/NJ congestion	
		Water depth at some berths		
		more limited		
Philadelphia	Specialist niche activities -	Not competitive for US	Water depths being	~
	i.e. reefer traffic	Midw est	improved - though still	
			somew hat limited	
		Up river location		
Virginia	SPPX cranes, deep water -	No local consumption to	Authorised to go to 16.7m	
	caters for biggest ships	entice more cargo	(55ft) water depth	
	Good rail access to US	Expensive to use - THCs		
	Midw est	known to be high		
Charleston	Traditional port of call for	Does not serve US Midwest	Will have 15.2m (50ft) water	
	Europe trades	as effectively as Savannah	depth by 2019	
Sav annah	SPPX cranes on long	Longer channel access on	By 2016 will have 14.3m	Delays to dredging to 14.3m
	contiguous quay	riv er	(47ft) depth av ailable	
	Strong, continued cargo		Known to be a good, efficient	Delays to terminal
	grow th historically		operator	ex pansion projects

Source: Ocean Shipping Consultants

3.6 Summary of Competitive Position of the Port of Vancouver in Region

The Port of Vancouver enjoys a significant ship size advantage in contrast to US ports and this is particularly the case with regard to Deltaport. This means that the largest vessels forecast for the Transpacific will be accommodated at the port at real anticipated load factors while other ports will be much more restricted.

Clear limits have been identified with regard to the draughts of ultra-large container vessels and this firmly indicates that the deeper water that is available at Prince Rupert will seldom be required.

Consequently, this difference between Prince Rupert and the Port of Vancouver is not a significant competitive issue and will not prove sufficient (on its own) to heavily influence a decision to switch liner services away from the Port of Vancouver container terminals and use Prince Rupert instead.

Of course, alternative fleet developments and water depth needs represents sensitivities to this conclusion and are further tested in this study, although the North American Environment considerations relevant to container ships calling remain factors that all ship operators are aware of and will have to adhere to at all times.

That said, the development of larger operating alliances between ocean carriers and the deployment of larger ships are not going to alter current environment regulations applicable for the North American continent, instead all vessels will have to continue to meet the terms and conditions in force governing this important consideration for calling to ports on the continent.

It is apparent that the Transpacific trades are increasingly being dominated by the major shipping lines and that there are pressures to deploy ever larger vessels, as can be noted with the move by CMA CGM to introduce 18,000 TEU units at the end of 2015.

The Port of Vancouver appears prominently in many existing Transpacific schedules offered by shipping lines, appearing in every major weekly service calling to the Pacific Northwest region. However, the port is often not the first inbound call from Asia.

This situation means that long term relationships with the major liner operators will be a key determinant of volumes for all ports competing to attract traffic. Only by offering required facilities with regard to vessel size, efficiency and hinterland links will potential demand be successfully realised.

In this respect, the Port of Vancouver has the potential to build on recent successes and consolidate and expand market share versus more restricted and limited alternative ports, including Prince Rupert (which cannot replicate the package of advantages offered at Vancouver).

In terms of ports on the US East Coast serving US Midwest regions for Asian cargo moving via the Suez and, from mid-2016, Panama canals, the larger-scale facilities offered by New York/New Jersey and Virginia represent the most viable competitive threats. Both ports have (or are working towards) deeper water and in the case of New York/New Jersey it remains a "must-call" facility in liner schedules.

The continued growth in container traffic and successful leveraging of distribution networks and hinterland intermodal rail via Savannah are also noteworthy.

SECTION IV – INTERMODAL DEVELOPMENTS & COST DIFFERENTIALS

4.1 Introduction

The development of intermodal links between Pacific West Coast gateway ports and the rest of North America has been one of the most significant factors shaping the North American market for container handling. Double-stack rail technology has stretched the hinterland of Pacific West Coast ports to the entire North American market, with service costs and transit time being highly competitive with that of All-Water services from the Far East. Latterly, 'pendulum' services via the Suez Canal have added to the initial competition via the Panama Canal.

The expansion of Panama Canal locks, which is due to be completed by the end of 2016, will allow vessels of around 12,800 TEU to pass through the canal between the Pacific and Atlantic Oceans, thereby boosting the competitiveness of the All-Water option. It is this benchmark that intermodal services from Pacific West Coast ports will be competing with in the future and the combination of cost and quality of service will be key competitive factors, as always.

It is worthy of note that the Panama Canal expansion will be focussed primarily on the Southern California ports and will only have a very limited impact on the Port of Vancouver and the US Pacific Northwest ports as a result of the shorter haul lengths of the intermodal rail to discretionary markets. This subject is addressed in Section 5 as it is a key component of the transportation cost analysis.

The continued use of Pacific West Coast ports to move cargoes between Asia and US Midwest or North American eastern states will be substantially determined by the capacity, efficiency and cost-competitiveness of the inland intermodal structure – comprising port, railroad and receiving facilities. Increasing demand until the mid-2000s was met by investment in both port and hinterland capabilities, notably completion of the Alameda Corridor through Los Angeles in 2002 and on-going improvements of the Fast (Freight Action Strategy for Seattle-Tacoma) Corridor through Seattle and Tacoma since 1998. These have contributed significantly to maintaining the capability of the system to connect the ports with the rail network efficiently. In western Canada, investments in intermodal yards are closely linked to the developing marine terminals, and there are no real constraints in despatching containers. That said, the role played by intermodal rail for Prince Rupert will remain crucial, while the expansion at the Port of Vancouver's Roberts Bank will also need to offer continued good-quality service at competitive prices.

With the expansion of the Panama Canal locks to take larger vessels from the end of 2015, the efficacy of intermodal connections will continue to be central to maintaining the competitiveness of intermodal routings via West Coast ports. This Section concentrates on the following key areas of interest to the Port of Vancouver:

- A brief summary of intermodal market developments, including an assessment of known and/or and planned investments in intermodal capacity in the competitive region for the Port of Vancouver.
- An estimate of the adequacy of intermodal capacity to meet demand, with specific emphasis on infrastructure available at ports in the Pacific Northwest and Pacific Southwest regions, plus from the

major container ports on the East Coast of North America serving key regions such as the US Midwest.

- A review of the importance of rail to the Port of Vancouver, with specific emphasis of the modal split between rail and truck and comments relating to future intermodal train paths required for both Port of Vancouver and Prince Rupert.
- Comments relating to intermodal rail pricing in North America and the potential for any merger activity amongst the Class 1 railroad operators.

4.2 Development Synopsis

The capabilities and capacities of North America's intermodal system for carrying international containers are determined by the following major considerations:

- The capacity of on-dock and near-dock container terminals.
- The adequacy of access between the terminals and intercontinental service network.
- The physical capacity of the relevant rail network.
- The capacity of major intermodal terminals able to serve the key areas of demand, such as the US Midwest and eastern North America.

It is clear that considerable investment has been made (and is continuing) in the provision of on-dock intermodal systems at the major Pacific West Coast container ports apart from Oakland, while several major US East Coast ports continue to seek to improve container handling facilities.

New terminal investments invariably feature on-dock rail facilities, although where not available then good access to near-dock intermodal rail terminals is necessary.

International intermodal container traffic increasing in 2015

International intermodal container flows on North American railroads increased steadily during the first part of the 2000s, to 8.51m containers in 2006. This was followed by a 28 per cent decline over 2006-09, impacted by the Global Financial Crisis in 2009 which saw a fall to 6.11m containers.

However, there has been positive growth since, as Table 4.1 shows, with the 2010 figure of 7.25 million containers continuing to increase year-on-year until it reached more than 8.16 million containers by the end of 2014. In 2015, the trend continued and the forecast for 2015 is for 8.50 million units.

As a proportion of total intermodal movements on North American railroads, which also includes domestic containers and trailers, international (ISO) container traffic increased in share from 48.5 per cent in 1999 to 59.2 per cent in 2007, but this has dropped back, with the downward share trend falling very slowly year-on-year to an estimated 50.1 per cent for 2015.

Being driven essentially by demand for consumer products, international traffic was more severely affected than domestic traffic during the Global Financial Crisis period, although the subsequent growth that has occurred has also been much better as the demand for access returned.

'000 ISO containers (20', 40' and 45')	Number	% of Total I/Modal
	000	
2000	5326.5	51.5
2005	7915.3	58.0
2010	7250.4	54.1
2011	7451.6	53.0
2012	7645.9	51.5
2013	7823.1	50.3
2014	8166.0	50.2
2015F	8501.9	50.1

Table 4.1 North America: International Intermodal Container Traffic, 2000-2015F

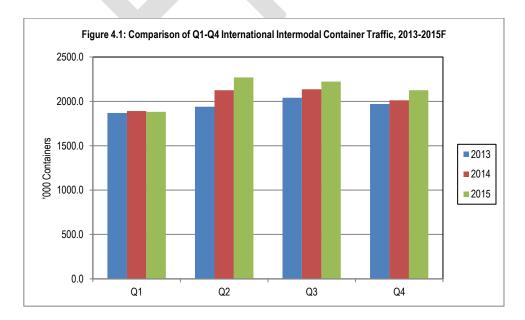
Sources: Ocean Shipping Consultants, dervied from Intermodal Association of North America

It is the international business that continues to really drive intermodal activity in North America. Throughout 2015 the Intermodal Association of North America (IANA) provided quarterly updates, which can be summarised as follows for the international container business:

- Q1 2015 vs Q1 2014: -0.4 per cent.
- Q2 2015 vs Q2 2014: +6.8 per cent.
- Q3 2015 vs Q2 2014: +4.0 per cent.

Clearly, after a slower start to 2015 there has been a good improvement over the corresponding period of 2014. Overall activity was slowed a little by domestic growth because when combined the Q3 2015 growth was actually at 3.4 per cent, with IANA noting that the main factors were port disruptions at US West Coast ports, falling fuel prices and an increase in truck capacity.

On the basis of this IANA data, Figure 4.1 highlights the quarterly development of international intermodal traffic between 2013 and 2015F.



International intermodal container train capacity and rail operators

The double-stack rail system is central to the strategies of the major shipping lines in serving America's vast hinterland. American President Lines (APL) was at the forefront of the establishment of dedicated double-stack services from Seattle, Portland and Los Angeles, and Sea-Land from Tacoma and Oakland. Such were the manifest economic advantages of these services, that other major Pacific operators were forced to follow suit. In subsequent consolidation of the container shipping industry, APL's stack-train operations were sold to Pacer Stacktrain, following APL's takeover by Neptune Orient Lines, whilst Sea-Land's remained with CSX, when Sea-Land's marine operations were acquired by Maersk Line.

Given that domestic and international containers and trailers are routinely carried on the same trains, that trains may be split and re-assembled and that hinterland regions overlap, only an estimation of capacity is possible. In 1986 – ahead of the real development of the double-stack revolution – total capacity on these routes amounted to some 0.68m TEU per annum. By far the greatest part was deployed on routes between the Pacific South ports and the Midwest. Development continued rapidly through the 1990s and, by 2003, total deployed capacity was running at around 8.12m TEU per annum.

Slower demand growth at US West Coast ports during the first decade of the 2000s, culminating in recession toward the end of the decade. This generally saw a reduced the need for additional capacity and was coupled with a slow but shifting trend in the US that continues to see a demographic and consumer demand move towards the South, areas that the Southern California ports are less able to serve as competitively due to the emergence of the Port of Savannah.

At the same time, the Port of Vancouver's role in the intermodal market increased during the past decade and further boosted the position of the Pacific Northwest, which was then further improved by the opening and volume development of Prince Rupert as a container terminal. The growth of demand and activity through these two Canadian ports continues to offset the lacklustre development of the US Pacific Northwest ports, especially Portland – the loss of the Hanjin Shipping and Cosco business has reduced the need for intermodal services, while the flat growth of the Seattle-Tacoma complex further reduces any pressure to increase intermodal capacity.

Generally, while the Canadian ports have increased their penetration of services for the east coast and Midwest, the Pacific South ports – particularly the San Pedro Bay complex – have seen a dramatic growth in services to the southeast, central and Gulf regions.

Virtually all major Transpacific lines offer landbridge services, either through direct contracts with the railroads or through third-party wholesalers like Pacer Stacktrain. The development of double-stack container train capacity from the major west-coast ports is shown in Table 4.2.

Table 4.0

	Pacific Northwest	Pacific South	Total
Midwest			
1986	116.5	276.6	393.1
1991	305.8	218.4	524.2
1995	563.3	1111.1	1674.4
2003	1276.3	993.6	2269.9
2015F	1219.4	838.9	2058.3
Northeast			
1986	87.4	58.2	145.6
1991	291.7	145.6	437.3
1995	396.9	367.5	764.4
2003	1814.4	722.4	2536.8
2015F	1008.3	873.5	1881.8
Central/Southeast/Gulf			
1986	87.4	58.2	145.6
1991	87.4	145.6	233.0
1995	110.9	741.9	852.8
2003	617.8	2694.1	3311.9
2015F	939.1	3482.4	4421.6
Total			
1986	291.3	393.0	684.3
1991	684.9	509.6	1194.5
1995	1071.1	2220.5	3291.6
2003	3708.4	4410.1	8118.6
2015F	3166.8	5194.8	8361.6

Table 4.2	
North American Pacific West Coast: International Container Train Capacity,	1986-2015F
000 TEU	

Note: Includes estimates

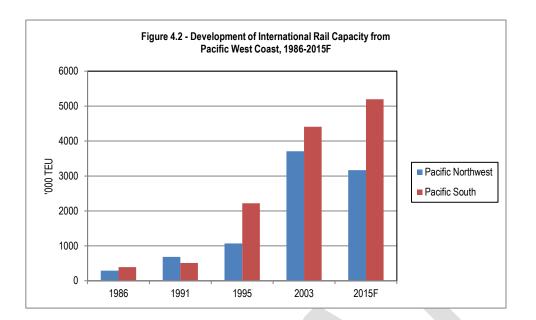
Source: Ocean Shipping Consultants

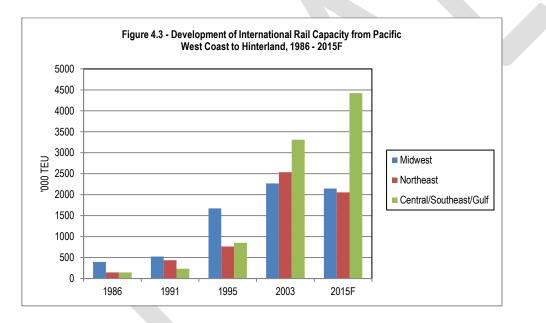
The development of Pacific West Coast double-stack container services in North America is shown in Figure 4.2, with the split noted between the Pacific Northwest ports (which includes Vancouver and Prince Rupert) and the Pacific South ports (of Long Beach, Los Angeles and Oakland).

The slight decline in the Pacific Northwest figure for 2015F is reflective of the loss of almost all container traffic moving to/from Portland. The addition of an additional railroad to the existing ports, such as a second operator serving Prince Rupert or even one of the US railroads serving the Port of Vancouver, could help increase the amount of competitive choice and capacity for the Pacific Gateway region. With the larger, established volumes and Terminal 2 expansion at Roberts Bank planned, the Port of Vancouver is an attractive option for either Burlington Northern Santa Fe (BNSF) or Union Pacific Railroad (UPRR).

Nevertheless, the difference between estimated capacities for these two regions can be noted, though of course it is largely consistent with the total container traffic moving through the respective ports too.

Figure 4.2 charts the development between 1986 and 2015F of the international container capacity from the Pacific Coast of North America to key hinterland regions. The continued growth to meet demand for the Central, Southeast and Gulf regions is particularly notable, though as already noted, this is largely in-keeping with demographic and consuming trends in North America.





In terms of estimated activity, it is possible to provide an indication of the numbers of trains per week carrying international containers in/out of Pacific West Coast ports.

Table 4.3 offers an overview of the position at the end of 2015 for each of the major Class 1 Railroads offering services.

The list of services is based on published or known schedules and includes estimates. It is accepted that the services offered are subject to frequent review and change by the railroad operators, although the broad regions in North America that are served (and indicated) are regarded as being fundamentally correct.

This analysis is offered to provide an indicative overview of the total rail capacity offered from the Pacific West Coast region. It is not meant to confirm traffic levels moving but instead the regions typically served by each railroad in North America from the Pacific West Coast of the continent.

Table 4.3

North American Pacific West Coast Ports: Projected Number of International Container Trains - End of 2015

Va Pri Pri CP Rail Va BNSF Lo Lo Lo Lo C C C C C C C C C C C C C C	'ancouv er south shore & Roberts Bank 'ancouv er south shore & Roberts Bank Prince Rupert Prince Rupert 'ancouv er south shore & Roberts Bank 'ancouv er south shore & Roberts Bank	21 7 7 56 14	outbound inbound outbound inbound	40% central Canada, 20% Midw est, 30% NE, 10% SE 40% central Canada, 20% Midw est, 30% NE, 10% SE 10% central Canada, 30% Midw est, 50% NE, 10% SE 10% central Canada, 30% Midw est, 50% NE, 10% SE
Va Pri Pri CP Rail Va BNSF Lo Lo Lo Lo C C C C C C C C C C C C C C	'ancouv er south shore & Roberts Bank Prince Rupert Prince Rupert 'ancouv er south shore & Roberts Bank	21 7 7 56 14	inbound outbound	40% central Canada, 20% Midwest, 30% NE, 10% SE 10% central Canada, 30% Midwest, 50% NE, 10% SE
Pi Pi CP Rail Vi BNSF Lo Lo Lo Lo C C C C C C C C C C C C C C	Prince Rupert Prince Rupert Princouv er south shore & Roberts Bank	7 7 56 14	outbound	10% central Canada, 30% Midwest, 50% NE, 10% SE
Pr CP Rail Va BNSF Lo Lo Lo Lo Lo Lo C C C C C C C C C C C	rince Rupert ′ancouver south shore & Roberts Bank	7 56 14		
CP Rail Vi SNSF La La La La La La La La La La La La La L	'ancouver south shore & Roberts Bank	56 14	inbound	10% central Canada, 30% Midwest, 50% NE, 10% SE
SNSF La La La La La La La Ca La Ca La Ca La Ca La Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca		14		
BNSF La La La La La La La Ca La Ca La Ca La Ca La Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca				
BNSF Lo Lo Lo Lo Lo Lo Lo C C C C C C C C C C	ancouver south shore & Roberts Bank		outbound	10% central Canada, 30% US Midwest, 60% northeast
ده د د د د د د د د د د د د د د د د د د		14 28	inbound	10% central Canada, 30% US Midwest, 60% northeast
La La La La La O O O O Sa Sa Sa	os Angeles/Long Beach on-dock	14	outbound	Chicago (50% Midw est, 50% transfer to northeast lines
La La La La O O O O S S S S	os Angeles/Long Beach on-dock	19	inbound	Chicago (50% Midwest, 50% transfer from northeast)
La La La La Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca	os Angeles/Long Beach on-dock	23	outbound	Central & Southeast
La La La O O O O Si Si Si	os Angeles/Long Beach on-dock	21	inbound	Central & Southeast
La La O O O O Si Si Si	os Angeles	11	outbound	Chicago & points east (20% Midwest, 80% NE)
La O O O O Si Si Si	os Angeles		inbound	Chicago (50% Midw est, 50% NE)
Lo O O O So So	os Angeles	26	outbound	Central & Southeast including transfers
0 0 0 0 56 56	os Angeles		inbound	Central & Southeast including transfers
O O Si Si	Dakland	3	outbound	Chicago (30% Midw est, 70% northeast)
O Si Si	Dakland	7	inbound	Chicago (50% Midwest, 50% northeast)
Si	Dakland	6	outbound	Southeast
Se	Dakland	8	inbound	Southeast
	Seattle	7	outbound	Chicago (50% Midwest, 50% northeast)
Se	Geattle	15	inbound	Chicago (50% Midwest, 50% northeast)
	Geattle	3	outbound	Central and Southeast
Se	Geattle	2	inbound	Southeast
Ta	acoma	6	outbound	Chicago & north (60% Midwest,40% northeast)
Та	acoma	15	inbound	Chicago & north (60% Midwest,40% northeast)
Т	acoma	2	outbound	Central
Та	acoma	2	inbound	Southeast
Po	Portland	4	outbound	Chicago & north (60% Midwest, 40% northeast)
Pe	Portland	7	inbound	Chicago & north (60% Midwest, 40% northeast)
		238		
Inion Pacific Lo	os Angeles/Long Beach on-dock	10	outbound	Chicago (70% Midwest, 30% northeast)
Lo	os Angeles/Long Beach on-dock	5	inbound	Chicago (70% Midwest, 30% northeast)
Lo	os Angeles/Long Beach on-dock	19	outbound	Central and southeast
Lo	os Angeles/Long Beach on-dock	18	inbound	Central and southeast
Lo	os Angeles	6	outbound	Central
Lo	os Angeles	6	inbound	Central
0	Dakland	5	outbound	Chicago (50% Midwest, 50% northeast)
0	Dakland	6	inbound	Chicago (50% Midwest, 50% northeast)
0	Dakland	12	outbound	Central and southeast
0	Dakland	8	inbound	Central and southeast
	Seattle		outbound	Chicago (60% Midwest, 40% northeast)
	Seattle		inbound	Chicago (70% Midwest, 30% northeast)
Se	Seattle	7	outbound	Central and Southeast
Se	Geattle	10	inbound	Central and Southeast
P	Portland			
P	Portland	4	outbound	Chicago (50% Midwest, 50% northeast)

Sources: Port of Vancouver, Rail companies, Ocean Shipping Consultants

Following a series of mergers and acquisitions in North America in the past, intermodal railroad capacity serving the Pacific West Coast market in the US is dominated by two Class 1 railroads, Burlington Northern Santa Fe and Union Pacific. In Canada, Canadian Pacific and Canadian National are, of course, dominant and they have also extended their reach into the eastern US by means of acquisitions and access to trackage rights. In addition, Canadian National's acquisition of additional rail capacity has widened coverage to the US southeast.

