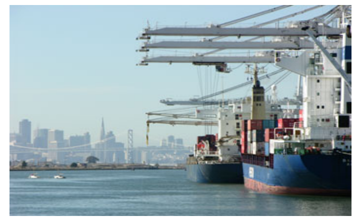
GHK









NORTH PACIFIC RIM TRADE CORRIDOR STUDY

FINAL REPORT

APRIL, 2007

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1 INTRODUCTION

1.1 Objectives

Alaska Canada Rail Link Inc. is investigating the feasibility of a rail link connecting the Alaska Railroad to the North America rail system in Canada. Within this context, GHK International (Canada) Ltd was appointed to "test the market for a new sea/rail transportation link between Asia and North America." The focus is on the potential ACRL rail traffic linking the fast growing East Asia economies and exports to North America. The Request for Proposals (RFP) specifies three separate but inter-related work packages to be completed.

Northern Pacific Rim Future Trade Dynamics: The first package involves a long term (50 year) analysis of world trade flows and what impact these flows might have on the relative advantages of various shipping routes, port gateways and inland corridors. In particular, an assessment needs to be provided of the possibility of establishing an Alaskan gateway (North Pacific Rim (NPR) Gateway) linked to the Alaska Canada Rail Link (ACRL) that, based on evolving patterns of trade, would be sustainable in the long run. Successfully completing this work package requires both a hard analysis of existing trade data as well as creative thinking about what impacts drivers such as like global warming, population shifts, geopolitical circumstances the emergence of new economies and so on might have on trade patterns and in turn how this speaks to the likelihood of success for an Alaskan gateway.

North Pacific Rim Sea/Rail Container Route: The second work package follows from the first. Once the future trade patterns have been established the issue becomes one of determining how much of that trade can be handled with existing, and already planned, extensions to trade related transportation infrastructure – road, rail and water. Congestion in ports on the North American west coast is already perceived to be a major problem. Therefore, this work package needs to establish the strategic role that the Alaska Canada Rail Link could play in building a 'bridge' for waterborne traffic through the Anchorage area to destinations elsewhere in North America should congestion at other west coast gateways become critical. Ultimately, this work package identifies North American West Coast port and rail capacity constraints and what this might mean for an Alaskan port gateway in terms of the traffic it will attract and the revenues it will generate.

North Pacific Rim Supply Chain Integration / Processing: A fundamental requirement of the third work package is to determine the relative location advantages that the ACRL might provide for developing a processing capacity for the resources of the Yukon and/or Alaska. This will require an assessment of the volume and types of resources available, the factors determining downstream processing locations and how improving *access* (or effectively reducing transport costs) to Yukon and Alaskan resources might affect global supply chains. The volume potential for Alaskan and/or Yukon ports and rail links to serve as air, sea/rail gateways will be improved where access transforms the overall economics of resource processing closer to raw material sources, assuming scale is achieved. A second element of this part of the work is to assess opportunities for inbound semi-finished or finished goods for import and distribution via a sea/rail link to the US interior.

1.2 Scope

In this report we present our analysis of flows and patterns of Pacific Rim trade to 2050 with relative emphasis on the next 25 years – in broad terms the demand side. In terms of the supply of sea/port/rail infrastructure and services, the report provides a broad capacity analysis of North American gateways and the challenges and constraints that may emerge over the period to 2024/5.

The analysis is set within the context of *emerging* shipping line, port and railroad strategies and plans which are likely to have an impact on the way in which future demand can be met. These strategies and plans are relevant as they often involve significant capital investment in assets with long term life cycles and returns. Hence these investments will fundamentally shape how trade is handled, both in terms of gateways and modes, over the long term and indeed over substantial part of the next 50 years.

Finally, the analysis is *focused on container traffic*. One possible opportunity for expanding traffic using the North Pacific Rim Trade Corridor, and the ACRL offer in particular, is capturing a share of the Far East, and increasingly China, eastbound (inbound) container cargo currently routing through other Pacific Northwest, Pacific Southwest and all water routes serving inland Canada and US markets.