The rail companies serving each west-coast port are listed in Table 4.4 and a high-level summary of the geographical coverage for each operator is also illustrated in Figure 4.4.

Table 4.4 North America - Pacific West Coast Ports: Major Rail Operators, End of 2015

Port	Railroads
Vancouver	Canadian Pacific Railway, Canadian National
Prince Rupert	Canadian National
Tacoma	Burlington Northern Santa Fe, Union Pacific Railroad
Seattle	BNSF, UPRR
Portland	BNSF, UPRR
Long Beach	BNSF, UPRR
Los Angeles	BNSF, UPRR
Oakland	BNSF, UPRR

Sources: Ports, Rail companies, Ocean Shipping Consultants

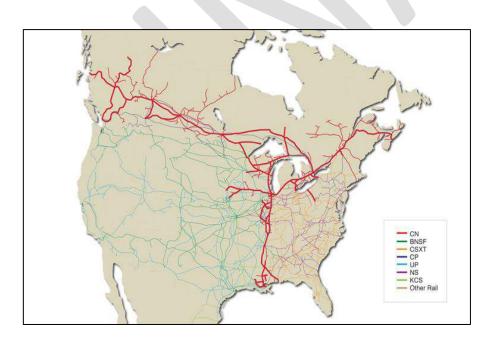


Figure 4.4: Summary of Published North American Railroad Networks, 2015

In terms of an overview of the intermodal networks of the railroads from the West Coast, these are shown in the following maps, which include a visual indication of access from the eastern seaboard too, in the case of Canadian National and Canadian Pacific. The BNSF image also shows the networks of the two key eastern

railroad operators, CSX and Norfolk Southern. These items are listed to provide further confirmation of the current key regions each operator confirms it serves.

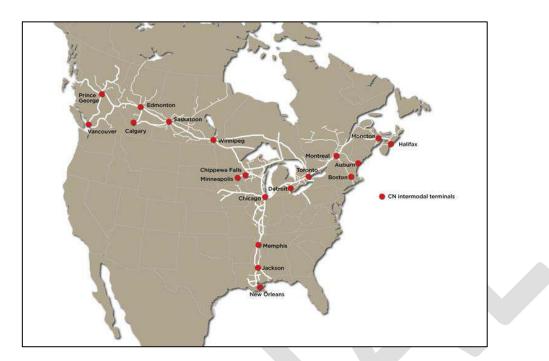


Figure 4.5: Canadian National Intermodal Network, with Location of Intermodal Terminals Highlighted



Figure 4.6: Canadian Pacific Intermodal Network - Access to New York Region Highlighted

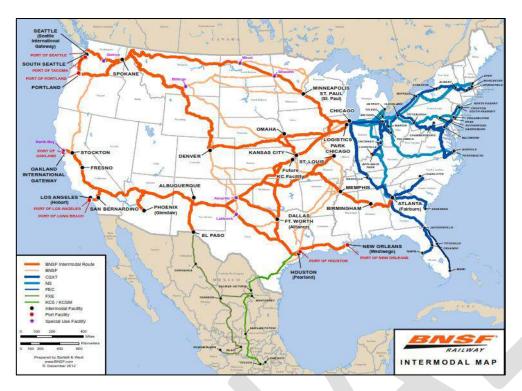


Figure 4.7: BNSF Intermodal Map - CSX and Norfolk Southern Networks Highlighted



Figure 4.8: Union Pacific Railroad Network

Potential merger activity in North American railroad industry

There is some history of mergers in the US railroad industry, such as the 1993 tie-up of Burlington Northern and Santa Fe and the 1996 arrangement that combined Union Pacific and Southern pacific, although this latter deal did encounter a number of major operating issues and for some years afterwards the level of service offered was challenging. The most recent merger occurred in 1997 when Norfolk Southern and CSX Transportation acquired the Conrail network on the US East Coast.

Nevertheless, the process of merger and acquisition has been a key part of how the current Class 1 operators in North America have built their large-scale networks.

So the concept itself is not unknown in North America and in November 2015 there were a number of press reports indicating that Canadian Pacific is interested in purchasing Norfolk Southern. This development comes just over a year after Canadian Pacific had an interest in acquiring CSX Transportation, though the deal did not ultimately come to fruition, mainly due to the lack of desire on the part of the Florida-based operator.

Norfolk, Virginia-based Norfolk Southern would add around 20,000 route miles to the existing Canadian Pacific network of approximately 14,000 miles and would certainly greatly improve the Canadian railroad's reach into the eastern side of North America, as can be seen by the NS proportion of Figure 4.7. The combined network will provide Canadian Pacific with the ability to link the Pacific West Coast region (and the Port of Vancouver) right through to the Gulf of Mexico and into key areas of the US Atlantic seaboard without the need to obtain any trackage rights.

Moreover, with little existing network overlap, then there are obvious geographic synergies that can be gained, while there are likely to be potential cost-savings to be made from probably economies of scale to be made from operating the larger network – albeit that these are very hard to quantify at this stage and in this analysis.

It can be noted that Canadian Pacific, probably rightly, has stated that a major incentive for the merger will be to help alleviate the long-standing issue of congestion in Chicago by allowing more rail traffic to be moved away from the city. The company has stated that it will be able to *create "fluid routes through under-utilised hubs and free-up much needed capacity for other railroads…..providing them with new, efficient and competitive service options for their own customers."* That said, it should be noted that intermodal activity is just one component of railroad activity and the dominant coal and bulk business will be a key factor too.

In terms of achieving a successful outcome and assuming that Norfolk Southern is interested in pursuing the project, the following are likely to be the major obstacles Canadian Pacific will need to overcome to achieve its objective:

- Showing the regulatory authorities in Ottawa and Washington DC that the newly-merged entity would not be anti-competitive and would improve service and performance to customers. There is some history of issues, such as in 2000 when a proposed merger of Canadian National and Burlington Northern was denied by the Surface Transportation Board.
- The potential US-driven nationalistic attitude towards a major infrastructure asset being obtained and then controlled by an organisation outside of the country, even if the purchaser was from near neighbour Canada and Canadian Pacific has a long-standing and generally successful history of railroad operations. The existing (and previous) Norfolk Southern president has openly stated he is "opposed to rail mergers" though this cannot be simply taken as the final decision at this stage.

Whether Canadian Pacific is ultimately successful will largely be a combination of its approach to the subject and handling of the matter, from any potential negotiations through to subsequent public relations activities. With a known history in North America of large-scale railroad mergers it would be foolish to simply dismiss this latest potential development, even if there are previous failed attempts in the industry. While some initial negative reaction is to be expected, it is not included in any container projections developed for the Port of Vancouver, so any merger developments can only represent an upside for the port.

4.3 Major Intermodal Facilities and Planned Investments

The development of the North American intermodal system and network has required very heavy investment in the various stages of the intermodal chain. In general, the capacity of the main lines linking the western ports with the eastern hinterland has not been significantly constrained and, where difficulties have occurred, the necessary investment to boost capacity has been forthcoming from the railroads.

The main constraints to the ability of the ports to maximise intermodal volumes have focused on:

- The availability of on-dock container handling capability;
- Links between port rail facilities and the major east-west rail lines.

Investment has been directed at both sectors to boost capacity significantly in the forecast period. The development of on-dock rail capacity at the major west-coast ports has followed an uncertain path since demand growth accelerated in the early 1990s. Initially, the big operators were highly reluctant to allow organised port labour to take a major role in intermodal container handling. This factor was responsible for the emphasis on 'near-dock' container yards, which became the principal means of linking marine terminals with the rail system. This applied at both Los Angeles and Long Beach, where the emphasis near-dock construction resulted in the Intermodal Container Transfer Facility (ICTF).

However, the costs associated with trucking containers from terminals to rail yards were obviously highly uncompetitive. Hence, there has been a switch in favour of on-dock rail facilities, and all new container terminals on the west coast either incorporate such a facility or provide on-dock access to an adjacent rail yard. The level of investment in these facilities has been very high and has provided capacity to handle current and anticipated intermodal volumes.

Of course, the quality of any transportation system is determined by its weakest link, and these investments placed greater pressure on the connections between the ports and the main transcontinental rail lines. The focus of investment thus shifted to providing dedicated "rail corridors" – the Alameda Corridor serving Los Angeles/Long Beach and the Fast Corridor serving Seattle/Tacoma. These programmes were central to the development of intermodal volumes to/from these locations.

Comparison of Port Rail Facilities

A summary of the on-dock rail facilities available in each major terminal on the west coast is presented in Table 4.5, based on available information at the end of 2015.

Where an on-dock terminal is available, an indication of the known, published or estimated capacity for doublestack rail cars has been provided. For completeness, the ICTF located five miles from the San Pedro ports of Los Angeles and Long Beach is also included.

However, this snapshot is representative of existing operations and not work in progress, hence the Terminal 5 modernisation project in Seattle, which has currently closed the facility to container traffic, also means that doublestack intermodal facilities are also not available.

Table 4.5

North American Pacific West Coast Ports - On-Dock or Near-Dock Facilities & Doublestack Capacity, End of 2015

Port/Terminal	On-dock/Near dock	Estimated Yard
		Capacity (Doublestack cars)
Port of Vancouver:		
Deltaport	On-dock	93
Vanterm	On-dock	32
Centerm	On-dock	27
Prince Rupert:		
Fairview Container Terminal	On-dock	56
Seattle:		
Terminal 5 - Global Gateway North (APL)	On-dock	Under modernisation programme
Terminal 18 - SSA	On-dock	108
BNSF SIG Yard (BNSF)	Near-dock	
UPRR ARGO (UPRR)	Near-dock	
BNSF Tukwila (BNSF)	Near-dock	
Tacoma:		
PCT Intermodal Yard (Ports America)	On-dock	78
Hyundai Intermodal Yard - WUT - Hyundai	On-dock	52
North Intermodal Yard - International (Port of Tacoma)	On-dock	76
South Intermodal Yard - Domestic (Pacific Rail Services)	Near-dock	67
Portland:		
Terminal 2 - SSA	On-dock	45
Terminal 6 - ICTSI	On-dock	84
Oakland:		
Joint Intermodal Terminal	Near-dock	111
Los Angeles:		
West Basin Container Terminal - China Shipping/Yangming	On-dock	81
Terminal Island Container Transfer Facility - Yusen Terminal	On-dock	119
(NYK)/Evergreen Terminal		
Pier 300 - Global Gateway South (APL)	On-dock	128
Pier 400 - APM Terminals	On-dock	222
Long Beach:		
Pier A - SSA/MSC	On-dock	63
Pier F - Long Beach Container Terminal (OOCL)	On-dock	28
Pier G - International Transport Services (K Line)	On-dock	54
Pier J - Pacific Container Terminal (SSA/Cosco)	On-dock	83
Pier T - Total Terminals Inc (Hanjin)	On-dock	174
San Pedro ICTF:		
Intermodal Container Transfer Facility - now	Near-dock	750,000 containers per annum
ICTF - future expansion	Near-dock	1.5 million containers per annum

Source: Ocean Shipping Consultants, dervied from published information

With respect to the specific competing ports on the Pacific West Coast and the level of intermodal rail facilities, the following represents a summary of the Pacific Northwest region position at the end of 2015, with noted investment plans also commented upon, where appropriate:

Port of Vancouver:

At the Port of Vancouver, all three container terminals offer on-dock rail facilities:

- Deltaport a supporting rail yard with eight tracks of 1067m each.
- Vanterm rail offered with six 305m and three 366m tracks.
- Centerm there are three rail tracks totalling 840m.

However, a C\$285 million expansion is planned to be able to cater for the growth in size of ships calling and, therefore, a higher number of containers moving via intermodal rail. It is known that US-bound

cargo moving through the Deltaport complex has grown by 35 per cent annually between 2009 and 2014, with the trend continuing moving forward.

The rail expansion at Deltaport is aimed at handling the approximate 10,000 container moves generated by the anticipated larger ships, which compares to the 7,000 container moves that are created by 9,000 TEU ships currently calling. The new rail facility is set to be completed in the second half of 2017 and will allow Canadian Pacific and Canadian National to increase the daily number of doublestack services linked to Deltaport increase from four to six.

Prince Rupert:

The relatively new Prince Rupert facility opened with rail facilities at the Fairview Container Terminal rail facilities comprising the following:

- Seven working tracks.
- Six storage tracks
- Total trackage of 5182m.

However, with the phase two development at the terminal the following is due to be offered:

- 14 working tracks.
- 12 storage tracks.
- Total trackage of 14000m.

With almost every container moving exclusively via rail at this port, it will need to ensure that the phase two development does bring the additional planned rail infrastructure improvements. Any delays or failure to deliver them will result in a negative impact to the port's ability to meet future growth demand.

The Northwest Seaport Alliance – Tacoma and Seattle

Tacoma:

Historically, Tacoma has added considerable rail track in recent years but, along with Seattle, faced increasing landside congestion, due to constraints on port access. This made intermodal access less competitive than via the Port of Vancouver.

Action to help overcome these issues are part of the Fast Corridor project, which is similar to the Alameda Corridor project – albeit on a considerably smaller scale – and the problem has been less significant in recent years due to declining overall container demand. Yet even despite these plans, the Port of Vancouver remains a lower cost, higher-capacity and more efficient rail option.

Of the port's current container terminals, only the APM Terminals facility does not have access to ondock intermodal rail facilities now.

The following represents a summary of the intermodal rail options at the port:

- Hyundai Intermodal Yard a 9.1 hectare site with 5140m of track served by BNSF.
- Ports America Yard a 10.3 hectare site with 7176m of track served by both BNSF and UP.
- North Intermodal Yard this 10.2 hectare site has eight 980m rail tracks and a total of 8153m of track, with overall capacity for 76 doublestack cars and handles intermodal containers.
- South Intermodal Yard handling domestic containers, this 7.2 hectare operation has around 2635m of track, with noted capacity for 67 doublestack cars.

Seattle:

On-dock intermodal access is available only at two for the ports four container terminals:

- Terminal 5 (APL) a 12.1 hectare site with six tracks that can accommodate 54 doublestack rail cars, supported by adjacent storage for another 54 cars, thereby allowing up to four full trains (according to the port), with services provided by both BNSF and UP. However, this terminal is currently undergoing modernisation and is closed for container business, so this intermodal option is unavailable. However, once the facility is completed in 2019, it will need to cater for extra intermodal activity as the overall terminal capacity is being raised to 1.0 million TEU per annum, so the need for containers moving via rail will, in principle, also have to rise.
- Terminal 18 (SSA) also has capacity for 54 doublestack cars on-dock and also a further 54 units in an adjacent storage location

There is also three other near-dock facilities provided by BNSF/UP, which predominantly serve the SSA-operated Terminal 30 and Hanjin Shipping's T46 operation.

Fast Corridor:

In addition there is the Fast Corridor, which comprises a collection of 24 projects aimed at improving the flow of rail (and road) traffic between Tacoma and Everett by means of grade separations, bridges and passing tracks. The participants comprise a mix of the Port Authorities, local cities, counties and both Federal and State agencies, plus trucking companies and railroads. To date, 19 projects have been carried out since 1998, leaving five to complete as part of the current (and confirmed) cycle.

The investment will allow more trains to be handled, and at speeds of up to 50 miles/hour. Plus, it will also double the capacity for intermodal trains to around 36 per day. This should be adequate to eliminate current difficulties and accommodate anticipated demand growth over the forecast period.

The San Pedro Bay ports are the largest Pacific West Coast gateways for intermodal shipments to the rest of North America, although access via Oakland is also of relevance. In 2015 it is estimated (by the ports) that 23 per cent of Long Beach's total container traffic moves to or from on-dock rail yards, while for Los Angeles the figure is at 26 per cent. However, both of these port authorities expect these totals to increase moving forward, with Long Beach targeting 35 per cent by 2020 and then 50 per cent thereafter, while Los Angeles is expecting to see 40 per cent reached.

Therefore, for the Pacific South region, the following summary applies at the end of 2015:

Los Angeles:

Dedicated or shared on-dock rail yards exist on all container terminals except MOL's Transpacific Terminal. As part of an on-going investment programme, it too is set to have an on-dock rail capability by 2015, but at present the following infrastructure is available:

- West Basin Container Terminal with three tracks of 793m each, a total of 81 doublestack rail cars can be accommodated at this facility, which is shared by China Shipping and Yangming.
- Terminal Island Container Transfer Facility shared by both NYK Line and Evergreen, with the operation capable of handling/storing a total of 119 doublestack rail cars.
- Pier 300 (APL) almost three complete trains can be handled simultaneously. There are eight rail tracks and supporting storage facilities, meaning that up to 128 doublestack rail cars can be catered for supporting the marine operation.
- Pier 400 (APM Terminals) with 12 loading tracks each representing 762m, with storage this operation can handle up to 222 doublestack rail cars.

Long Beach:

All terminals except that for the Pier C facility operated by SSA for Matson Line have on-dock rail yards, with railcar capacity ranging between 28 and 174:

- Pier T (Hanjin Shipping) with around 27400m of track available, a total of 174 doublestack rail cars can be accommodated on the working and storage tracks. The working tracks account for around 19000m.
- Pier J (SSA/Cosco) rail transfer facility can handle up to 83 doublestack rail cars using reachstackers.
- Pier G (K Line) eight rail tracks split across North and South yard operations, with doublestack capacity for 54 rail cars.
- Pier F (OOCL) relatively small on-dock operation compared to other facilities at the port, with capacity for 28 doublestack rail cars and around 3050m of track. The Middle Harbor project will see the total track available increase to around 22860m and add 14 hectares. As the size of the facility is increasing quite substantially, it is reasonable to expect the capacity of doublestack rail cars to increase to at least 50, from the current level of 28 units.
- Pier A (SSA/MSC) there are two rail tracks, totalling 4260m and allowing two trains to be worked on simultaneously. A total of 63 doublestack rail cars is the estimated working capacity for the facility at any one time.

At the start of Q4 2015, the port announced that the US\$93 million Green Port Gateway rail project had been completed, as part of a combined San Pedro intention to invest over US\$1 billion in rail infrastructure over the foreseeable future. This relatively small component of the overall initiative realigns a rail pathway to relieve an existing bottleneck with better access to the Piers J and G and the Middle Harbor terminals.

ICTF – this operation is located approximately five miles from the San Pedro port complex and was opened in 1986 as a multi-user facility for numerous shipping lines, operated by UP. Since its construction, the facility has expanded its role for transcontinental rail services, as well as the relay of containers to/from the ports and major rail yards in downtown Los Angeles. The 112.1 hectare facility can accommodate a weekly total of around 70 double-stack container trains in each direction (westbound and eastbound). There are six loading lines, varying in length from 1158m to 1524m, with the capacity to handle 95 double-stack cars, and an adjacent storage yard for 100 more railcars. These figures equate to an estimated annual capacity (by the operator) of 750,000 containers per annum.

There are confirmed plans to expand the capacity of the facility to 1.5 million containers per annum, which UP claims can be achieved through reducing the land used to 94.3 hectares and could be completed with a construction schedule of three-to-four years. To date the project has not been undertaken.

Given the high investment in on-dock and near-dock intermodal terminals at Los Angeles and Long Beach, this aspect of intermodal capacity is not anticipated to be a constraint on the development of port demand.

 Alameda Corridor - Opened in 2002, the Alameda Corridor provides a 20-mile expressway between these key port intermodal terminals and the major UP and BNSF marshalling yards in downtown Los Angeles, which in turn link to the transcontinental rail network. Costing US\$2.4bn, this dedicated route for port traffic allows the two railroad operators to carry up to 12.7m containers/year (87 stack trains daily) on its double tracks (compared with 3.7m in 1999 on pre-existing tracks).

As such, the capacity will be sufficient to meet anticipated demand growth. There is also scope for more intensive operation, if demand progresses beyond this level.

Oakland:

The lack of on-dock intermodal rail was a longstanding competitive issue for the port's terminals. Instead of offering this option, a joint intermodal terminal was developed with both UP and BNSF having access.

The site is located behind B55-B59 and B60-B63, albeit that it is still near-dock and not directly ondock, but offers the following:

- UP a terminal portion of 44.5 hectares, capable of handling 70 doublestack rail cars.
- BNSF an operation covering 32.5 hectares, with a capacity of 41 doublestack rail car units.

The importance of the immediate San Francisco hinterland is critical for Oakland in terms of a key local market it serves. The proximity of the port to this area, plus its traditional role in serving US export markets (and not the higher inbound Asian volumes) are largely responsible for the comparative lack of effective rail capacity at the port.

4.4 Regional Doublestack Rail Capacity

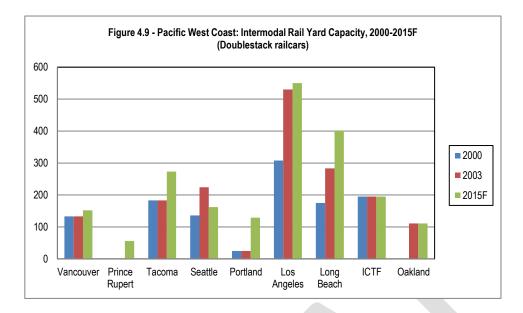
The scale of demand growth during the late 1990s caused significant constraints to build up in the operation of intermodal links in both the Pacific South and Pacific Northwest markets. However, organisational efficiencies, the completion of the Alameda Corridor, progress on the Fast Corridor and a slower pace of demand growth over the past decade have changed the situation.

In the Port of Vancouver, investments in intermodal yards and rail capacity are closely linked to the development of marine terminals, and there are no real constraints in despatching containers. Rail services will be further improved as part of the C\$309 million Roberts Bank Rail Corridor project, as already identified, which follows none recent initiatives completed for the start of 2015 that included six grade separations and two overpasses, which will collectively help reduce congestion and aid efficiency of rail operations.

Taking into account the current known capacities available at all ports in the Pacific Norwest and Pacific South regions, Figure 4.9 provides an indication of the current position (at the end of 2015), together with how the development has occurred since 2000 at all ports included for the Pacific West Coast. The capacity at these facilities will partially determine the amount of cargo that can move in this manner.

The dominant position of the two San Pedro ports can be noted. The ICTF in Southern California is listed separately because this option does entail additional time and costs being incurred compared to a container moving directly from marine terminal to on-dock intermodal train.

No allowance for annual capacities has been calculated, the analysis is simply based on the published or known capacities provided by respective port and terminal operators.



Moving forward over the short-term to 2020, Table 4.6 outlines the likely change in position that will occur between the end of 2015 and 2020 at each relevant port or intermodal transfer facility. Both on-dock and near-dock developments are included and although some estimates are included and timescales from various projects can change, it nonetheless gives a good indication of how the share of doublestack capacity is expected to develop over the remainder of the current decade.

Table 4.6

North American Pacific West Coast Ports: Intermodal Yard Capacity, 2015-2020 double-stack railcars

		2015F				2020		
	On-dock	Near-dock	Total	%	On-dock	Near-dock	Total	%
Vancouv er	152	0	152	7.5%	203	0	203	8.9%
Prince Rupert	56	0	56	2.8%	143	0	143	6.3%
Tacoma	130	143	273	13.4%	130	143	273	12.0%
Seattle	162	na	162	8.0%	216	na	216	9.5%
Portland	129	0	129	6.4%	129	0	129	5.7%
Oakland	0	111	111	5.5%	0	111	111	4.9%
Long Beach*	402	0	402	19.8%	452	0	452	19.9%
Los Angeles	550	0	550	27.1%	550	0	550	24.2%
LA: ICTF	0	195	195	9.6%	0	195	195	8.6%
Total	1581	449	2030	100.0%	1823	449	2272	100.0%

Notes:

* = Assumes Middle Harbor project finishes on schedule but ICTF in Southern California is not completed.

Seattle Terminal 5 modernisation has not specified the increase in doublestack capacity.

Source: Ocean Shipping Consultants

Both the Port of Vancouver and Prince Rupert can expect to see respective shares of intermodal yard capacity increase by 2020, based on doublestack rail cars that can be handled, including as a result of the Deltaport Terminal, Road and Rail Improvement Project. Subsequent development of Deltaport Terminal 2 Project is expected to further improve intermodal access, although the final build-out will not be until after the assessment period addressed to 2020

As a result, the Port of Vancouver's share retained at the end of 2015 of 7.5 per cent of the total available at all ports listed will increase to 8.9 per cent by 2020, whereas Prince Rupert will see a 2015F share of 2.9 per cent rise to 6.3 per cent – assuming, of course, that the port's phase two development occurs as planned.

The gains by Vancouver and Prince Rupert come at the expense of Tacoma (down from 13.4 per cent in 2015F to 12.0 per cent by 2020), Seattle (8.0 per cent to 9.5 per cent) and also Portland (falling from 6.4 per cent to 5.7 per cent).

In the Pacific Southwest region Long Beach will see a marginal increase from 19.8 per cent to 19.9 per cent due to the Middle Harbor expansion project (assuming it is completed on-schedule) but Los Angeles, despite retaining a dominant share of all ports listed, will also see its end of 2015 share of 27.1 per cent fall to 24.2 per cent.

It is clear that the relative importance of on-dock will continue to increase for both the Pacific Northwest and Pacific South port regions. For major rail operators, intermodal traffic is one sector of the total rail business, and will benefit from broader development programmes.

There have also been some other relevant service initiatives of note:

- Canadian Pacific launched a faster intermodal rail service between Toronto and Calgary in June 2013 (a reduction of 20 hours to 64 hours to make the 3400km journey), which itself represented improved schedules being generated in 2012 for its service linking Chicago, Vancouver and Toronto.
- Canadian National has increased capacity on its Edmonton to Winnipeg in northern Ontario, while also
 on the link between Winnipeg, Chicago and Memphis key locations that are being served from the
 Pacific Gateway and where further demand growth is anticipated.
- Both Canadian railroads are targeting competitive service times from the Port of Vancouver to key consuming hinterlands:
 - Canadian Pacific offers a four-day service to Chicago.
 - o Canadian National can reach Chicago in 100 hours from Deltaport and Memphis in 130 hours.

Summary of key examples of inland rail facilities

The final part of the intermodal chain is the provision of inland intermodal terminal capacity. This sector has experienced periodic congestion. However, significant shares of limited capital budgets have been targeted at this sector, underlining a continued commitment to the handling of international container volumes.

With double-stack capacity firmly established on corridors to/from west-coast ports, the focus has shifted somewhat to improving intermodal capabilities for East Coast ports. With demand also growing less rapidly, the pace of investment in the intermodal transport chain serving West Coast ports has eased.

The recent major investments of note:

 Canadian National opened a new intermodal terminal at Calgary. Strategically located between Vancouver and Prince Rupert and key cities of consumption and demand the new facility offered a 30 per cent capacity increase over the existing operation and comprises 2.5 million square-feet of distribution warehousing space. Imports include consumer goods and industrial materials, with exports comprising forest products, plastics and agri-products.

- Union Pacific has formally opened its new US\$370m Joliet International Terminal (JIT) close to west Chicago and Interstates 55 and 58. The terminal significantly increases UP's capacity and flexibility for international intermodal services. JIT has a capacity of 0.5m containers (and/or trailers) per annum. The 220-hectare Phase I development was commissioned in 2010 and there is scope for a further expansion of around 95 hectares. Measured by capacity, JIT is the second largest of UP's intermodal facilities, being somewhat smaller than the ICTF yard at Long Beach.
- On Columbus' west side, CSX Corp.'s intermodal cargo facility (Buckeye Yard) doubled its capacity. The project, as part of the National Gateway initiative, was completed in early 2013, increasing the yard's annual capacity from 0.18m to 0.36m containers (or trailers). The project added 24 acre of land (totalling 36 acre now) and a second access track, redesigned the yard by introducing RMG systems, and expanded the track from 9,000 feet to 15,000 feet as well as the gate.
- A new terminal under construction at Union Pacific is the new Santa Teresa in New Mexico. This new
 intermodal terminal will be integrated along the Sunset Route (where a second main track is being
 built) and is scheduled to open during 2014 with an annual capacity of 0.25m containers (and/or
 trailers).

Aside from these major capacity additions, only limited additional investment is planned for the inland sector. Sufficient capacity is seen to exist to handle current and medium term demand but, if required, it is reasonable to assume that further capacity can be added with minimum difficulty.

4.5 The Importance of Rail Connectivity for the Port of Vancouver

The fact that the Port of Vancouver continues to serve more distant hinterlands throughout Canada, together with the US Midwest, Chicago and towards Memphis, is a clear indication of the need, and importance, of being able to offer good intermodal rail connectivity.

As already identified, the Class 1 railroads in North America offer connectivity to/from ports on the Pacific West Coast to/from a wide-range of different inland locations throughout Canada and the US.

It is apparent, therefore, that intermodal rail links are very important for the import sector, with on-dock rail terminals providing the key driver of demand at Centerm, Vanterm and Deltaport. The smaller facilities at Fraser Surrey also have on-dock rail.

The current position is further summarised in Table 4.7, where the market share of railed import containers increased from 64.7 per cent in 2012 to 67.8 per cent in 2013, but for 2014 the share has fallen to 56.6 per cent and is forecast to be very similar for 2015 also, at 57.5 per cent.

The larger jump in import volumes leaving the terminals by truck and not rail indicates that this is cargo that is either for the local market or could be part of a transloading operation nearby to the terminals.

	By Rail	By Truck	Total	Rail
	000TEU	000TEU		percent
2012	878.2	479.0	1357.2	64.7%
2013	956.4	454.2	1410.6	67.8%
2014	1032.1	792.9	1825.0	56.6%
2015F	1079.4	799.3	1878.7	57.5%

Table 4.7 Modal Share for Port of Vancouver Import Containers, 2012-2015F

As removed from the terminals

Source: Port of Vancouv er data / OSC estimates

The importance of the port's rail links are seen to be very significant. A large volume of import containers are transloaded at depots in the immediate vicinity of the Port of Vancouver. This transloading involves the unloading of international maritime ISO containers and the reloading of these goods into domestic 53' containers. These reloaded containers are then delivered to customers either by truck or by rail.

This means that a significant proportion of containerised goods leaving the marine terminals by truck are ultimately dependent upon the rail system for final delivery.

Identification of the volumes involved here is a complex matter and lies outside the scope of the current study. However, a detailed review¹ of these matters was undertaken in early 2011, which throws considerable light on these matters.

This Study provided an empirical assessment of the distribution of containers by mode for 2009 based upon detailed discussions with major shippers, trucking companies and the railroads in order to define the importance of transload activities for containerised freight.

At that time the headline split between rail and trucks for import containers leaving the maritime terminals was around 63 : 27. A review was undertaken of the modality of trucked containers within the 27 per cent sector. This has now declined as a proportion, but the overall conclusions of the earlier study are seen to be still valid.

These conclusions have been adjusted to take into account the projected split between tail and truck for 2015 and the following key components can be derived for this sector, while remaining consistent with the Transload Mapping Study content:

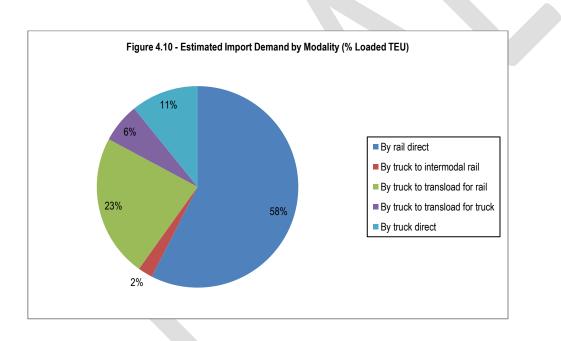
- 2.4 per cent of total import demand is trucked to intermodal rail facilities from the terminals i.e. not all railed containers are directly loaded in the terminals.
- 23.0 per cent of total import demand is trucked to transload stations for reloading into 53' containers for onward shipment by rail.

¹ See 'Lower Mainland Transload Mapping Study' prepared by Culham Business Solutions for Transport Canada in January 2011.

- 6.3 per cent of import demand is trucked to transload stations for reloading into 53' containers for delivery to BC destinations by truck.
- 10.8 per cent of import demand is trucked to transload stations for reloading into 53' containers for delivery to other Canadian destinations by truck.

This means that rail is even more important for import containers via Vancouver than headline modal split figures would indicate. In total rail is necessary for an estimated (57.5 + 2.4 + 23.0) 82.9 per cent of all import containers shipped via the port.

While this is a small drop on the position in 2013, which was estimated to be 86.9 per cent, the trend is well established and it is anticipated that this general proportional significance will be maintained over the forecast period. For reference this research has not been updated as the requirement is beyond the existing scope of work but it is understood that the transload proportion and key conclusions remain consistent.



The position is further summarised in Figure 4.10.

Importance of intermodal rail evident to Pacific Gateway region

The importance of intermodal rail to the Port of Vancouver (and Prince Rupert) is evident. Currently, 82.9 per cent of all import containers leaving the Port of Vancouver's container terminals ultimately involve rail, whereas for Prince Rupert the figure is higher, at an estimated 95 per cent, which therefore indicates only a very small involvement with its limited local markets.

Table 4.8 provides a summary of the total container traffic estimated for 2015 that left each port using rail. These figures will form the basis of the estimation for intermodal train paths required for these two ports.

Table 4.8

Import Container TEU Moving by Rail - Port of Vancouver & Prince Rupert, 2015F

Port	International Full	International Empty	Total Inbound	% Share via Rail	Total Rail TEU
Port of Vancouver	1,579,112	30,228	1,609,340	82.9%	1,334,143
Prince Rupert	479,774	4,846	484,620	95.0%	460,389

Source: Ocean Shipping Consultants, derived from port data

However, to offer an indication of the likely number of intermodal train paths required, it is necessary to make some assumptions regarding the length of train and number of cars.

This total is known to vary between routes and operators, with Canadian Pacific averaging around 160 cars plus often three engines, while the minimum and maximum for US railroad operators can be between 115 and 170 cars (plus engines).

Therefore, for the purposes of this basic assessment, it is noted that 160 cars will be applicable. This total of cars equates to four TEU equivalents.

Using the TEU volumes in 2015 for the Port of Vancouver and Prince Rupert, as shown in Table 4.9, the following high-level conclusions can be noted for both of these container ports:

- An average size of intermodal train with 160 cars will move 640 TEU (based on each doublestack car unit carrying four TEU). This is noted to be a typical size of train built by a Class 1 railroad operator in offering service to ports on the Pacific Coast.
- For the Port of Vancouver, the 2015 import total moving via rail is estimated to be 2085 intermodal train
 paths per annum (or 40 per week), with Prince Rupert requiring 719 train paths per annum (or nine per
 week).
- The large difference between the intermodal train paths between the two ports is reflective of the big differences in volumes moving via rail at present.

Future intermodal train path capacity to increase to keep pace with cargo demand

Moving forward it is possible to estimate the future number of train paths for both Vancouver and Prince Rupert. Table 4.9 provides a projection for both ports, based on an intermodal train remaining the same size and carrying capacity but taking into account projected container traffic for each port to 2025.

In terms of future need for intermodal import train paths this is expected to increase for both ports, based on the following:

- Assuming that 82.9 per cent of all Port of Vancouver future container traffic requires use of intermodal rail at some point in its transportation network.
- The share of import international containers remains constant.

 A remaining high share (of 95 per cent) of Prince Rupert import container cargo moves via intermodal rail.

Table 4.9

Estimated Train Paths to 2025 for Port of Vancouver & Prince Rupert

Year	2013	2015F	2020F	2025F
Total Per Annum:				
Port of Vancouver	2,048	2,085	2,800	3,409
Prince Rupert	475	719	891	1,027
Total Per Week:				
Port of Vancouver	39	40	54	66
Prince Rupert	9	14	17	20

Source: Ocean Shipping Consultants

4.6 Synopsis of Intermodal Rail Pricing in North America

Intermodal rail pricing is an important component that has some influence over container traffic moving within North America. In overall terms, it is irrelevant if the Port of Vancouver can satisfy the marine and terminal requirements of shipping lines if the cost of moving the cargo to end user in more distant (i.e. non-local) destinations is prohibitive and can be served more cheaply from a competing port.

On this basis, because the Port of Vancouver is serving hinterlands in Central/Eastern Canada and the US Midwest regions, then it is heavily dependent on cost-effective intermodal rail services and pricing.

Earlier analysis in this Section has identified that the Port of Vancouver is able to offer good on-dock intermodal rail capacity and is currently served by both Canadian National and Canadian Pacific railroads. Plus, it is not inconceivable that in the future one of the US West Coast Class 1 operators, of BNSF or UPRR, might also be a user of some or all of the port's container terminals, which would further increase competition (or choice for shippers) and, potentially, capacity.

Based on research and information gathered and used in Section V of this Study (which utilises intermodal costs between ports and key inland locations as part of an in-depth analysis of the cost competitive position of the Port of Vancouver and competing ports to a range of key inland locations) Table 4.10 details some typical rail rates of interest in this analysis.

These examples are not meant to be all encompassing and are to be regarded of what is likely to be paid, subject to specific commercial factors that shippers/shipping lines and rail service providers will undertake.

Hence, it is not possible to know with any precision the potential impact of any volume discounts that could be applied due to the highly commercially sensitive nature of the data.

Nevertheless, the following key conclusions can be noted:

- The Port of Vancouver and Prince Rupert are highly competitive against Southern California ports for all example locations used.
- These two Canadian ports are also able to rely on lower rates than the US Pacific Northwest ports of Seattle and Tacoma.
- Due to the distances involved, US intermodal rates from Norfolk, New York and Savannah are lower than the Pacific Gateway to Chicago and Memphis – however, this is largely due to the shorter distances to be covered.
- Generally, Canadian railroads are able to offer lower prices than their US West Coast counterparts and on average there is generally a variation of around 10 per cent between rates available.

<u>Table 4.10</u>

Typical 2015 Intermodal Rail Costs to Toronto, Chicago and Memphis

- US\$ per 40' container

To Toronto	Typical	To Chicago	Typical	To Memphis	Typical
Vancouver	1650	Vancouver	1650	Vancouver	1800
Prince Rupert	1630	Prince Rupert	1650	Prince Rupert	1800
Seattle/Tacoma	1950	Seattle	1800	Seattle	1950
Los Angeles	2100	Los Angeles	1700	Los Angeles	2050
New York	1950	New York	1650	New York	2150
Norfolk	2250	Norfolk	1350	Norfolk	1650
Savannah	2200	Sav annah	1550	Sav annah	1250

Source: Ocean Shipping Consultants/Local Rail Companies

Anecdotal evidence suggests that the Port of Tacoma is already facing an intermodal cost advantage of about US\$400 to Chicago compared to the Port of Vancouver and Prince Rupert. To put this amount into perspective, it is around 20 per cent of the total intermodal freight cost, a substantial amount and share of this cost component.