The analysis is based on the following sources and evidence:

- A review of shipping and container trade sources (e.g. PIERS, Containerisation International, Journal of Commerce), selected bespoke data base analysis and industry reports;
- International trade statistics and associated reports; and
- Semi-structured interview data covering a cross section of interests including shipping lines, terminal operators, port authorities, railways and selected cargo owners.

Geographic coverage

The geographic coverage is North America however *relative* emphasis is placed on the core market segments of the West Coast port ranges as the dominant ports in the Pacific container trade. It is recognized that port choice decisions and assessments of capacity are subject to variability over time and thus the analysis considers those ports that could reasonably be expected to compete for Alaskan gateway traffic in the future.

1.3 Organization

The report is organized into six sections plus supporting Appendices:

- Section 2 is focused trade patterns and trends and thus addresses the core aspects of work package one - ***Northern Pacific Rim Future Trade Dynamics***. The drivers of container traffic growth are assessed including overall trans-pacific trade patterns as well as the key factors shaping the dominant inbound market (US imports from East Asia / PRC).

- Section 3 focus on the key issues related to work package two - ***North Pacific Rim Sea/Rail Container Route***. The analysis provides an overview of the direction and key trends in the shipping, port and intermodal rail sectors. The test is to see how well the ACRL sea / rail concept fits with broad market developments. The analysis also takes a broad view of port and rail capacity to assess where bottlenecks and future investment priorities are.
- Section 4 provides an economic profile of the Yukon and Alaska - a large territory with a small population and a heavy reliance on the public sector. The desirability of greater economic diversification is highlighted, notably the need for more export-oriented industry to help balance the very high levels of imports. In addition, opportunities for new economic development opportunities that might benefit from an NPR gateway and corridor are assessed.
- Section 5 focuses on demand projections, specifically an assessment of the future demand for container gateway services in Anchorage/Port Mackenzie.
- Section 6 analyzes the business case, by assessing the relative competitiveness of the ACRL offer; the potential revenue envelope and the volume, revenue and timing of container traffic that ACRL could expect to capture.

2 GLOBALISATION, TRADE AND TRANSPORT GATEWAYS

2.1 Introduction: The World is Flat (ter)

The purpose of this section is to address the core themes of the work package relating to *Northern Pacific Rim Future Trade Dynamics*. Trade growth is the driver of the demand for port and intermodal rail services. More specifically, the opportunities for the North Pacific Rim and the ACRL in particular relating to routing the large and growing China / Far East trades via a northern sea – rail link. The future of this trade and how it is handled is the critical focus on the analysis.

The section starts by providing an overview of global trade and economic trends. The main driver of the trans-pacific container trade is Far East / PRC exports to the US (and Canada). Given this, *relative* emphasis of the analysis is on the US import growth and the factors likely to influence future growth. The analysis then focuses on the relationship between GDP and trade growth and container traffic. The section ends with guidance on future growth assumptions for container traffic over the planning horizon.

2.2 Globalization and the Growth of World and US Economies

Globalization generally refers to a process of increasing integration of economic activities across the world enabled by technological change and liberalization of policy towards a relatively stronger influence of market forces. The technological changes are now familiar and result in dramatic reduction in transport and communications costs. In effect, these technological changes are bringing the various regions of the world together and more forcefully allowing new forms of economic organization and collaboration to develop – in the words of Thomas Friedman, "The world is flat."[1]

However, and equally important, is the shift in policy. Governments are redefining the boundaries of state influence and ownership of productive assets and shifting towards a more liberal approach to economic policy. This is important as the trends towards a more global and liberalized world could in fact be slowed or even reversed even with further technological progress. The strength of globalization in terms of increasing integration of goods, services, labour and capital is a key determinant of the market prospects for ACRL and thus a flex point in thinking about the long term future. First, however, it is useful to assess the current position and trends.

World GDP and Trade: Liberalization is driving growth

Long term growth of world GDP and international trade has been relatively constant over the last thirty years. GDP growth has averaged about 3.5% p.a. and world trade growth has averaged about 6.5% p.a. in each of the last three decades. The averages for the last

[1] Thomas L. Friedman (2006), *The World is Flat*, Penguin.

twenty years are shown in Table 2.1. Growth has proven to be robust and withstood destabilizing events such as the Asian financial crisis of the late 1990s and 9/11.