To offset this disadvantage the port has acknowledged the need to take time and cost out of the supply chain by improving the movement of containers from vessels to trains – incidentally, a process that is already efficient at the Port of Vancouver's Deltaport facility with its direct load operation.

Another initiative noted by Tacoma is to coordinate vessel stowage and unloading with intermodal trains. Yet this too is something other ports will be replicating or already doing, so it is hard to note tangible differences in terms of costs.

While this approach from Tacoma is clearly correct, it does also show that a reduction in pricing by the railroads serving the port is not going to be an option, leaving the port itself with having to find potential alternative strategies.

However, whatever the port does to try to mitigate this cost, it is reasonable to assume that it can also be replicated by both the Port of Vancouver and Prince Rupert (if it is already not happening), which therefore means that it is hard to see how any quantifiable advantage can be gained over the Pacific Gateway facilities.

While this data and analysis should only be regarded as what is generally indicative of typical rates that are currently applied, it does endorse the fact that Canadian National and Canadian Pacific can offer the Canadian ports in the Pacific Gateway cheaper intermodal rates – and while this continues, it will help ensure that both the Port of Vancouver and Prince Rupert remain competitive options for serving key discretionary hinterlands in North America.

The key question is how the US railroads are reacting to this situation and whether there could be a time when they undertake any lowering of rates. To date this does not seem to have occurred and it is probably likely that both of the Canadian railroads can then match the most competitive options provided by the US railroad companies.

It should, of course, be noted that the Canadian railroads continue to invest in their networks, including in the Western Canada region and to/from key destinations serving larger population/consumption regions.

Moreover, the current desire of Canadian Pacific to explore the potential for acquiring Norfolk Southern further emphasises the desire to expand its network in order to further improve service offerings to customers.

4.7 Key Conclusions – Implications for the Port of Vancouver

The Pacific West Coast intermodal market is well served by established rail facilities at the terminals and by inland facilities located on the major Midwest markets. There has been continued demand for access to the network for the movement of containers to the east and this will continue.

Future capacity for doublestack operations will continue to be of vital importance to all ports on the Pacific West Coast. Ongoing projects, such as the FAST Corridor in Seattle-Tacoma and the Middle Harbor development in Long Beach will further assist the flow of cargo.

The Port of Vancouver is already working to ensure that additional good-quality on-dock rail infrastructure is provided at key facilities and this is investment that will continue to be required moving forward, especially in view of the ability to serve more distant hinterlands that require the use of intermodal rail.

The cost advantage generally enjoyed by Canadian railroads over US counterparts is unlikely to change in the immediate future, leaving US ports having to find other ways of being competitive regarding intermodal rail. However, the Pacific Gateway Canadian ports themselves are already doing likewise themselves and seeking to maximise potential to maintain, if not increase, overall competitiveness.

If Canadian Pacific can overcome potential surface transportation authority objections and a sense of US nationalism towards foreign ownership, then the acquisition of Norfolk Southern could gain further traction. However, the process is likely to be a challenging process, although the North American Class

1 Railroad industry has seen large-scale merger and acquisition activity in the past, so the process itself involving Canadian Pacific and Norfolk Southern cannot simply be dismissed.

Regardless of the railroads serving the Pacific Gateway region, it can be concluded that both the Port of Vancouver and Prince Rupert will see an increased number of doublestack rail car intermodal paths needed by 2025, with the total rising in line with overall container volumes.

There is nothing to be noted in the North American intermodal industry in terms of service, investment, pricing or activities that are expected to place the Port of Vancouver in a more negative competitive position compared to all major competing ports in North America over the forecast period.

SECTION V – THE COMPETITIVE COST STRUCTURE AT THE PORT OF VANCOUVER

5.1 Introduction and Methodology

The market position of the Port of Vancouver in the trades under review will primarily be determined by the costs of using the port's terminals in contrast to other possible facilities.

These charges will comprise not simply the stevedoring costs associated with using a particular terminal but also the overall costs entailed in delivering containers to/from major markets. From this perspective, the competitive position will be determined by the total of comparable shipping costs, stevedoring costs and intermodal and truck delivery charges.

This Section provides an analysis of the current and future development of costs in these sectors and is thus of central importance to informing Port of Vancouver projections.

Included in this analysis are a range of cost comparisons for container cargo routed to Toronto, Chicago and Memphis via different port gateways in Canada and the US on both the East Coast and Pacific West Coast of North America. The comparative cost position of the Port of Vancouver is therefore generated in relation to other port gateways.

5.2 Container Stevedoring Charges

Attention is initially turned to the current and potential future development of container handling charges that can be applied at the Port of Vancouver. The analysis is developed as follows:

- The levels of container stevedoring charges on the West Coast are contrasted with other major port markets.
- A more focused analysis of the total costs of transiting major West Coast terminals and the competitive position of Vancouver is presented.
- The effect of US/Canadian dollar exchange rates on container handling costs is then considered.
- The future development of the Port of Vancouver container handling charges to 2025 is projected.

Container handling charges at the Port of Vancouver are seen to be competitive in relation to those at competing Pacific Northwest and Pacific South ports. The level of relative competitive position varies in-line with the exchange rate with the US dollar but is also attributable to generally lower cost structures in the port.

West Coast container handling charges since 2008

The level of container handling charges has continued to be dynamic. Cost levels are determined by the inter-relation between central and local administrative policies and the actual supply and demand of container handling capacity. There are, therefore, very strong regional pressures in the container

handling markets.

The identification of container handling charges is a complex undertaking. Whilst some terminals publish a tariff for container handling, this provides only the most general guide to the level of charges that are actually levied. Invariably, discounts are available for volume customers and often further flexibility is made available in the light of major marketing initiatives.

In addition, the various activities included in container handling charges are also found to vary between ports and, indeed, often in different terminals within the same port. However, this complexity must be negotiated if the competitive position of the Port of Vancouver is to be identified.

Assessment of container handling charges based on three different types of sources

The methodology here utilised reflects the complexity of the issues involved and, accordingly, provides typical cost estimates on the basis of:

- Published tariffs (where available).
- Data provided by container terminals.
- Data provided and confirmed by major shipping lines.

By assuming this wide-ranging approach a sophisticated analysis of the current (and anticipated) developments of handling charges can be derived.

In this Section, analysis is presented for the broader regional market for import/export container handling. Although the Port of Vancouver has the potential to develop a significant regional transshipment role, the regions' ports have not yet developed a competitive tariff structure for this part of the market. As such, transshipment charges are not considered in this analysis.

Evaluation of cost structures must be grounded on a homogeneous basis of handling activities Prior to evaluating cost structures, some further remarks are necessary with regard to the methodology utilised in determining typical cost levels.

In order to develop costs that are comparable, it is necessary to develop data as follows:

- Ensure that similar consignments are utilised.
- Make clear that all parallel handling activity is included.

There are numerous differences between the actual handling activities that are included in a particular tariff. Sometimes prices include all extra operations that may become necessary, whilst on other occasions these costs relate simply to the movement of the container from the vessel to the yard during regular working hours, with other costs such as hatch opening, lashing, overtime payments constituting further billings. It is essential that these costs must all be included as they can exert a great influence over total outgoings. The method employed has been to identify costs that include the basic handling charge and any other applicable handling charges.

Basic Handling Charge includes all handling costs between the ship and the yard in either direction. Other Handling Charges include the diverse activities that are sometimes billed to the shipowner. These include:

- Hatch opening and closing.
- Security charges.
- Cargo plan preparation.
- Overtime costs.
- Lashing/unlashing.
- Extra yard moves.
- Weighing.

Stand-by on vessel account.

The distribution between different categories varies for each port and terminal but this approach allows direct comparisons to be developed. A synthetic analysis has been developed that identifies charges on a homogeneous basis among different ports.

It is also necessary to consider the average (or typical) customer for a particular port and this will obviously vary greatly. In order to allow direct comparison we have assumed the following criteria:

- 90,000 units per annum,
- Around 100 calls per annum,
- Typically, 900 containers per port call, and
- Average vessel size of 8500TEU or larger.

These synthetic conditions are adequately reflected in the regional ports that are under consideration, although some differences will be noted in smaller volume terminals.

It is also necessary to estimate the mix of ISO containers utilised and it has been assumed that around 15 per cent are 20' units, with the remainder being 40' ISO boxes. Further, it is assumed that 80 per cent are loaded and 20 per cent are empty. This latter approach allows typical costs to be synthesised between ports which quote different tariffs for empty and full containers and with those that offer a uniform rate.

Table 5.1

North American Container Stevedoring Charges in the World Context

- end-y ear US dollars per import/ex port container*

	2008	2009	2010	2011	2012	2013	2014	2015
				,				
Vancouver - C\$	240	235	250	255	261	267	265	260
Vancouver - US\$	242	193	238	255	258	243	230	193
Prince Rupert - C\$	N/A	N/A	230	235	240	246	245	250
Seattle/Tacoma	265	245	272	265	270	274	265	263
Oakland	310	285	325	350	356	362	345	352
Long Beach/Los Angeles	335	335	355	345	351	357	345	355
Top 5 Japanese Ports	279	336	339	390	395	400	385	390
Kaohsiung	86	85	80	79	75	72	75	85
Pusan	155	145	160	162	165	168	155	156
Hong Kong	325	315	335	340	345	350	335	325
Singapore	185	185	177	190	195	200	200	198
Antwerp - Scheldt	158	147	145	135	135	130	125	125
Rotterdam - Delta	201	185	184	170	165	160	140	135

* - Vancouver TEU : FEU

Prevailing exchange rate. Prince Rupert 2008/2009 subject to new port price

Additional charges not included and are generally noted to be 25-30% of basic handling charges - however, important to note applies to all ports.

Source: Ocean Shipping Consultants

World container handling charges

In order to offer a degree of comparison with other major regional ports and analysis has been undertaken of the development of container handling prices at the Port of Vancouver and other major world port ranges for the period since 2008. This reflects the period of market downturn and subsequent recovery. The results are summarised for import/export containers in Table 5.1. This run of data contrasts similar activities in major Pacific West Coast ports with those in Asian and North European hub ports. Although differences are noted, it is clear that Pacific West Coast terminal handling rates are – generally speaking – broadly comparable with the most expensive East Asian ports and significantly more expensive than in northern Europe. This reflects the balance of the market in each region. For example, the container handling market in northern Europe is highly competitive, with an over-capacity situation noted. This results in strong downward pressure on prices. In some Asian gateways – especially Hong Kong (until recently) – the balance of the market has favoured the stevedore, with the next effect being very high stevedoring charges.

In other situations – most notably in Japan – the strict regulation of the port market has seen stevedoring rates at very high levels, with this being manifested in an uncertain development for these terminals.

Regional market balance determines the container handling pricing levels

It must be stressed, therefore, that the regional balance of a market is critical in determining pricing levels. Although the level of pricing in a different world region is of some interest, it remains the case that the regional balance of supply and demand and the structure of the immediate market are of fundamental importance in determining prices at the Port of Vancouver.

Regional container handling charges

Table 5.2 summarises those revenues that are directed towards the stevedoring company from the shipping lines for the service of container handling (other charges such as port dues are a separate sector) on the Pacific West Coast. The development of prices has been collated on an annual basis since the early 2000s on the basis of evolving representative deepsea services as defined above. The current position is here summarised.

Table 5.2

Pacific West Coast Container Handling and Other Charges - 2015

- US\$ per import/ex port container

	to Stevedore	to Port Authority	Total
Vancouver	192.59	18.65	211.24
Prince Rupert	185.19	17.50	202.69
Seattle/Tacoma	263.00	19.45	282.45
Oakland	352.00	21.85	373.85
Long Beach/Los Angeles	355.00	24.55	379.55

Note - the mechanism for port dues/w harfage collection varies in each port. Includes some estimation.

Source: Ocean Shipping Consultants

Trends on the Pacific West Coast: Fairly stable pricing levels in US ports

In recent years, the general trend in container handling prices on the West Coast has been characterised by a limited contraction in line with the downturn in demand noted since 2007, but the recovery has been reflected in firmer pricing levels. The position was made uncertain by the decline in market share that followed the industrial unrest in US Pacific West Coast ports and the subsequent attempt to re-establish market share.

The tight control of the waterfront and high labour costs has limited the level of price weakening during

the downturn. Stevedoring charges at Los Angeles/Long Beach increased by some six per cent between 2008-2010, with a marginal downturn reported thereafter as the ports tried to overcome the impact of the Global Financial Crisis and have traffic return to pre-recessionary levels. This pattern has also been noted at Oakland.

This stability has also been noted in the US Pacific Northwest region, and the scope for price increases is much more restricted here given declining market share and very strong competition from Canadian ports. Typical stevedore charges for transiting Seattle/Tacoma terminals reflect the weaker balance of supply and demand.

The effect of exchange rate movements on container handling charges

The development of stevedoring prices at the Port of Vancouver has shown a different development pattern over the period. Since 1995 the role of the port has been transformed from a medium volume local terminal to a major alternative gateway for the Pacific Northwest and the broader US hinterland. There has been little development in handling prices in terms of Canadian dollars over the period.

It is certainly the case that the competitive position of the Port of Vancouver has been influenced by the developing value of the Canadian dollar over the period since the early-2000s. It is invariably the case that shipping costs are primarily billed in terms of US dollars and in the period to 2003, the relatively weak position of the Canadian dollar versus its US counterpart resulted in lower handling rates at Vancouver. In the subsequent period the Canadian dollar has strengthened sharply, with this negating the earlier exchange rate advantage. More recently, the position has reversed as a result of the commodity downturn.

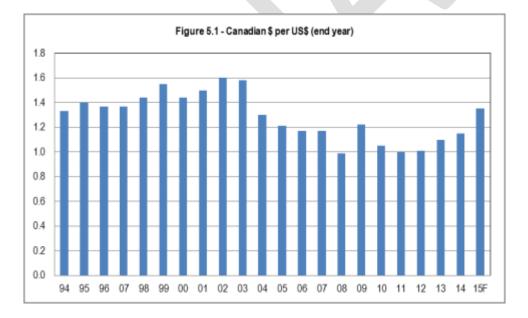


Figure 5.1 charts the development of end-year exchange rates between the two currencies together with current data at the end of 2015. It is clear that the Port of Vancouver has succeeded in increasing its market share in the region, despite the relative increase in stevedore costs at the port when considered in terms of US dollars since 2009. The growth in demand was not the result of favourable exchange rate shifts.

Table 5.3 summarises the effect of shifts in the exchange rate on current stevedoring and port revenues considered in terms of US dollars. It is apparent that although the Canadian dollar has strengthened considerably (to rates not recorded since before 1994) over the period, this has not adversely impacted on competitive position.

In 1995, the port was already somewhat cheaper than the neighbouring US ports and this position has improved further. In 2011 the Port of Vancouver enjoyed a price advantage of around 3.8 per cent over Seattle and an advantage of around 26 per cent over Californian ports. There is an underlying difference in pricing but the year-on-year position has been obscured by changes in the exchange rate and this is relevant for the position at the end of 2013.

The Port of Vancouver's competitive position has been noted throughout this period of uncertainty, with relative exchange rates seen to exert only a limited influence on competitive position of the port and is expected to continue in the short-term future, at least. The recent decline in the value of the Canadian dollar has been an added attraction for the Vancouver option.

Table 5.3

The Effect of Currency Fluctuations on Port of Vancouver Container Revenue - US\$ charges per container

	to Stevedore	to Port Authority	Total	
at US\$ = C\$0.90	213.99	20.72	234.71	
at US\$ = C\$1.00	192.59	18.65	211.24	
at US\$ = C\$1.10	175.08	16.95	192.04	
at US\$ = C\$1.20	160.49	15.54	176.04	
at US\$ = C\$1.30	148.15	14.35	162.49	
at US\$ = C\$1.40	137.57	13.32	150.89	
at US\$ = C\$1.50	128.40	12.43	140.83	
at US\$ = C\$1.60	120.37	11.66	132.03	

Source: Ocean Shipping Consultants

In addition to revenues retained by the stevedoring companies, further charges are levied that are directed towards the Port Authorities. These 'port charges' are associated with vessels calling at regional ports and represent revenues for the development of the port. There are wide differences noted in the mechanisms utilised for the collection of these charges, with stevedores sometimes responsible (as at the Port of Vancouver) and in other cases direct billing.

Port dues form a limited part of the total built-up transit costs

There are usually published tariffs for every key element of port charges – port dues on ship, port dues on cargo, pilotage, towage, etc. – but in the current regional market there is a high degree of flexibility in these charges – especially for new customers. It is certain that Maersk Line does not pay port dues in direct conformity with the published tariffs, for example. This flexibility is most notable in the establishment of major new terminal contracts, and the overall package of prices is often related to stevedore charges in order to deliver a competitive overall cost. This is a highly sensitive area and a matter of strict secrecy.

The current position with regard to charges for representative vessels and customers has been estimated from a variety of sources. This is based not simply on published tariffs, but actual reports from shipping lines and agents utilising these ports. Clearly, there is a mixture of fixed and cargo volume-related charges, which are thus closely influenced by consignment size.

Port charges at the Port of Vancouver are currently marginally higher than at US Pacific Northwest ports but much lower than Pacific South ports

Charges to the Port Authority are currently estimated at some US\$18.65 at the Port of Vancouver, with this being marginally higher than in US Pacific Northwest ports and significantly cheaper than the position at Long Beach/Los Angeles.

There has been little change in these relative costs, except as attributable to fluctuations in exchange rates, and this position is expected to remain similar moving forward.

This cost sector represents a significant potential for revenue generation for terminal development at the Port of Vancouver, but it must be stressed that this is a highly competitive area, and ports are quite prepared to offer significant additional discounts to secure important customers.

Short-term volatility in stevedoring charges and port dues has a limited effect on the overall competitive position

It should also be stressed that these charges are only a single element of through-transport costs. With competitive shipping and intermodal charges, short-term volatility in the stevedoring charge and port dues would have only a very limited effect on the overall competitive position – especially if productivity and efficiency can be sustained at higher levels in Vancouver.

5.3 The Outlook for Port of Vancouver Container Handling Charges

In order to consider the development of the competitive position of the Port of Vancouver over the forecast period, it is necessary to consider how terminal handling charges are likely to develop. This market is seen to be highly dynamic with strong demand growth, and regional moves towards introduction of more private capital into container handling, suggesting significant changes in average costs.

Handling charges primarily determined by the local balance of supply and demand for capacity In considering the future development of handling charges in the regional market, the most significant factor determining demand will be the future balance of supply and demand for container handling capacity. The free market will determine pricing against this background.

The primary determinant of market prices will be the local balance of supply and demand in Vancouver modified by the broader balance of the market of which the Port of Vancouver is a part (i.e. the Pacific Northwest market). It is the resulting capacity-utilisation rate that will offer the best indicator of the direction of the market over the forecast period. There are of course limitations encountered in relying on this methodology.

The future development of capacity becomes increasingly problematic to specify beyond the medium term, with further capacity additions predicated upon actual demand growth in the medium term. However, given the timescale associated with port investment, it is felt that a supply/demand-based approach is meaningful through to 2025.

Tables 5.4 summarise the development of supply and demand for the Pacific Northwest market for the forecast period and includes the most recent Port of Vancouver-supplied data relating to planned capacity, together with any other changes at regional ports. At present overall Base Case utilisation rates are running at some 73.7 per cent for 2015, but this obscures considerable differences between smaller and larger terminals, with deep water remaining at a premium in the range.

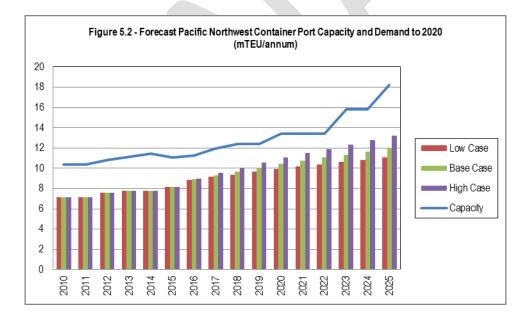
Table 5.4
Forecast Pacific Northwest Container Port Supply/Demand Balance to 2020
- million TEU/annum and nercentage

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Capacity	10.40	10.35	10.80	11.10	11.45	11.05	11.25	11.95	12.40	12.40	13.40	13.40	13.40	15.80	15.80	18.25
Total Demand																
Low Case	7.14	7.13	7.56	7.79	7.78	8.14	8.84	9.14	9.39	9.67	9.94	10.16	10.38	10.60	10.83	11.06
Base Case	7.14	7.13	7.56	7.79	7.78	8.14	8.89	9.32	9.68	10.07	10.45	10.74	11.04	11.35	11.66	11.99
High Case	7.14	7.13	7.56	7.79	7.78	8.14	8.95	9.52	10.04	10.57	11.09	11.49	11.90	12.33	12.78	13.24
Capacity Utilisat	<u>on - %</u>															
Low Case	68.7%	68.9%	70.0%	70.2%	67.9%	73.7%	78.5%	76.5%	75.7%	78.0%	74.2%	75.8%	77.4%	67.1%	68.5%	60.6%
Base Case	68.7%	68.9%	70.0%	70.2%	67.9%	73.7%	79.1%	78.0%	78.1%	81.2%	78.0%	80.2%	82.4%	71.8%	73.8%	65.7%
High Case	68.7%	68.9%	70.0%	70.2%	67.9%	73.7%	79.6%	79.7%	80.9%	85.2%	82.7%	85.7%	88.8%	78.0%	80.9%	72.5%

Source: Ocean Shipping Consultants

It is anticipated that the balance of the market will remain broadly stable, although the gradient of this improvement will be determined by the level of demand, with limited changes anticipated for the capacity side of the equation.

This phased development is typical of port utilisation rates with capacity being provided in large packages and demand increasing incrementally. The position is further summarised in Figure 5.2.



There is no deterministic relation between the development of capacity-utilisation rates and stevedoring prices. However, an evaluation of this indicator provides by far the best assessment of the general anticipated level of stevedoring prices. This is especially appropriate in North America where the free market can operate uninfluenced by other regulatory factors.

On the basis of these forecast supply/demand shifts, a projection of forecast import/export stevedore rates at the Port of Vancouver – in terms of real Canadian dollars – has been developed and summarised in Table 5.5.

A strengthening in prices is forecast in the short term, and then a cyclical pattern is anticipated that will

reflect the balance of supply and demand over the rest of the period. It is forecast that rates will be significantly higher in real terms in 2025 than is currently the case. This represents a positive outlook for the market.

Table 5.5

Forecast Port of Vancouver Stevedoring Rates to 2025

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Pacific Northwest Capacity Utilisation - %											
Low Case	73.7%	78.5%	76.5%	75.7%	78.0%	74.2%	75.8%	77.4%	67.1%	68.5%	60.6%
Base Case	73.7%	79.1%	78.0%	78.1%	81.2%	78.0%	80.2%	82.4%	71.8%	73.8%	65.7%
High Case	73.7%	79.6%	79.7%	80.9%	85.2%	82.7%	85.7%	88.8%	78.0%	80.9%	72.5%
2015 C\$ per impor	t/export c	ontaine	r								
Low Case	260	277	270	267	275	262	267	273	237	242	214
Base Case	260	279	275	276	287	275	283	291	253	260	232
High Case	260	281	281	286	301	292	302	313	275	285	256

* vessel - terminal departure

Source: Ocean Shipping Consultants

The outlook for container handling prices at the Port of Vancouver under anticipated local and regional supply/demand balances is generally positive. There is little danger that prices will show any sustained weakness and the competitive position of the port versus other US locations will be sustained.

5.4 Relative Cost Structures and Potential Port of Vancouver Demand

The future share of the Port of Vancouver in the total Asian markets will be further influenced by the competitive cost structures associated with intermodal services to the US Midwest. The competitive pressures will be between other Pacific West Coast ports and alternative all-water services via US East Coast ports.

The current analysis defines the relative level of costs involved and assesses how these will develop in the future. The analysis concludes with a forecast of the likely impact of competitive transport cost structures on Port of Vancouver demand projections. The analysis provides a summary of the comparative costs for delivering a standard 40' freight container from two Asian source ports to the major representative inland destinations of Toronto, Chicago and Memphis – where the major intermodal yards are located. In order to provide a range of analyses, two Asian ports have been selected – Shanghai and Singapore – as they represent the geographical range of trades under review and are the major demand centres.

In the current and future market there are three options for these movements:

Via US Pacific West Coast ports and then by landbridge intermodal link to each inland location
 – four port alternatives have here been used to cover the direct competition with the Port of
 Vancouver (Los Angeles, Seattle/Tacoma, Vancouver and Prince Rupert).

- Via the Panama Canal and various north-east coast North American ports (Norfolk, Savannah and New York), with onward rail movement to intermodal hubs. The economics of this alternative will be radically revised when larger vessels can transit the Canal from 2016.
- As above, except with shipment via the Suez Canal.

In defining these competitive cost structures, it is necessary to identify the following cost areas:

- Voyage Costs. These comprise built-up vessel trading costs capital charges (ship mortgage), operating costs and bunker charges – and, where appropriate, canal dues.
- Stevedoring and Port Costs. These have been defined for the range of ports under review, on the basis of high volume typical movements of 40' containers. The basic handling charges are applied. Additional charges are generally accepted to be around 25-30 per cent of this charge at all competing ports, so the relative impact to the basic handling charges are consistent from a through transport cost analysis perspective.
- Inland Distribution Costs. These are based upon quoted intermodal rail rates for delivery of 40' containers from the discharge port to the three inland destinations. Once again, rates for high volume shipments of 40' containers have been utilised.

It is also necessary to adopt a dynamic approach to these cost estimations. The water depth advantage of the Port of Vancouver has been significant in the development of Asia to US container flows, but recent years have seen an improvement of water depth at some terminals on the West Coast and at New York and there are plans to improve some of the other East Coast ports. At present, all of the East Coast US ports are restricted with regard to water depth. It is currently not possible to berth the largest container vessels on a fully loaded basis anywhere on the East Coast and, even with the dredging programme at New York/New Jersey finalised, there remain limitations for the largest vessels and other air draught restrictions (until the Bayonne Bridge project is finished during the current decade).

Given these developments, costs have been considered from the following key perspectives:

- The maximum vessel size currently possible for each trade.
- The forecast position from around 2017.

Key Assumptions

Table 5.6 presents a summary of the dimensions and berthing requirements for vessels which are currently dominant and are anticipated for these trades.

<u>Table 5.6</u>

Current and Forecast Container Vessel Particulars

	4500TEU	8500TEU	12500TEU	14500TEU	18300TEU
	Panamax		New Panamax		
Dimensions					
Draught (design) - m	12.2	14.5	15.2	15.5	15.5
Required depth - m	12.8	15.0	15.6	15.9	15.9
LOA - m	294	320.0	366.0	380.0	400.0
Beam	32	45.5	49.0	56.4	59.0
Suez Transit - \$	315000	424000	517000	548000	615000
Panama Transit - \$	324000	612000	900000	na	na
Accessibility in 2015					
Vancouver	Y	Y	Y	Y	Y
Prince Rupert	Y	Y	Y	Y	Y
Singapore	Y	Y	Y	Y	Y
Kobe	Y	Y	Y	Ν	N
Seattle/Tacoma	Y	Y	Ν	Ν	Ν
Los Angeles	Y	Y	Y	Ν	Ν
Long Beach	Y	Y	Y	Ν	Ν
Panama	Y	Ν	Ν	Ν	Ν
Halifax	Y	Y	Y	Y	Ν
New York	Y	Y	Ν	Ν	Ν
Suez	Y	Y	Y	Y	Y
Accessibility in 2017					
Vancouver	Y	Y	Y	Y	Y
Prince Rupert	Y	Y	Y	Y	Y
Singapore	Y	Y	Y	Y	Y
Kobe	Y	Y	Y	N	N
Seattle/Tacoma	Y	Y	Y	N	N
Los Angeles	Y	Y	Y	Y	N
Long Beach	Y	Y	Y	Y	N
Panama	Y	Y	Y	Ν	Ν
Halifax	Y	Y	Y	Y	Ν
New York	Y	Y	Ν	Ν	Ν
Suez	Y	Y	Y	Y	Y

From start of 2017.

Source: Ocean Shipping Consultants

The typical dimensions of each of the vessel types are detailed and the implications for port and canal accessibility are defined. Required water depth has been calculated on the basis of current operational practices and load states of the vessels. As is detailed in Section 3, these units are seldom fully-loaded by weight, but their operators are stressing these requirements.

The known specifications of the 18,300TEU class vessels are also included. The current largest and anticipated largest vessels have been selected on the basis port and canal developments over the period to 2017. It is anticipated that no significant further increases will be noted for the container sector.

The costs of transiting the Panama and Suez Canals are of relevance to this study. Table 5.6 reflects the increased cost for the Panama Canal of US72.00 per TEU, but the level of charges for the Suez Canal is not anticipated to change in the medium term.

The summarised data is based on net canal tonnage for these vessels and calculates transit charges on the basis of current tariffs. Estimates have been made of transit costs for the expanded Panama Canal

and for the use of the largest vessels via Suez. The daily at-sea and in-port trading costs of these vessels have already been considered in the context of scale economy evaluation in Section 3.

Table 5.7 details the haul lengths involved in terms of nautical miles for the various trade permutations under consideration in this study.

It is important to note the wide divergence in haul lengths between Singapore and Shanghai, with the westerly option via Suez clearly favoured for south-east Asian cargoes (in distance terms).

The range of selected origins provides a useful indicator the overall range of costs on Asia inland North America trades.

Table 5.7

Asia to North America Haul Lengths

- nautical miles

	Singapore	Shanghai
Vancouver	7078	5099
Prince Rupert	6667	4629
Tacoma	7082	5102
Seattle	7062	5082
Los Angeles	7669	5688
Long Beach	7669	5777
New York via Panama	12620	10596
Norfolk via Panama	12422	10398
Savannah via Panama	12200	10176
New York via Suez	10239	12434
Norfolk via Suez	10380	12575
Savannah via Suez	10752	12947

Source: Ocean Shipping Consultants

Table 5.8 provides a summary of container handling charges at the various ports under review. These price levels relate to high volume and regular consignments, and are representative of the entire charge for transiting container terminals with 40' (loaded) containers.

Typical Container Handling Charges

- US\$ per 40' container

Terminal	Handling Charge
Singapore	198.00
Shanghai	225.00
Prince Rupert	185.00
Vancouver	193.00
Seattle/Tacoma	263.00
Los Angeles/Long Beach	355.00
New York	338.00
Norfolk	315.00
Savannah	305.00

- all charges between gate and vessel

Source: Ocean Shipping Consultants

The development of intermodal rail rates for the North American market is summarised in Table 5.9, which details typical costs for rail movements of high volumes of 40' loaded containers on a regular service basis. This market sector is seen to be highly competitive, especially where several railroads are offering a service. Also, the level of rates is seen to be highly negotiable, and the specific rates from a terminal are the subject of intense short-term volatility.

Table 5.9

Typical 2015 Intermodal Rail Costs to Toronto, Chicago and Memphis

- US\$ per 40' container

To Toronto	Typical	To Chicago	Typical	To Memphis	Typical
Vancouver	1650	Vancouver	1650	Vancouver	1800
Prince Rupert	1630	Prince Rupert	1650	Prince Rupert	1800
Seattle/Tacoma	1950	Seattle	1800	Seattle	1950
Los Angeles	2100	Los Angeles	1700	Los Angeles	2050
New York	1950	New York	1650	New York	2150
Norfolk	2250	Norfolk	1350	Norfolk	1650
Sav annah	2200	Savannah	1550	Savannah	1250

Rates do not apply on hazardous or restricted commodities Includes lift charges

Source: Ocean Shipping Consultants/Local Rail Companies

The data here summarised details the average rates that have been identified by OSC during the September to November 2015 period, in which total intermodal costs fell slightly by around 1.5 per cent over the comparable period of 2014 as a result of lower fuel charges.

It is important to note that these rates are regarded as indicative only and do not take into account specially negotiated arrangements with railroads that are not available in the public domain.

Given the volatility and competitive nature of this market, it has been necessary to identify a 'typical' rate. This has been defined from data extracted from numerous sources, and should be noted as merely representative of the current market. These rates have been confirmed as reasonably representative by several operators who are active on these trades. This typical rate is used in the following cost comparisons.

5.5 Cost Calculations

These input costs have been utilised in defining the built-up charge associated with the various existing and future transport options that are relevant for North American hinterland distribution and the relative position of the Port of Vancouver in these markets.

In developing these costs several further key assumptions have been utilised:

- It has been assumed that a load factor of 90 per cent will be achieved.
- An average trading speed of 19 knots has been utilized for all vessels.
- Container handling has been estimated at a speed of 90 containers per hour 'through-the-ship' – there will be scope to improve these rates.
- For ease of comparison a simplified port itinerary has been utilised.
- Canal charges have been calculated on the basis of current tariffs without rebates.
- The US Harbor Maintenance Fees (HMF) cost has been excluded. It equates to 0.125 per cent of the value of the imported goods. However, because the value is unknown beyond applying a basic constant cost, the exclusion of this charge ensures that the cost calculations provided are conservative and understate the competitive position of Vancouver.

Table 5.10 through to Table 5.13 provides a further insight into the calculation methodologies utilised in this study. The first two tables summarise cost calculations for Singapore to Toronto under current vessel sizes and the next tables reconsiders these costs on the basis of the anticipated vessel size position from 2017 when larger vessels are deployed on some trades – i.e. when the Panama Canal is open to much larger vessels and when US East Coast ports are able to accommodate larger vessels.

As the focus of the analysis is the relative position and the importance of changes in the shipping sector, all other costs are held constant in real terms.

There are numerous assumptions made in these analyses and only a general picture can be offered. However, this provides a useful assessment of the *relative* position for both final destinations and a range of entry ports in both Canada and the US from both East and West coasts.

Table 5.10 Sample Calculation I - Singapore to Toronto with Largest Current Vessels

- US dollars per 40' container

Routing	Vancouver	Prince	Seattle/ L	os Angeles	New York	New York	Norfolk	Norfolk	Savannah	Savanna
-		Rupert	Tacoma		via Panama	via Suez	via Panama	via Suez	via Panama	via Suez
Vessel TEU	14500	14500	8500	12500	4500	8500	4500	12500	4500	8500
Load factor - %	90	90	90	90	90	90	90	90	90	90
Ocean Haul Length	7078	6667	7082	7669	12620	10239	12422	10380	12200	10752
Sea Days @ 19 knots	15.52	14.62	15.53	16.82	27.68	22.45	27.24	22.76	26.75	23.58
Port (and Canal) Days	9.10	9.10	5.33	7.84	2.82	5.33	2.82	7.84	2.82	5.33
Cargo size - box es	7733	7733	4533	6667	2400	4533	2400	6667	2400	4533
Sea Costs per day	102632	102632	65881	91400	40010	65881	40010	91400	40010	65881
Port Costs per day	65945	65945	42315	58777	27224	42315	27224	58777	27224	42315
Sea Costs	1593044	1500540	1023176	1537168	1107298	1479285	1089926	2080559	1070447	1553401
Port Costs	599973	599973	225682	460994	76867	225682	76867	460994	76867	225682
Canal Charges	0	0	0	0	324000	436720	324000	532510	324000	532510
Voyage Cost	2193017	2100513	1248858	1998163	1508165	2141688	1490792	3074063	1471314	2311594
No. FEU	6525	6525	3825	5625	2025	3825	2025	5625	2025	3825
Cost per FEU	336.09	321.92	326.50	355.23	744.77	559.92	736.19	546.50	726.57	604.34
Discharge cost	193.00	185.00	263.00	355.00	338.00	338.00	315.00	315.00	305.00	305.00
Load cost	198.00	198.00	198.00	198.00	198.00	198.00	198.00	198.00	198.00	198.00
Total per FEU	727.09	704.92	787.50	908.23	1280.77	1095.92	1249.19	1059.50	1229.57	1107.34
Inland to Toronto	1650.00	1630.00	1950.00	2100.00	1950.00	1950.00	2250.00	2250.00	2200.00	2200.00
Total	2377.09	2334.92	2737.50	3008.23	3230.77	3045.92	3499.19	3309.50	3429.57	3307.34

<u>Table 5.11</u>

Sample Calculation I - Shanghai to Toronto with Largest Current Vessels

- US dollars per 40' container

Routing	Vancouver	Prince	Seattle/ L	os Angeles	New York	New York	Norfolk	Norfolk	Savannah	Savanna
-		Rupert	Tacoma		via Panama	via Suez	via Panama	via Suez	via Panama	via Suez
Vessel TEU	14500	14500	8500	12500	4500	8500	4500	12500	4500	8500
Load factor - %	90	90	90	90	90	90	90	90	90	90
Ocean Haul Length	5099	4629	5102	5688	10596	12434	10398	12575	10176	12947
Sea Days @ 19 knots	11.18	10.15	11.19	12.47	23.24	27.27	22.80	27.58	22.32	28.39
Port (and Canal) Days	9.10	9.10	5.33	7.84	2.82	5.33	2.82	7.84	2.82	5.33
Cargo size - box es	7733	7733	4533	6667	2400	4533	2400	6667	2400	4533
Sea Costs per day	102632	102632	65881	91400	40010	65881	40010	91400	40010	65881
Port Costs per day	65945	65945	42315	58777	27224	42315	27224	58777	27224	42315
Sea Costs	1147631	1041848	737114	1140098	929710	1796409	912337	2520523	892858	1870525
Port Costs	599973	599973	225682	460994	76867	225682	76867	460994	76867	225682
Canal Charges	0	0	0	0	324000	436720	324000	532510	324000	532510
Voyage Cost	1747604	1641821	962797	1601093	1330576	2458812	1313203	3514027	1293725	2628717
No. FEU	6525	6525	3825	5625	2025	3825	2025	5625	2025	3825
Cost per FEU	267.83	251.62	251.71	284.64	657.07	642.83	648.50	624.72	638.88	687.25
Discharge cost	193.00	185.00	263.00	355.00	338.00	338.00	315.00	315.00	305.00	305.00
Load cost	225.00	225.00	225.00	225.00	225.00	225.00	225.00	225.00	225.00	225.00
Total per FEU	685.83	661.62	739.71	864.64	1220.07	1205.83	1188.50	1164.72	1168.88	1217.25
Inland to Toronto	1650.00	1630.00	1950.00	2100.00	1950.00	1950.00	2250.00	2250.00	2200.00	2200.00
Total	2335.83	2291.62	2689.71	2964.64	3170.07	3155.83	3438.50	3414.72	3368.88	3417.25