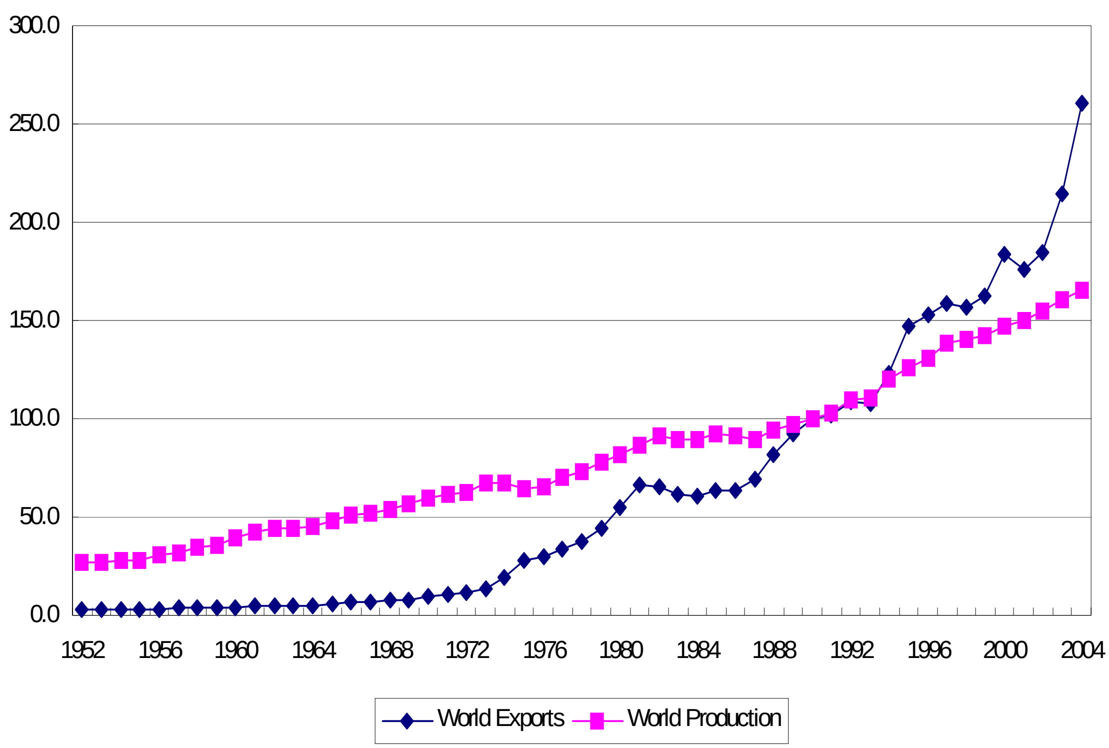
Table 2.1 Growth in GDP and Trade, 1987-2005 (% p.a.)

	GDP	Trade volume (imports)
World		
1987-1996	3.3	6.5
1997-2005	3.8	6.5
Advanced Economies		
1987-1996	3.0	6.5
1997-2005	2.7	6.1

Source: IMF World Economic Outlook 2005

The fundamental reason for international trade growth remaining above growth in GDP (i.e. output) has been *growing trade and investment liberalization* – Figure 2.1. Increasingly across much of the global economy there has been a reduction in trade barriers (e.g. tariffs) and a gradual opening up domestic economies to foreign investment.

Figure 2.1 Trade is Shaping Growth



The PRC Open Door Policy: Workshop for the World

Along side the liberalization trend within much of the OECD countries was a crucial set of complementary changes in Mainland China and its shift to export oriented industrialization – the "open door" policies. Combined with technological changes and new ways of organizing production, the barriers to relocating manufacturing to areas with comparative advantages, especially low labor costs, are now minimal. In fact, most low income countries have set up free trade zones to attract manufacturing. As a result of these reforms, the proportion of GDP accounted for by exports and imports has risen sharply in most countries.