Sample Calculation I - Singapore to Toronto with Largest Future Vessels

- US dollars per 40' container

Routing	Vancouver	Prince	Seattle/ L	os Angeles	New York	New York	Norfolk	Norfolk	Savannah	Savanna
_		Rupert	Tacoma		via Panama	via Suez	via Panama	via Suez	via Panama	via Suez
Vessel TEU	14500	14500	8500	12500	12500	12500	12500	12500	8500	8500
Load factor - %	90	90	90	90	90	90	90	90	90	90
Ocean Haul Length	7078	6667	7082	7669	12620	10239	12422	10380	12200	10752
Sea Days @ 19 knots	15.52	14.62	15.53	16.82	27.68	22.45	27.24	22.76	26.75	23.58
Port (and Canal) Days	9.10	9.10	5.33	7.84	7.84	7.84	7.84	7.84	5.33	5.33
Cargo size - box es	7733	7733	4533	6667	6667	6667	6667	6667	4533	4533
Sea Costs per day	102632	102632	65881	91400	91400	91400	91400	91400	65881	65881
Port Costs per day	65945	65945	42315	58777	58777	58777	58777	58777	42315	42315
Sea Costs	1593044	1500540	1023176	1537168	2529543	2052297	2489856	2080559	1762602	1553401
Port Costs	599973	599973	225682	460994	460994	460994	460994	460994	225682	225682
Canal Charges	0	0	0	0	900000	436720	900000	532510	612000	532510
Voyage Cost	2193017	2100513	1248858	1998163	3890537	2950011	3850850	3074063	2600284	2311594
No. FEU	6525	6525	3825	5625	5625	5625	5625	5625	3825	3825
Cost per FEU	336.09	321.92	326.50	355.23	691.65	524.45	684.60	546.50	679.81	604.34
Discharge cost	193.00	185.00	263.00	355.00	338.00	338.00	315.00	315.00	305.00	305.00
Load cost	198.00	198.00	198.00	198.00	198.00	198.00	198.00	198.00	198.00	198.00
Total per FEU	727.09	704.92	787.50	908.23	1227.65	1060.45	1197.60	1059.50	1182.81	1107.34
Inland to Toronto	1650.00	1630.00	1950.00	2100.00	1950.00	1950.00	2250.00	2250.00	2200.00	2200.00
Total	2377.09	2334.92	2737.50	3008.23	3177.65	3010.45	3447.60	3309.50	3382.81	3307.34

Sample Calculation I - Shanghai to Toronto with Largest Future Vessels

- US dollars per 40' container

Routing	Vancouver	Prince	Seattle/ L	os Angeles	New York	New York	Norfolk	Norfolk	Savannah	Savanna
-		Rupert	Tacoma		via Panama	via Suez	via Panama	via Suez	via Panama	via Suez
Vessel TEU	14500	14500	8500	12500	12500	12500	12500	12500	8500	8500
Load factor - %	90	90	90	90	90	90	90	90	90	90
Ocean Haul Length	5099	4629	5102	5688	10596	12434	10398	12575	10176	12947
Sea Days @ 19 knots	11.18	10.15	11.19	12.47	23.24	27.27	22.80	27.58	22.32	28.39
Port (and Canal) Days	9.10	9.10	5.33	7.84	7.84	7.84	7.84	7.84	5.33	5.33
Cargo size - box es	7733	7733	4533	6667	6667	6667	6667	6667	4533	4533
Sea Costs per day	102632	102632	65881	91400	91400	91400	91400	91400	65881	65881
Port Costs per day	65945	65945	42315	58777	58777	58777	58777	58777	42315	42315
Sea Costs	1147631	1041848	737114	1140098	2123854	2492261	2084167	2520523	1470183	1870525
Port Costs	599973	599973	225682	460994	460994	460994	460994	460994	225682	225682
Canal Charges	0	0	0	0	900000	436720	900000	532510	612000	532510
Voyage Cost	1747604	1641821	962797	1601093	3484848	3389975	3445161	3514027	2307866	2628717
No. FEU	6525	6525	3825	5625	5625	5625	5625	5625	3825	3825
Cost per FEU	267.83	251.62	251.71	284.64	619.53	602.66	612.47	624.72	603.36	687.25
Discharge cost	193.00	185.00	263.00	355.00	338.00	338.00	315.00	315.00	305.00	305.00
Load cost	225.00	225.00	225.00	225.00	225.00	225.00	225.00	225.00	225.00	225.00
Total per FEU	685.83	661.62	739.71	864.64	1182.53	1165.66	1152.47	1164.72	1133.36	1217.25
Inland to Toronto	1650.00	1630.00	1950.00	2100.00	1950.00	1950.00	2250.00	2250.00	2200.00	2200.00
Total	2335.83	2291.62	2689.71	2964.64	3132.53	3115.66	3402.47	3414.72	3333.36	3417.25

Cost Levels for Transport Alternatives

Table 5.14 through to Table 5.19 provides a summary of the total transport costs under each alternative with current largest vessels deployed (limited by port and canal constraints) and for when larger vessels are introduced as port and canal improvements materialize for the period from around late 2016. The ultimate destinations focused on are Toronto, Chicago and Memphis as major intermodal distribution centres for eastern Canada and the US Midwest.

It should be noted that all other costs are held constant, with the exception of sea costs incurred with the introduction of larger vessels where this is possible. In addition, it has been further assumed that the accessibility of other West Coast ports is also improved over the period.

Representative shipments costs are derived from Shanghai and Singapore are also kept as constants because these ports constitute the geographical range of demand growth.

Table 5.14 Asia to Toronto Container Distribution Costs - Current Direct Comparison*

-US\$ per 40' container Sea Costs Stevedoring Costs** In

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Singapore to Toronto				
via Vancouver	336.09	391.00	1650.00	2377.09
via Prince Rupert	321.92	383.00	1630.00	2334.92
via Seattle/Tacoma	326.50	461.00	1950.00	2737.50
via Los Angeles/Long Beach	355.23	553.00	2100.00	3008.23
via New York and Panama	744.77	536.00	1950.00	3230.77
via New York and Suez	559.92	536.00	1950.00	3045.92
via Norfolk and Panama	736.19	513.00	2250.00	3499.19
via Norfolk and Suez	546.50	513.00	2250.00	3309.50
via Savannah and Panama	726.57	503.00	2200.00	3429.57
via Savannah and Suez	604.34	503.00	2200.00	3307.34
<u>Shanghai to Toronto</u>				
via Vancouver	267.83	418.00	1650.00	2335.83
via Prince Rupert	251.62	410.00	1630.00	2291.62
via Seattle/Tacoma	251.71	488.00	1950.00	2689.71
via Los Angeles/Long Beach	284.64	580.00	2100.00	2964.64
via New York and Panama	657.07	563.00	1950.00	3170.07
via New York and Suez	642.83	563.00	1950.00	3155.83
via Norfolk and Panama	648.50	540.00	2250.00	3438.50
via Norfolk and Suez	624.72	540.00	2250.00	3414.72
via Savannah and Panama	638.88	530.00	2200.00	3368.88
via Savannah and Suez	687.25	530.00	2200.00	3417.25

* - current largest possible capacity vessels deployed on each alternative

** - load and discharge costs

Asia to Chicago Container Distribution Costs - Current Direct Comparison* -US\$ per 40' container

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Singapore to Chicago				
via Vancouver	336.09	391.00	1650.00	2377.09
via Prince Rupert	321.92	383.00	1650.00	2354.92
via Seattle/Tacoma	326.50	461.00	1800.00	2587.50
via Los Angeles/Long Beach	355.23	553.00	1700.00	2608.23
via New York and Panama	744.77	536.00	1650.00	2930.77
via New York and Suez	559.92	536.00	1650.00	2745.92
via Norfolk and Panama	736.19	513.00	1350.00	2599.19
via Norfolk and Suez	546.50	513.00	1350.00	2409.50
via Savannah and Panama	726.57	503.00	1550.00	2779.57
via Savannah and Suez	604.34	503.00	1550.00	2657.34
Shanghai to Chicago				
via Vancouver	267.83	418.00	1650.00	2335.83
via Prince Rupert	251.62	410.00	1650.00	2311.62
via Seattle/Tacoma	251.71	488.00	1800.00	2539.71
via Los Angeles/Long Beach	284.64	580.00	1700.00	2564.64
via New York and Panama	657.07	563.00	1650.00	2870.07
via New York and Suez	642.83	563.00	1650.00	2855.83
via Norfolk and Panama	648.50	540.00	1350.00	2538.50
via Norfolk and Suez	624.72	540.00	1350.00	2514.72
via Savannah and Panama	638.88	530.00	1550.00	2718.88
via Savannah and Suez	687.25	530.00	1550.00	2767.25

 * - current largest possible capacity vessels deployed on each alternative ** - load and discharge costs

Source: Ocean Shipping Consultants

Table 5.16

Asia to Memphis Container Distribution Costs - Current Direct Comparison* -US\$ per 40' container

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Singapore to Memphis				
via Vancouver	336.09	391.00	1800.00	2527.09
via Prince Rupert	321.92	383.00	1800.00	2504.92
via Seattle/Tacoma	326.50	461.00	1950.00	2737.50
via Los Angeles/Long Beach	355.23	553.00	2050.00	2958.23
via New York and Panama	744.77	536.00	2150.00	3430.77
via New York and Suez	559.92	536.00	2150.00	3245.92
via Norfolk and Panama	736.19	513.00	1650.00	2899.19
via Norfolk and Suez	546.50	513.00	1650.00	2709.50
via Savannah and Panama	726.57	503.00	1250.00	2479.57
via Savannah and Suez	604.34	503.00	1250.00	2357.34
<u>Shanghai to Memphis</u>				
via Vancouver	267.83	418.00	1800.00	2485.83
via Prince Rupert	251.62	410.00	1800.00	2461.62
via Seattle/Tacoma	251.71	488.00	1950.00	2689.71
via Los Angeles/Long Beach	284.64	580.00	2050.00	2914.64
via New York and Panama	657.07	563.00	2150.00	3370.07
via New York and Suez	642.83	563.00	2150.00	3355.83
via Norfolk and Panama	648.50	540.00	1650.00	2838.50
via Norfolk and Suez	624.72	540.00	1650.00	2814.72
via Savannah and Panama	638.88	530.00	1250.00	2418.88
via Savannah and Suez	687.25	530.00	1250.00	2467.25

 * - current largest possible capacity vessels deployed on each alternative ** - load and discharge costs

Asia to Toronto Container Distribution Costs - Future Comparison* -US\$ per 40' container

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Singapore to Toronto				
via Vancouver	336.09	391.00	1650.00	2377.09
via Prince Rupert	321.92	383.00	1630.00	2334.92
via Seattle/Tacoma	326.50	461.00	1950.00	2737.50
via Los Angeles/Long Beach	355.23	553.00	2100.00	3008.23
via New York and Panama	691.65	536.00	1950.00	3177.65
via New York and Suez	524.45	536.00	1950.00	3010.45
via Norfolk and Panama	684.60	513.00	2250.00	3447.60
via Norfolk and Suez	546.50	513.00	2250.00	3309.50
via Savannah and Panama	679.81	503.00	2200.00	3382.81
via Savannah and Suez	604.34	503.00	2200.00	3307.34
Shanghai to Toronto				
via Vancouver	267.83	418.00	1650.00	2335.83
via Prince Rupert	251.62	410.00	1630.00	2291.62
via Seattle/Tacoma	251.71	488.00	1950.00	2689.71
via Los Angeles/Long Beach	284.64	580.00	2100.00	2964.64
via New York and Panama	619.53	563.00	1950.00	3132.53
via New York and Suez	602.66	563.00	1950.00	3115.66
via Norfolk and Panama	612.47	540.00	2250.00	3402.47
via Norfolk and Suez	624.72	540.00	2250.00	3414.72
via Savannah and Panama	603.36	530.00	2200.00	3333.36
via Savannah and Suez	687.25	530.00	2200.00	3417.25

* - futurelargest possible capacity vessels deployed on each alternative

** - load and discharge costs

Source: Ocean Shipping Consultants

Table 5.18

Asia to Chicago Container Distribution Costs - Future Comparison* -US\$ per 40' container

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Singapore to Chicago				
via Vancouver	336.09	391.00	1650.00	2377.09
via Prince Rupert	321.92	383.00	1650.00	2354.92
via Seattle/Tacoma	326.50	461.00	1800.00	2587.50
via Los Angeles/Long Beach	355.23	553.00	1700.00	2608.23
via New York and Panama	691.65	536.00	1650.00	2877.65
via New York and Suez	524.45	536.00	1650.00	2710.45
via Norfolk and Panama	684.60	513.00	1350.00	2547.60
via Norfolk and Suez	546.50	513.00	1350.00	2409.50
via Savannah and Panama	679.81	503.00	1550.00	2732.81
via Savannah and Suez	604.34	503.00	1550.00	2657.34
<u>Shanghai to Chicago</u>	0.00			
via Vancouver	267.83	418.00	1650.00	2335.83
via Prince Rupert	251.62	410.00	1650.00	2311.62
via Seattle/Tacoma	251.71	488.00	1800.00	2539.71
via Los Angeles/Long Beach	284.64	580.00	1700.00	2564.64
via New York and Panama	619.53	563.00	1650.00	2832.53
via New York and Suez	602.66	563.00	1650.00	2815.66
via Norfolk and Panama	612.47	540.00	1350.00	2502.47
via Norfolk and Suez	624.72	540.00	1350.00	2514.72
via Savannah and Panama	603.36	530.00	1550.00	2683.36
via Savannah and Suez	687.25	530.00	1550.00	2767.25

 * - futurelargest possible capacity vessels deployed on each alternative ** - load and discharge costs

Asia to Memphis Container Distribution Costs - Future Comparison*

-US\$ per 40' container

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Singapore to Memphis				
via Vancouver	336.09	391.00	1800.00	2527.09
via Prince Rupert	321.92	383.00	1800.00	2504.92
via Seattle/Tacoma	326.50	461.00	1950.00	2737.50
via Los Angeles/Long Beach	355.23	553.00	2050.00	2958.23
via New York and Panama	691.65	536.00	2150.00	3377.65
via New York and Suez	524.45	536.00	2150.00	3210.45
via Norfolk and Panama	684.60	513.00	1650.00	2847.60
via Norfolk and Suez	546.50	513.00	1650.00	2709.50
via Savannah and Panama	679.81	503.00	1250.00	2432.81
via Savannah and Suez	604.34	503.00	1250.00	2357.34
Shanghai to Memphis	0.00			
via Vancouver	267.83	418.00	1800.00	2485.83
via Prince Rupert	251.62	410.00	1800.00	2461.62
via Seattle/Tacoma	251.71	488.00	1950.00	2689.71
via Los Angeles/Long Beach	284.64	580.00	2050.00	2914.64
via New York and Panama	619.53	563.00	2150.00	3332.53
via New York and Suez	602.66	563.00	2150.00	3315.66
via Norfolk and Panama	612.47	540.00	1650.00	2802.47
via Norfolk and Suez	624.72	540.00	1650.00	2814.72
via Savannah and Panama	603.36	530.00	1250.00	2383.36
via Savannah and Suez	687.25	530.00	1250.00	2467.25

* - futurelargest possible capacity vessels deployed on each alternative

** - load and discharge costs

Source: Ocean Shipping Consultants

Conclusions on the current competitive position of the Port of Vancouver for Asian trades to Chicago shows a highly competitive option

For Asian trades the Port of Vancouver/Prince Rupert option is highly competitive for both Toronto and Chicago by a considerable margin, but the level of this advantage is seen to be greater for Shanghai and points to the northeast of the Asian region as a result of the considerably shorter ocean hauls to Pacific Northwest ports.

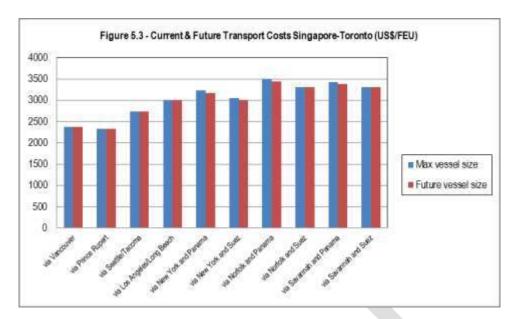
This gateway is considerably cheaper than other Pacific Northwest ports and also much lower than Pacific South alternatives. It should also be noted that the East Coast option becomes cheaper than the Californian routing for these trades with the New Panamax vessel. This will further squeeze demand at Pacific South ports.

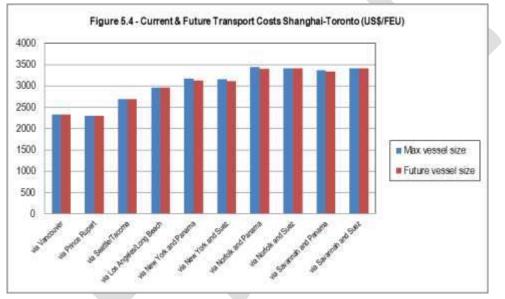
Prince Rupert generates a slightly lower through cost than noted for the Port of Vancouver, but this is marginal and other considerations such as the greater availability of export cargo at Vancouver and the greater critical mass offered by a Vancouver call will continue to offset this difference.

All-water options remain more expensive as a result of the distances involved in the case of NE Asia and the size limitations of the Panama Canal for SE Asian suppliers.

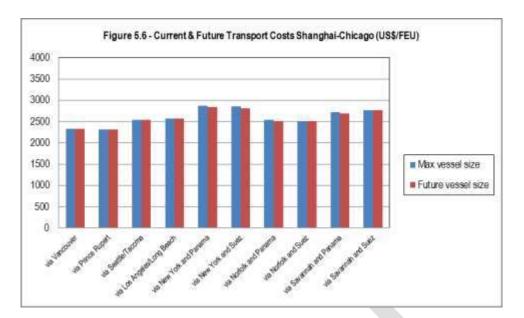
The *relative* advantage of the Port of Vancouver is sustained for shipments from Singapore (and the ASEAN market in general). Once again, it must be stressed that timings will continue to favour the West Coast and this will sustain overall demand. Within this, the costs of the Port of Vancouver are seen to be highly favourable.

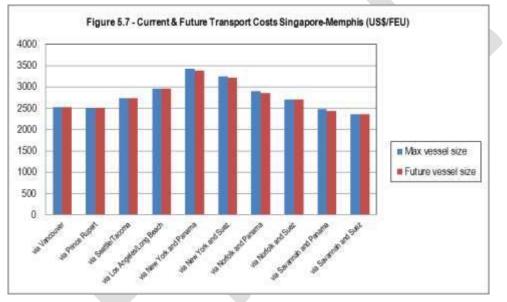
The outlook is further summarised in Figures 5.3 to 5.8.

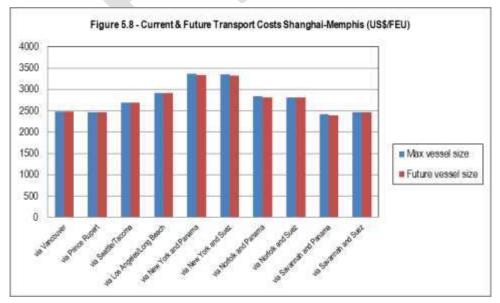












Conclusions on the current competitive position of the Port of Vancouver for Asian trades to Toronto notes a competitive cost option

Similar calculations using the same ports of entry in Canada and the US have been used to draw some indicative comparisons for Singapore and Kobe serving Toronto.

Once again, the Port of Vancouver and Prince Rupert options offered the most competitive cost options, favoured in part by the sailing distances and no requirement to use transit canals as impacts East Coast facilities.

The Pacific South ports are deemed to be more expensive than the Pacific Northwest alternatives, with volume and local cargo issues influencing the structure of Californian demand.

The empty container issue

The Asia-North America container trades are severely distorted by the imbalance in goods flows in favour of eastbound containers. This generates a requirement for large volumes of empty container repositioning back to Asia. This is seen to be only indirectly relevant to the current analysis but the following points may be made:

- The relative balance of the Port of Vancouver flows minimises disruptions due to these considerations. Given identified competitive cost structures this further supports the Vancouver option.
- There is no time pressure for repositioning empties. As such, the slower transit time via the East Coast will not be a penalty for this trade.
- The North Atlantic trade is in far better balance eastbound and westbound and, as such, there
 is a more limited pool of empty containers on the East Coast. Possibilities for reloading are
 therefore higher.
- The introduction of the Pendulum service offers greater opportunities for global integration of hardware, with the North American, European and Asian markets interlinked by transshipment over wayports.

Although the competitive position of the Suez all-water option is clearly improving, in particular for New York/New Jersey seeking to serve central Canada, these will still be more than offset by the advantages via the Port of Vancouver (and Prince Rupert). This will be far less true of other Pacific Northwest ports and be scarcely the case with the Californian terminals.

There are no specific negative factors impacting on the position of the Port of Vancouver with regard to the empty container repositioning issue. Indeed, the main impact of the Port of Vancouver's market position has been a *lack* of empty containers to handle the increasing level of export volumes.

5.6 Key Conclusions – Implications for Port of Vancouver

This analysis has summarised the existing highly competitive cost position for Port of Vancouver terminals when serving the eastern Canadian and US Midwest regions. This position is largely the same as it has been in recent years. The same competitive position emerges if Toronto is used as the final destination further reflecting the same competitive issues. The competitive position is undermined for southern destinations as represented by Memphis.

The Pacific Northwest region in general is seen to be very well placed and, within this sector, the Port of Vancouver and Prince Rupert generate the lowest costs. This represents a major

competitive advantage. These advantages are focused on the NE Asian trades but are also significant with regard to the SE Asian markets.

It is also concluded that this relatively strong competitive position will be further boosted by anticipated ship size developments in the main line container trades. The strong existing advantage will be considerably enhanced as larger vessels are introduced into the trades.

The use of a US East Coast port, such as New York/New Jersey, is not seen to be a more viable cost alternative, with the higher sea costs, fees associated with transiting canals and greater terminal handling charges more than offsetting any benefits gained from lower inland intermodal costs.

On this basis, although there will be increased competition from all-water services (especially from SE Asia via Suez in the largest classes of vessels) two factors will restrict this:

- The time involved in shipping via Suez is considerably greater than via the landbridge. If there are no intermodal delays, a difference of around nine days is indicated in favour of the West Coast alternative. This will continue to be a relevant factor for higher value cargoes. For empty containers and lower value goods this will be of no real importance.
- A competitive response may be anticipated from the major railroads if east coast ports are chosen as locations of major deepsea developments.

Despite these factors, it is apparent that the Port of Vancouver/Prince Rupert option offers a highly competitive overall transport alternative for the US Midwest region, both within the West Coast market and also in contrast to the Panama and Suez alternatives.

The level of this advantage has been somewhat reduced by the lower marine fuel prices that are currently being recorded, but this is seen as a temporary adjustment. With bunker prices at typical average levels the relative advantages of the Port of Vancouver option are even more significant. These advantages will increase in the next few years.

SECTION VI – SWOT ANALYSIS FOR THE PORT OF VANCOUVER

6.1 Introduction

There is no doubt that the Port of Vancouver is currently a highly-competitive option for container traffic moving to/from local and more distant hinterland markets in Canada and the US.

In addition, considerable potential exists for the further development of the port as a major regional load-centre and transit point for the broader North American markets. The port will continue to enjoy a highly diversified cargo base. As such, this represents a continuation of the expanding role of the port that has been noted in recent years. In order to cope with this demand it will be necessary to significantly increase handling capacity.

This Section provides an essentially subjective review of the relative competitive position of the port versus other locations in the Pacific Northwest and other parts of North America for both existing and developing sectors of the market.

The competitive position versus Prince Rupert is considered, as is the ability to compete with the San Pedro complex in Southern California. In addition, a summary is presented of the strengths and weaknesses of the port in each of the major identified market sectors, namely:

- Vancouver and British Columbia;
- The broader Pacific Northwest;
- Eastern Canada and the US Midwest (i.e. major intermodal discretionary markets).

In each case, the general competitive position of the Port of Vancouver is seen to be positive.

6.2 The Competitive Position of the Port of Vancouver – Qualitative Assessment

This study has identified a series of criteria that will determine the existing and forecast competitive position of the Port of Vancouver in the developing markets. These criteria may be summarised as follows:

- The physical capability of the terminals;
- The planned development of capacity;
- The productivity of the terminals;
- The costs of transiting the terminals;
- Delivered costs to eastern Canada and the US Midwest;
- Intermodal capacity;

- Import/export balances;
- Suitability as a regional hub location;
- Existing customer base.

The accompanying analysis (summarised in Table 6.1) provides an evaluation of these items in order to help assess the competitive position of the Port of Vancouver versus its immediate competitor in the Pacific Gateway region – i.e. Prince Rupert. For completeness, Seattle-Tacoma and the ports of Long Beach and Los Angeles are also included due to the relatively close geographic proximity, even though the competitive overlap is more restricted to more distant discretionary markets.

Of course, not all of these factors are of equal weight and they will, in any case, vary in significance from customer to customer. Nevertheless, this is exactly the type of qualitative evaluation that is undertaken by shipping lines (and the largest shippers) when evaluating port choice and terminal investment.

As such, OSC has confidence in the veracity of this approach, especially as it has been used for a wide-range of different assignments on a global basis.

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The Relative Competitive Position of the Port of Vancouver Versus Competing Ports

	Vancouver	Prince Rupert	Sea-Tac	San Pedro
Physical Capability of Terminals	****	****	****	****
Planned Capacity Development	****	****	**	****
Productivity of Terminals	****	****	***	***
Cost of Transiting Terminals	****	****	****	**
Delivered costs to Midwest	****	****	**	****
Intermodal Capacity	****	*****	***	****
Import/Ex port Balance	****	***	****	****
Local Demand	****	**	****	****
Location as a Regional Hub	****	**	****	****
Existing Customer Base	****	***	****	****
Total	46	37	35	44
- percentage	92.0%	74.0%	70.0%	88.0%

The following qualitative points must be stressed in this analysis to accompany the summary assessment:

Physical Capability

The Port of Vancouver facilities offer considerable advantages with regard to ship size accessibility and available capacity – particularly at Deltaport. The facilities at Prince Rupert (although offering a much lower capacity) are seen to be equally well suited to current and future shipping requirements, although the delivery of Phase II on time as planned is crucial to the port continuing to meet demand. With new owner, DP World, it will be highly-likely to ensure this objective is met.

The position in both Seattle and Tacoma is less competitive, with generally less deepwater capacity and a more fractured terminal structure. There is very little planned investment at these locations. The Port of Vancouver enjoys an existing advantage and (providing planned developments are expedited) this competitive position will be maintained.

Prince Rupert has noted plans to expand beyond the existing phase one development. After making the significant investment in acquiring the port, and with an existing terminal at the Port of Vancouver, there is no doubt that DP World is very committed to the Pacific Gateway region and both facilities. It is reasonable to assume that the expansion at Prince Rupert will be undertaken as part of the new owner's commitment to the facility.

The San Pedro ports comprise the largest terminals on the Pacific Coast and have a substantial critical mass of volumes and customers, with large local markets to serve. There are known plans to expand over the next 10 years, although there is a need to improve productivity and to better embrace the advantages of automation, which is occurring very slowly.

Planned Capacity Development

The Port of Vancouver has a comprehensive plan to increase container handling capacity. This will allow it to expand its market share and further extend its hinterland. Expansion is also planned at Prince Rupert. The US Pacific Northwest ports do not have significant expansion plans, whereas short-to-medium term projects in San Pedro will see both terminal and intermodal capacity increase further.

Terminal Productivity

In terms of land use and crane utilisation rates, productivity at the Port of Vancouver is significantly higher than is noted on average in the competing US terminals. Productivity levels at Prince Rupert are comparable with Vancouver, although Prince Rupert is already under pressure to add ship-to-shore gantry cranes to lower the assessed annual moves each unit has to perform to more sustainable levels.

Both Seattle and Tacoma need to increase utilisation rates and it will be essential for the Port of Vancouver to continue its process of productivity improvements for the terminals to maintain the existing relative advantages.

Long Beach and Los Angeles are fully aware of the need to improve productivity, especially as a solution instead of simply looking to build further terminals at a much higher cost. Achieving these objectives will not be without challenges, especially with regard to the unionised workforce.

Cost Levels

The Port of Vancouver and Prince Rupert both enjoy a significant advantage with regard to stevedoring costs in contrast to both Seattle and Tacoma. This has been partially attributable to favourable

exchange rates, but underlying cost structures are also generally lower so this advantage should be maintained in the future.

Southern California ports are also slightly less competitive but have the advantage of offering significant volumes of cargo and terminal operators who are generally serving ships in which their own companies have an interest.

Delivered Costs to US Midwest and Central/Eastern Canada

The Pacific Northwest region generally enjoys a highly competitive cost structure on these hauls in contrast to Californian and US East Coast ports. The Port of Vancouver and Prince Rupert have a lower cost structure than both Seattle and Tacoma and therefore the Canadian ports remain a more cost-competitive alternative.

The Pacific Gateway ports are highly competitive for Toronto as a representative distribution centre for eastern Canada US East Coast ports using the All-Water via Suez Canal routing are estimated to be less cost-competitive. Any benefits gained with the lower inland portion of the through costs are easily offset by higher ocean components and terminal charges.

The San Pedro ports are generally quite cost competitive and offer very high volumes of potential cargo to transportation providers, while the sizeable local demand will always entice shipping lines to use these ports, with discretionary market traffic therefore arriving on the same vessels. This position will not change over the forecast period.

Intermodal Capacity

Both Tacoma and Seattle have been hampered by a lack of available on-dock rail capacity and – more importantly – by congestion linking the ports with the transcontinental mainlines. These difficulties have declined in recent years as investment has been stepped-up and also as volumes have stagnated, certainly not helped by issues of capacity for intermodal trains having to exit the local mountainous terrain between Everett to Spokane via Stevens Pass. Current access for Canadian National and Canadian Pacific in serving the Port of Vancouver is not impacted by these restrictions and is less capacity constrained.

In contrast to Prince Rupert, the Port of Vancouver is served by two transcontinental lines – thus offering improved flexibility and security – with a strong likelihood that one of the US western railroads seek access to the terminal too.

The doublestack capacity and number of services to/from Southern California is substantial and will continue to be offered by the two US West Coast railroad operators, even if at a slightly higher cost than the Canadian railroads can provide. Moreover, the amount of intermodal capacity at both Long Beach and Los Angeles will continue to expand to keep pace with demand.

Import/Export Balances

In contrast to the Californian ports, the balance between imports and exports in the Pacific Gateway and Pacific Northwest regions is considerably more positive – with this position generally helping to ease the problems associated with repositioning empty containers.

The Port of Vancouver does, however, enjoy a relative advantage in contrast to both Seattle and Tacoma with a much more balanced profile. There are major existing and expanding containerised export opportunities for Vancouver and this will be a more important driver than will be the case for competing ports.

Local Demand

Each of the major ports in the region has a very strong local market – with the exception of Prince Rupert which is in an isolated location. The combined local demand of Seattle and Tacoma is greater than that for the Port of Vancouver, but the overall structure of demand and deeper hinterland reach of the Port of Vancouver offsets this relative deficiency.

Southern California remains a massive local market and will always underpin demand for the two ports located in this state.

Suitability as a Regional Hub

As pressures to reduce port calls intensify as larger vessels are deployed, the Port of Vancouver will be better- placed to play a dominant Pacific Northwest role. The difficulties associated with cross-border movements into the US will be offset by the other advantages of the port. It is likely that the Port of Vancouver and either Tacoma *or* Seattle will be called at by most major lines.

Although the most restricted port in the port rotation may influence the ship limitations it is still reasonable to expect the Port of Vancouver to benefit from this process of concentration of port calls.

Long Beach and Los Angeles will remain key ports of call in their own right, with the overlap with the Pacific Northwest only for the distant discretionary markets.

Existing Customer Base

In contrast to Seattle, the diversity of the existing customer base (that is the number of major lines calling at the port) is somewhat more limited at the Port of Vancouver, but the difference has narrowed in recent years. In relation to Tacoma, there is little relative difference, however. As the competitive position of the port is consolidated, it is anticipated that this relative disadvantage will decline. Prince Rupert is focused on a single customer grouping.

Seattle and Tacoma are generally well-represented but not as much as the San Pedro complex which will always be a "must-call" in any Transpacific liner routing.

It should be apparent from these considerations that the Port of Vancouver occupies a highly competitive position. Of course, the relative importance of each of these considerations is not equal and it is not possible to provide a more definitive quantification of such issues.

However, by ranking the position of the Port of Vancouver for each criteria and comparing these scores with the other ports, a general view of the competitive position can be defined.

It is apparent that the overall competitive position of the port is highly positive in relation to its immediate competitors.

6.3 The Competitive Position of the Port of Vancouver – Forecast Growth Areas

In addition to the qualitative assessment provided in Section 6.2, a separate analysis for the Port of Vancouver has been undertaken with a specific focus on the port's key forecast growth areas, namely:

- Local Demand Vancouver and British Columbia.
- Regional Demand the broader Pacific Northwest market.
- Continental Demand the North American intermodal (discretionary container) market, including Eastern Canada.

Each of these areas is included in Table 6.2, which seeks to summarise the opportunities for further development and to detail the potential threats to development.

<u>Table 6.2</u>

Summary Strengths, Weaknesses, Opportunities & Threats Analysis for the Port of Vancouver by Regional Market Sector

Market Sector	Strengths	Weaknesses	Opportunities	Threats
Local Demand - Vancouver &				
<u>British Columbia</u>	Central location No cross border costs Competitive handling rate Capacity available and planned More lines offering first/last call Strong export demand Relatively high productivity	Ex change rate volatility vs US ports	Scope for local market to grow abov e trend	Failure to deliver required port capacity Adverse currency moves could lower relative advantage
<u>The Broader Pacific Northwest</u>	Competitive handling rates v US ports Competitive productivity Stronger local market for exports Av ailable intermodal capacity Deeper water than US ports More lines offering first/last call Capacity av ailable and planned Relatively high productivity	Ex change rate volatility vs US ports Vancouver local market is smaller than Seattle/Tacoma	PNW market to expand at continental rate - could increase share Low er costs and port consolidation could fav our Port of Vancouv er	Failure to deliver required port capacity
<u>The Eastern Canadian and US</u> Intermodal Markets	Competitive handling costs Deeper water than US ports Effective intermodal links Capacity available and planned Low est intermodal costs Relatively high productivity Through-costs are low	Costs slightly higher than Prince Rupert Lack of westbound cargo PNW volumes smaller than Pacific South South may favour Californian ports Exposure to C\$ rate for US cargoes US ports may offer first/last calls	Can increase market share in both US and Canadian markets Concentration of port calls in PNW fav our Vancouv er	Failure to deliver required port capacity All-water services could lift market share Potential border costs for US cargoes Potential use of US East Coast ports

SECTION VII – FORECAST CONTAINER HANDLING VOLUMES AT THE PORT OF VANCOUVER

7.1 Introduction and Methodology

On the basis of the analyses in this detailed study, this Section summarises the overall anticipated development of the Port of Vancouver container port demand.

It uses forecasts provided in Section I, specifically from the regional demand forecasts to 2050 contained in Section 1.11 and the qualitative evaluations provided in Section II to Section V.

The schematic shown in Figure 7.1 provides a visual summary of this robust methodology used to determine the container forecasts for the Port of Vancouver, with a synopsis noted as follows:

1. The market study model forecasts the future container demand for the following levels of aggregation:

In Section 1.11 the following is provided:

- Total for all North American container ports, broken down to Pacific West Coast and Atlantic/ Gulf coasts.
- Pacific West Coast container demand
- Pacific Northwest region, which includes the US ports of Seattle and Tacoma, together with the Port of Vancouver and Prince Rupert.
- Pacific Gateway facilities of the Port of Vancouver and Prince Rupert.

In this Section VI:

- Port of Vancouver container demand forecasts.
- 2. The scenarios underlying the forecasts, as developed in Section I, are:
 - High, medium and low GDP growth scenarios for North America, China and other major Asia economies, along with Other Canada and West Canada.
 - High, medium and low GDP growth: Demand growth Multipliers for North America and both China and other major Asia regions.
 - Application of four specific risk/opportunity factors (covering US side capacity development in Pacific Northwest, intermodal transportation from the Port of Vancouver increases, application of intermodal transportation costs/charges and market share of the Port of Vancouver based on mainly ship size and draught developments).

- 3. The overall container demand outlook is formulated in Section 1.11 for North America and subsequently for the Pacific Northwest region by forecasting a market share for this area on the following basis:
 - North American container demand consists of the container volumes handled on the Pacific West Coast, Atlantic Coast and Gulf Coasts. Trade is split by global regions (i.e. NE Asia, SE Asia, Australasia, South America, Middle East/India, Africa and Europe). The total container demand is generated using the North American outlook for GDP and multipliers.
 - The Pacific West Coast container demand is generated based on market share of total North American market versus share of East Coast for each growth scenario.
 - The market share which ports in the Pacific Northwest region are able to attract from the total Pacific West Coast demand is subsequently determined.
- 4. The outlook for the Pacific Gateway area comprises the container volumes for the Port of Vancouver and Prince Rupert. The forecasts for import and export containers are developed separately and the approach for each consists of the following.
 - The forecast of underlying import demand is based on confirmed 2015 import volumes of both ports (excluding empty containers). This volume of full imports in 2015 is split to their destinations. The volumes for each destination are then combined with corresponding GDP outlook for West Canada, the other Canadian regions and US and the North American multipliers outlook.
 - The additional potential of the Pacific Gateway for increased penetration in the US and Canadian hinterland is captured by an additional market growth factor for intermodal transport penetration and intermodal cost outlook (see risk/opportunity factors under point two above).
 - The combined forecast for the Pacific Gateway of the underlying import demand plus the continued penetration of more distant regions are then split by origin and commodity type.

The outlook for the export volumes for the Pacific Gateway follows a similar approach:

- The forecast for full exports is based on the actual full exports in 2014 and 2015. The full exports are split in two container flows based on 2015 actual destination shares. These two container exports flows are then projected using either the China or other major Asia GDP scenario and the Asian multiplier scenarios.
- The total export container forecast is then split by origin and commodity type, based on the known position for 2014, for both China and other major Asian areas.

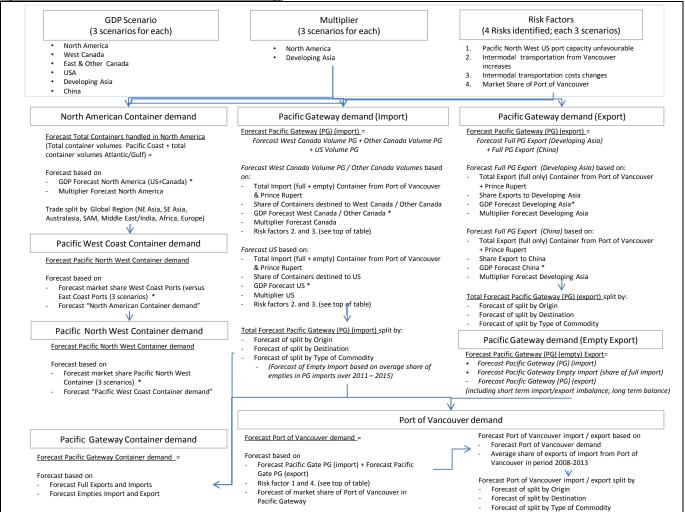
The outlook for empty containers has been carried out as a separate set of steps.

- The empty import containers have been forecast based on their average historic share of full imports and subsequently applying a declining trend.
- The empty export containers are determined as the balance between the full and empty imports minus the full exports. In the near future this balance is set such that the (full and empty) imports make up for roughly 54 per cent as is currently witnessed. However, the forecast assumes that the balance between total imports and exports will move towards a 50-50 per cent split from around 2022 onwards.

5. The volumes for the Port of Vancouver are determined by the market share which the Port of Vancouver is anticipated to capture from the Pacific Gateway volumes. The first (US side capacity development Pacific Northwest) and fourth risk factor (increased ship sizes and draught) are applied to this forecast.

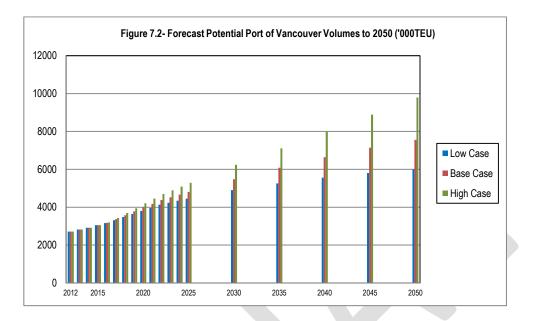
As with the Pacific Gateway forecast, the Port of Vancouver forecasts are split into a set of detailed forecast to identify the origin, destination and commodity type of the container flows. The import : export ratio is kept the same as that of the total Pacific Gateway to calculate Port of Vancouver imports and exports from the total traffic forecast.