USA: Key Driver of the Trans-pacific trades

Trends in the USA's international trade and GDP have been similar to those of the world economy - Tables 2.2 and 2.3. The US economy is the largest and most innovative economy in the world. Critically, the US is also the largest importer and has been a driver of world trade growth.

The principal differences between the global position and that of the US are:

- GDP growth has been slightly lower; and
- International trade (import) growth, at 8% p.a., has been slightly higher than the world average.

The higher ratio of imports to GDP is reflected in the US's large balance of payments deficits of recent years.

Table 2.2 Summary of Growth in US GDP and Trade, 1987-2005 (% p.a.)

	GDP	Trade volume (imports)
US		
1987-1996	2.9	6.1
1997-2005	3.4	8.0
World		
1987-1996	3.3	6.5
1997-2005	3.8	6.5

Source: IMF World Economic Outlook 2005. See Table 3 for details.

Table 2.3 Growth of World and US GDP and International Trade (% p.a.)

	World GDP (Real)	World Trade (Volume)	US GDP (Real)	US Imports (Volume)
1997	4.2	10.5	3.4	13.6
1998	2.8	4.6	2.6	11.6
1999	3.7	5.8	3.5	11.5
2000	4.6	12.4	3.8	13.1
2001	2.5	0.2	1.2	-2.7
2002	3.0	3.3	1.6	3.4
2003	4.0	4.9	2.0	4.4
2004	5.1	9.9	3.4	9.9
2005	4.3	7.4	2.6	7.0
Average 1997-2005	3.8	6.5	2.7	8.0

Source: IMF, World Economic Outlook

2.3 Growth Forecasts: Trade Volumes and Directions are Positive for ACRL

The continuation of the long-term growth rates which have been maintained over the last thirty years are subject to uncertainties. In the case of GDP growth, demand in some product markets is maturing, for example food and cars, and thus growth rates will likely be slower in the future as they relate to the advanced countries. The shift of production to low cost countries, with the PRC at the center of this, has already happened thus reducing the rate of growth derived from reorganizing production and supply chains. On the upside, consumption of electronic goods, textiles, footwear, other fashion items and furniture have grown as a result of built-in “style obsolescence”.

The rapidly expanding economies of China and India, with over 2 billion people and where consumption levels are still on the early part of the S-curve, offer considerable growth opportunities. However, while this presents considerable growth and trade opportunities for intra-Asia trade the direct benefits to ACRL are likely to be less; that is, there will be a relative shift in trade volumes and new patterns of trade towards Asia. This is a relative shift and there remain growth opportunities on current trades as well as in resources to supply these new global leaders.

Overall, the leading forecasting agencies predict growth of international trade at levels well above GDP growth and generally positive long term prospects - Table 2.4.

Table 2.4 Taking the Pulse of World Economic Growth (% p.a.)

	2004	2005	2006	2007	2008	2009
GDP						
Oxford Economic Forecasting, Economic Outlook Jan 2006	4.2	3.6	3.4	3.2	3.1	3.2
EIU Country Forecasts 2006	4.2	3.5	2.8	2.5	2.8	3.1
IMF World Economic Outlook, Sept 2005	4.2	3.5	3.3			
OECD Economic Outlook	4.2	3.6	3.5	3.3		
World Bank	2.7			3.2		
EIA	3.9					
IMPORTS						
Oxford Economic Forecasting, Economic Outlook Jan 2006	10.7	6.1	5	4.3	5.7	6.8
EIU Country Forecasts 2006	10.7	6.4	6.2	5.4	6.4	6.8
OECD Economic Outlook	10.7	5.8	6	7		
EXPORTS						
Oxford Economic Forecasting, Economic Outlook Jan 2006	8.4	7	7.8	10.4	9.7	9.1
EIU Country Forecasts 2006	8.4	7	6.5	6.8	6.9	7.1
OECD Economic Outlook	8.4	7.1	8.3	8.5		