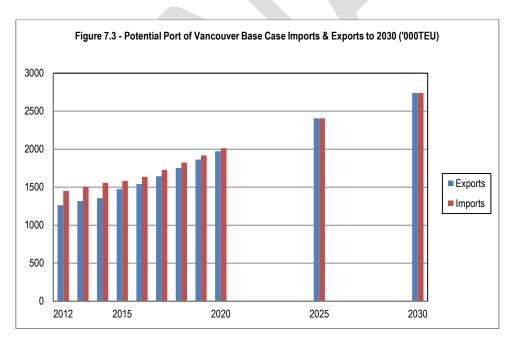
Figure 7.1: Port of Vancouver Forecast Demand Model Methodology



7.2 Port of Vancouver Forecast Demand Development

The development of this updated demand is summarised in Table 7.1 and in Figure 7.2. The balance of imports and exports under the Base Case growth option to 2030 is also detailed in Figure 7.3, which highlights the largely balanced nature of the trade for the Port of Vancouver.





Clearly there is a discontinuity in the forecasts developed to 2025 with the longer term projections. For the period between 2025 and 2050 a scenario-based approach has been adopted and this can only really offer a snapshot of potential demand in each of the periods under review. The range of possible developments clearly broadens significantly in the second half of the forecast period.

Table 7.1 Forecast Potential Total Port of Vancouver Volumes to 2050 - '000 TEU

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
<u>Total</u>																					
Low Case	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5	3161.1	3317.4	3481.6	3643.7	3807.7	3966.0	4131.0	4236.1	4343.7	4453.7	4904.7	5259.9	5563.8	5809.8	5998.7
Base Case	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5	3177.1	3371.9	3577.4	3780.5	3986.7	4178.8	4380.2	4520.2	4664.3	4812.6	5479.4	6082.5	6645.3	7139.8	7552.7
High Case	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5	3192.8	3435.4	3693.7	3950.1	4212.1	4450.7	4702.9	4892.3	5089.0	5293.2	6233.7	7108.0	7994.7	8894.8	9793.3

Includes empties

 Table 7.2

 Port of Vancouver - Base Scenario Import Container Port Demand to 2030

 - 000 TEU

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
By Destination																			
West Canada & Unknown	611.0	621.3	599.3	610.2	613.6	648.0	684.2	719.5	755.0	787.4	821.3	847.5	874.5	902.4	930.8	959.8	982.2	1004.7	1027.4
Other Canada	645.8	677.1	607.1	591.2	647.9	684.3	722.5	759.8	797.3	831.5	867.3	895.0	923.5	952.9	982.9	1013.5	1037.2	1061.0	1084.9
US	193.0	209.6	350.3	379.4	374.7	395.7	417.8	439.4	461.0	480.9	501.5	517.6	534.1	551.0	568.4	586.1	599.8	613.5	627.4
Total	1449.9	1508.0	1556.7	1580.8	1636.2	1728.1	1824.5	1918.6	2013.3	2099.8	2190.1	2260.1	2332.1	2406.3	2482.1	2559.5	2619.1	2679.2	2739.7
By commodity																			
Household Goods	404.8	414.2	512.7	553.9	574.0	606.3	640.3	673.5	706.9	737.5	769.3	793.9	819.2	845.8	872.5	899.6	920.6	941.8	963.0
Construction & Materials	179.5	192.9	200.9	191.3	198.2	209.4	221.2	232.6	244.2	254.7	265.7	274.2	283.0	292.1	301.4	310.7	318.0	325.3	332.6
Industrial, Auto and Vehicles	149.8	160.3	184.4	199.0	206.2	217.9	230.1	242.0	254.0	265.0	276.5	285.3	294.4	303.9	313.5	323.3	330.8	338.4	346.0
Machinery	108.0	105.0	110.9	108.0	111.9	118.2	124.9	131.3	137.8	143.8	150.0	154.8	159.7	164.9	170.1	175.4	179.5	183.6	187.8
Basic Metals	56.7	44.0	55.5	57.1	59.2	62.5	66.0	69.4	72.9	76.0	79.3	81.8	84.4	87.2	89.9	92.7	94.9	97.1	99.3
Other goods	450.7	502.2	434.7	433.5	449.3	474.6	501.2	527.2	553.3	577.2	602.2	621.4	641.2	662.0	682.9	704.2	720.6	737.1	753.8
Empties	101.9	89.5	57.6	38.1	37.4	39.1	40.9	42.6	44.2	45.6	47.1	48.6	50.1	50.3	51.9	53.5	54.7	56.0	57.2
Total	1451.3	1508.0	1556.7	1580.8	1636.2	1728.1	1824.5	1918.6	2013.3	2099.8	2190.1	2260.1	2332.1	2406.3	2482.1	2559.5	2619.1	2679.2	2739.7
By origin																			
China	773.5	846.0	946.5	948.5	981.7	1036.8	1094.7	1151.2	1208.0	1259.9	1314.1	1356.0	1399.3	1443.8	1489.3	1535.7	1571.5	1607.5	1643.8
Hong Kong	87.1	61.8	63.8	63.2	65.4	69.1	73.0	76.7	80.5	84.0	87.6	90.4	93.3	96.3	99.3	102.4	104.8	107.2	109.6
South Korea	178.5	165.9	160.3	167.6	173.4	183.2	193.4	203.4	213.4	222.6	232.2	239.6	247.2	255.1	263.1	271.3	277.6	284.0	290.4
Taiwan	90.0	76.9	65.4	66.4	68.7	72.6	76.6	80.6	84.6	88.2	92.0	94.9	97.9	101.1	104.2	107.5	110.0	112.5	115.1
Thailand	49.3	55.8	59.2	56.9	58.9	62.2	65.7	69.1	72.5	75.6	78.8	81.4	84.0	86.6	89.4	92.1	94.3	96.5	98.6
Others	272.8	301.6	261.5	278.2	288.0	304.1	321.1	337.7	354.3	369.6	385.5	397.8	410.5	423.5	436.9	450.5	461.0	471.5	482.2
Total	1451.3	1508.0	1556.7	1580.8	1636.2	1728.1	1824.5	1918.6	2013.3	2099.8	2190.1	2260.1	2332.1	2406.3	2482.1	2559.5	2619.1	2679.2	2739.7

 Table 7.3

 Port of Vancouver - Base Scenario Export Container Port Demand to 2030

 - 000 TEU

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
By Origin																			
British Columbia	969.0	977.6	1015.8	1150.9	1164.4	1242.2	1324.7	1407.0	1491.3	1571.0	1655.0	1707.9	1762.3	1818.4	1875.7	1934.1	1979.2	2024.6	2070.3
Alberta & Prairies	88.5	89.6	104.4	104.6	111.9	119.4	127.3	135.2	143.3	151.0	159.1	164.2	169.4	174.8	180.3	185.9	190.2	194.6	199.0
C&E Canada	151.6	152.8	153.3	137.0	180.5	192.6	205.4	218.2	231.2	243.6	256.6	264.8	273.2	281.9	290.8	299.9	306.9	313.9	321.0
NW Territories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Canada	1.9	0.0	0.0	0.0	1.8	1.9	2.0	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.0	3.1	3.2
US	49.9	1.3	81.4	78.1	62.5	66.7	71.1	75.5	80.1	84.3	88.9	91.7	94.6	97.6	100.7	103.8	106.3	108.7	111.2
Unknown	0.9	96.2	1.4	2.9	19.7	21.0	22.4	23.8	25.2	26.6	28.0	28.9	29.8	30.8	31.7	32.7	33.5	34.3	35.0
Total	1261.9	1317.5	1356.2	1473.6	1540.9	1643.8	1752.9	1861.9	1973.4	2078.9	2190.1	2260.1	2332.1	2406.3	2482.1	2559.5	2619.1	2679.2	2739.7
By commodity																			
Lumber	333.5	342.2	297.0	247.0	253.0	262.3	272.7	283.8	295.2	307.5	320.5	331.1	342.1	353.5	365.2	377.1	388.7	400.5	412.5
Woodpulp	182.5	186.9	153.7	133.5	136.7	141.8	147.4	153.4	159.5	166.2	173.2	178.9	184.9	191.1	197.4	203.8	210.1	216.5	222.9
Specialty Crops	150.0	190.2	202.9	158.7	162.6	168.6	175.2	182.3	189.7	197.6	205.9	212.8	219.8	227.2	234.7	242.3	249.8	257.4	265.1
Meat, Fish & Poultry	43.0	40.5	39.7	33.6	34.5	35.7	37.1	38.6	40.2	41.9	43.6	45.1	46.6	48.1	49.7	51.4	52.9	54.5	56.2
Basic Metals	44.1	34.9	30.3	27.3	28.0	29.0	30.2	31.4	32.7	34.0	35.5	36.6	37.9	39.1	40.4	41.7	43.0	44.3	45.6
Other Goods	295.8	330.9	322.1	450.9	461.9	478.9	497.8	518.0	538.9	561.3	585.1	604.5	624.6	645.4	666.7	688.5	709.6	731.2	753.1
Empties	213.0	191.9	310.5	422.6	464.2	527.4	592.4	654.4	717.2	770.6	826.3	851.1	876.3	902.0	928.1	954.6	965.0	974.9	984.2
Total	1261.9	1317.5	1356.2	1473.6	1540.9	1643.8	1752.9	1861.9	1973.4	2078.9	2190.1	2260.1	2332.1	2406.3	2482.1	2559.5	2619.1	2679.2	2739.7
By Destination																			
China	522.4	606.0	587.2	639.6	679.0	734.8	794.5	855.6	919.6	980.7	1045.0	1089.5	1135.7	1183.7	1231.9	1280.2	1318.7	1356.6	1393.6
Other Major Asia	739.4	711.4	769.0	834.1	861.9	908.9	958.4	1006.3	1053.8	1098.2	1145.1	1170.6	1196.4	1222.6	1250.2	1279.3	1300.4	1322.7	1346.1
Total	1261.9	1317.5	1356.2	1473.6	1540.9	1643.8	1752.9	1861.9	1973.4	2078.9	2190.1	2260.1	2332.1	2406.3	2482.1	2559.5	2619.1	2679.2	2739.7

As Table 7.2 shows, import demand will continue to be driven by commodities from Asia, most specifically China, as expected. Key commodities are household goods, although construction and materials, industrial, auto and vehicle parts and machinery all offer supporting volumes.

This means that US destinations will remain the third largest import destination market in North America for the Port of Vancouver, with 551,000 TEU by 2025 and an estimated 627,400 TEU in 2030. West Canada and the other remaining Canadian regions will be the two largest areas of import activity, recording 902,400 TEU and 952,900 TEU, respectively in 2025. By 2030, it is projected that West Canada will have grown to almost 1.03 million TEU per annum, with the remainder of Canada (collated under the "Other Canada" classification) will be generating over 1.08 million TEU per annum.

These more distant markets will require efficient intermodal rail services to be available from the port and it remains essential that effective levels of containers moving via rail continues to be offered.

With respect to export commodities, British Columbia will continue to be the dominant origin area for cargo being shipped from the Port of Vancouver in containers. By 2025 the province will account for almost 1.97 million TEU, with 2.29 million TEU expected in 2030.

China will remain the key driver of export demand, accounting for over 1.18 million TEU in 2025 and then 1.39 million TEU by 2030. By way of comparison, the other major Asia region comprising the key markets will collectively reach 1.22 million TEU in 2025 and 1.34 million TEU by 2030.

Of the individual commodities lumber, woodpulp and specialty crops will continue to generate the largest export volumes being containerised. Locally-sourced cargo from British Columbia will be an important generator of some of this volume, although the need for continued good transloading facilities in Vancouver will be equally important for any of this cargo arriving from more distant locations.

7.3 Comparison of Port of Vancouver Annual Growth

It is possible to generate a comparison of annual growth rates for the Port of Vancouver in which the historic levels of container development are shown against projected development.

Table 7.4 compares the annual growth rates (CAGR) for the following regions and time periods, with assumptions and conclusions added:

- North America, Pacific Northwest region and the Port of Vancouver are listed. The Pacific Gateway region (consisting of the Port of Vancouver and Prince Rupert) is excluded because historic data is unavailable for the full assessment period as Prince Rupert only opened during 2007.
- The Port of Vancouver has outperformed the North American and Pacific Northwest region historically between 1990 and 2000 but also for the period 2000 to 2014.
- Between 2013 and 2025, and also for the 2025 to 2050 period, the Port of Vancouver will continue to see its total container demand growth surpass projections for North America and the Pacific Northwest region.
- North America, the Pacific Northwest region and Vancouver are all mature markets, which is reflected in the lower growth in overall terms (if compared to emerging or developing economies).

Table 7.4 Comparison of Annual Growth Rates of Total TEU - Historic Container Demand and Projected Volumes

North Americ	<u>a</u>		Pacific North West Region		Port of Vancouver	
Time Period	Scenario	Average Annual Growth Rate	Time Perio Scenario	Average Annual Growth Rate	Time Perio Scenario	Average Annual Growth Rate
2010-2014	Historic	3.7%	2010-2014 Historic	2.2%	2010-2014 Historic	3.7%
2015		5.5%	2015	4.6%	2015	4.9%
2016-2025	High Scenario Base Scenario Low Scenario	4.1% 3.1% 2.3%	2016-2025 High Scenario Base Scenario Low Scenario	5.0% 3.9% 3.1%	2016-2025 High Scenario Base Scenario Low Scenario	5.7% 4.7% 3.8%
2026-2050	High Scenario Base Scenario Low Scenario	2.4% 1.7% 1.1%	2026-2050 High Scenario Base Scenario Low Scenario	2.4% 1.7% 1.1%	2026-2050 High Scenario Base Scenario Low Scenario	2.5% 1.8% 1.2%

7.4 Comparison of the Port of Vancouver Container Forecasts – June 2014 vs. January 2016 Studies

A comparison of the total container forecasts completed in July 2013 and the current modeling exercise has been conducted.

As shown in Table 7.5, there is a reduction in the number of containers anticipated in the current projections in contrast to the outlook undertaken in mid-2014.

The adjustments reflect a reduction in overall container demand at the port during the forecast period. The impact of the forecast level of demand in relation to the planned investment in new container handling facilities at the Port of Vancouver is addressed in the supply/demand balance in Section 7.5.

		Base Case			Low Case			High Case					
	June 2014	January 2016	Difference	June 2014	January 2016	Difference	June 2014	January 2016	Difference				
2012	2713.2	2713.2		2713.2	2713.2		2713.2	2713.2					
2013	2825.5	2825.5		2825.5	2825.5		2825.5	2825.5					
2014	2999.6	2912.9	-86.7	2974.2	2912.9	-61.3	3018.6	2912.9	-105.7				
2015	3156.1	3054.5	-101.6	3102.4	3054.5	-47.9	3197.3	3054.5	-142.8				
2016	3326.6	3177.1	-149.5	3240.3	3161.1	-79.2	3393.0	3192.8	-200.2				
2017	3497.5	3371.9	-125.6	3361.8	3317.4	-44.4	3625.7	3435.4	-190.3				
2018	3677.1	3577.4	-99.7	3487.7	3481.6	-6.1	3874.2	3693.7	-180.5				
2019	3865.7	3780.5	-85.2	3618.2	3643.7	25.5	4139.6	3950.1	-189.5				
2020	4063.8	3986.7	-77.1	3753.4	3807.7	54.3	4423.0	4212.1	-210.9				
2021	4235.2	4178.8	-56.4	3875.4	3966.0	90.6	4664.2	4450.7	-213.5				
2022	4413.6	4380.2	-33.4	4001.3	4131.0	129.7	4918.4	4702.9	-215.5				
2023	4599.4	4520.2	-79.2	4131.1	4236.1	105.0	5186.3	4892.3	-294.0				
2024	4792.9	4664.3	-128.6	4264.9	4343.7	78.8	5468.6	5089.0	-379.6				
2025	4994.3	4812.6	-181.7	4403.0	4453.7	50.7	5766.1	5293.2	-472.9				
2030	5812.7	5479.4	-333.3	4918.1	4904.7	-13.4	7066.5	6233.7	-832.8				
2035	6510.0	6082.5	-427.5	5331.0	5259.9	-71.1	8242.2	7108.0	-1134.2				
2040	7131.9	6645.3	-486.6	5670.4	5563.8	-106.6	9367.4	7994.7	-1372.7				
045	7716.6	7139.8	-576.8	5959.0	5809.8	-149.2	10514.8	8894.8	-1620.0				
050	8252.2	7552.7	-699.5	6195.2	5998.7	-196.5	11663.2	9793.3	-1869.9				

Table 7.5 Port of Vancouver Forecast Comparisons - June 2014 vs January 2016 000 TEU

Source: Ocean Shipping Consultants

7.5 Port of Vancouver Supply/Demand Development to 2025

The final analysis of this Section considers the development of the supply/demand balance at Vancouver's container facilities on the basis of demand volumes here defined and the core assessment of capacity development at the port as detailed in this study.

It is apparent that container terminal utilisation rates will steadily increase over the forecast period, although there is already a pressing need for additional capacity to be developed at Vancouver.

It should be noted that an effective utilisation rate of around 85 per cent of the maximum or 'design' of terminal capacity typically indicates less than optimal terminal use and the first signs of congestion either with regard to vessel arrival or for hinterland linkages.

The scope of this Report is not to conduct a detailed capacity analysis of the Port of Vancouver container terminals. However, it is possible to note that using this typical 85 per cent benchmark, with confirmed throughout for 2014 and 2015, followed by short-term projections to 2025 onwards, it is clear that the Port of Vancouver is already surpassing this utilisation figure.

These developments are further summarised in Figure 7.4 and in Table 7.6.

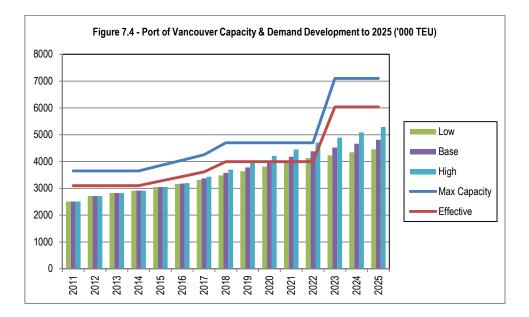


Table 7.6 Port of Vancouver Container Supply-Demand Balance to 2025 000 TEU

				2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capacity - '000 TE	U														
Maximum	3650	3650	3650	3650	3850	4050	4250	4700	4700	4700	4700	4700	7100	7100	7100
Effective	3103	3103	3103	3103	3273	3443	3613	3995	3995	3995	3995	3995	6035	6035	6035
Demand - '000 TE	<u>u</u>														
High	2507	2713	2825	2913	3055	3193	3435	3694	3950	4212	4451	4703	4892	5089	5293
Base	2507	2713	2825	2913	3055	3177	3372	3577	3781	3987	4179	4380	4520	4664	4813
Low	2507	2713	2825	2913	3055	3161	3317	3482	3644	3808	3966	4131	4236	4344	4454
Utilisation - %															
High	80.8%	87.5%	91.1%	93.9%	93.3%	92.7%	95.1%	92.5%	98.9%	105.4%	111.4%	117.7%	81.1%	84.3%	87.7%
Base	80.8%	87.5%	91.1%	93.9%	93.3%	92.3%	93.3%	89.5%	94.6%	99.8%	104.6%	109.6%	74.9%	77.3%	79.7%
Low	80.8%	87.5%	91.1%	93.9%	93.3%	91.8%	91.8%	87.1%	91.2%	95.3%	99.3%	103.4%	70.2%	72.0%	73.8%

Note: Utilisation based on effective capacity available.

7.6 Conclusions – Key Implications for the Port of Vancouver

The Port of Vancouver remains a highly-competitive option for import and export container volumes moving forward.

By 2025, the port's terminals are projected to be handling over 4.8 million TEU per annum in total (under the Base Case growth scenario), compared to the 2015 confirmed total of just over 3.0 million TEU.

Continued growth of Asian imports, together with locally-sourced exports, are anticipated to continue, with the port able to serve more distant import intermodal markets in both Canada and the US. However, it will need intermodal rail capacity to continue to serve these important locations. Although relatively small volumes, likely future demand growth for exports of specialty crops from North America should also be noted.

It can be concluded that there is already a pressing need for investment in additional capacity at the Port of Vancouver just to keep pace with projected container demand growth, even for the Base Case growth scenario.