The World Bank's *Global Economic Prospects* (2005) argues the world economy is "in good shape". It acknowledges various risks, including the twin US deficits, the high and volatile oil prices, delayed recovery in Europe and questions over the future of China's economy (see later for further discussion). Overall, it emphasizes the strengths of the world economy, including the speed with which the growth of the Asian economies was resumed after the crisis of the late 1990s, and the good prospects for East and Central Asia. The World Bank's "Prospects for the Global Economy" predicts that the world's GDP (output) over the next ten years will rise to a higher level than in recent years. Their forecast of world GDP growth (% p.a.) – Table 2.5:

Table 2.5 World Bank Perspectives

	GDP	GDP (a)
1980s	1.3	3.0
1990s	1.2	2.5
2001-2006	1.5	2.7
2006-2015	2.1	3.2
(a) The growth rates are the World Bank's per capita rates plus population growth		

The EIA's *World Economic Outlook* states that "world economic growth is projected to *average 3.9 percent annually* (up to 2025). This growth projection is slightly higher than the 2004 projection, because economic performance in most regions of the world was exceptionally strong in 2003 and 2004." The consensus is for GDP growth of about 3% p.a. and 6% p.a. in national imports up to 2010 - slightly below the trends of the last ten years. The key issue going forward is the future of the US economy.

US: The Key Driver of NPR Trade Opportunity

The IMF, OECD, World Bank and Oxford Economic Forecasting are relatively optimistic about the future of the US economy.[2] The World Bank forecasts growth rates for US GDP increasing to levels above those of the last decade – Table 2.6. Nevertheless, various econometric forecasts draw attention to a number of downside risks. One concern relates to high levels of US consumer debt and its dampening impact on demand.

Table 2.6 US Forecasts: More Growth to Come

US GDP Growth (a)	
2001-2006	+2.8% pa
2006-2015	+3.5% pa
(a) The growth rates shown are the World Bank's per capita rates plus one per cent population growth (source: EIU)	

There are signs that consumer spending could flatten out, with rising interest rates, the cooling of the housing market and the consequent decline in consumers' ability to borrow on the basis of rising housing values (equity extraction). A second concern is the US foreign trade deficit that at $800 billion is equivalent to 6.5% of 2005 US GDP; "…There are few more graphic examples of the enormous US trade deficit, which threatens the

[2] IMF *World Economic Outlook*, OECD *Economic Outlook*, Oxford Economic Forecasting *Economic Outlook*.

stability of the world economy."[3] The IMF notes that the trade deficit problem is not a matter of "if" it is solved, but when and how. The weakness of the US balance of payments will remain a threat to economic stability and may also lead to a decline in the value of the dollar (there has been downward pressure and in early 2005 it had fallen by 15%) thus raising import prices and reducing import growth. Other issues shaping US growth are oil price movements (high and volatile) and protectionism. On balance, the broad direction of trade and economic growth is favourable for future container traffic. The general consensus of the forecasts is that US GDP will continue to grow at around 3% p.a. and imports[4] at about 6% p.a., i.e. 2% less than 1997-2004 – see Table 2.6.

Table 2.6 Forecasts of US Economic Growth (Growth in % p.a.)

	2004	2005	2006	2007	2008	2009
GDP						
Oxford Economic Forecasting, Economic Outlook (EO) Jan 2006	4.2	3.6	3.4	3.2	3.1	3.2
EIU Country Forecasts 2006	4.2	3.5	2.8	2.5	2.8	3.1
IMF World Economic Outlook (WEO), Sept 2005	3.3	2.6	3.0			
OECD Economic Outlook	4.2	2.7	2.9	3.9		
World Bank	2.8			3.5		
EIA	3.1					
IMPORTS						
Oxford Economic Forecasting, Economic Outlook Jan 2006	10.7	6.1	5.0	4.3	5.7	6.8
EIU Country Forecasts 2006	10.7	6.4	6.2	5.4	6.4	6.8
IMF WEO,	9.9	6.5	6.3			
OECD Economic Outlook	10.7	58	6.0	7.0		
EXPORTS						
Oxford Economic Forecasting, EO Jan 2006	8.4	7.0	7.8	10.4	9.7	9.1
EIU Country Forecasts 2006	8.4	7.0	6.5	6.8	6.9	7.1
IMF World Economic Outlook	8.5	7.2	9.5			
OECD Economic Outlook	8.4	7.1	8.3	8.5		

[3] Financial Times, January 25, 2006

[4] The analysis in this chapter will focus on imports, which are the dominant leg on all container services calling at North American West Coast ports. Outbound container movements will be determined by, and more or less the same as, inward movements – although many of the outbound containers will be empty.

2.4 Going Forward: Establishing Base Line Assumptions

The growth profile described above will form the basis of our projection to 2010. Post 2010, it will be assumed that the US economy continues to maintain the strength that it has demonstrated over the last 20 to 30 years. One caution however, is the fact that the fundamental problems of the balance of payments deficit and consumer over-spending on foreign goods will necessitate a reduction in import growth - Table 2.6.

Table 2.6 US Import Growth (%pa): A Figure that Matters

2005-2010	6
2010-2015	5
2015-2020	4.5
2020+	4

2.5 US Imports: Where do they come from?

Table 2.7a,b provides an overview of US imports by country of origin. There is an important restructuring of trade flows. Overall, Asia's share of US imports has fallen slightly as Japan's share has declined and the Asian tigers export growth to the US has slowed. Europe's share of US imports has remained fairly static, while Mexico's has risen and Canada's has declined.

Table 2.7a US Imports by Origin (% of value in US dollars)

	1995	1998	2000	2004
Japan	16%	13%	12%	9%
Other Asia	25%	25%	25%	28%
Total Asia	**41%**	**38%**	**37%**	**36%**
Canada	19%	19%	18%	17%
Mexico	8%	10%	11%	10%
Europe (industrialized)	**19%**	**21%**	**19%**	**20%**
Other Europe	**1%**	**2%**	**2%**	**2%**
Europe (total)	**21%**	**22%**	**21%**	**22%**
Africa	**2%**	**2%**	**2%**	**3%**
Middle East	**3%**	**2%**	**4%**	**4%**
Australia	**1%**	**1%**	**1%**	**1%**
Others	6%	7%	7%	8%
Total	**100%**	**100%**	**100%**	**100%**

Source: IMF, Direction of Trade

Table 2.7b US Imports by Origin (US$bn)

	1995	1998	2000	2004
Japan	127	125	149	133
China	…	75	106	211
Other Asia	190	162	206	212
Total Asia	**317**	**362**	**461**	**556**
Canada	148	178	229	260
Mexico	63	96	135	158
Europe (industrialized)	**148**	**194**	**240**	**298**
Other Europe	10	15	21	33
Europe (total)	**158**	**209**	**261**	**331**
Africa	16	16	27	47
Middle East	**25**	21	50	56
Australia	5	6	7	8
Others				
Total	**770**	**944**	**1257**	**1524**

Source: IMF, Direction of Trade

2.6 The China Syndrome: Growth and Displacement

China is now the second largest source of US imports and accounts for 38% of Asia's total exports to the US. Critically, China's export growth to the US has been increasing at 26% p.a. over the last four years, compared with average import growth of 8% p.a. – Figure 2.2. Going forward there are few signs of any slowdown in China's exports. On the contrary, they are forecast by the EIU to increase at just over 15% p.a. in 2006-7 - Table 2.8. Growth prospects may actually be more bullish as the General Administration of Customs has already reported growth of 28% in exports in 2005, with particularly strong growth in electronic machinery and textiles which now account for the majority of China's exports - Table 2.9. Within the electrical appliances category the growth rates were 27% for data processing machines, 39% for telecoms equipment and 27% for electrical machinery. Machinery and transport equipment accounted for 46% of china's merchandise exports, and up 31% on 2004. The rapid export growth of Chinese manufactured goods is resulting in some trade restrictions (e.g. quota agreements) from US and EU trading partners.

On balance, it is assumed that these restrictions would be temporary and overall prospects for the key China – US trade remain favorable although rates of growth are expected to slow.

Figure 2.2 PRC on the Rise

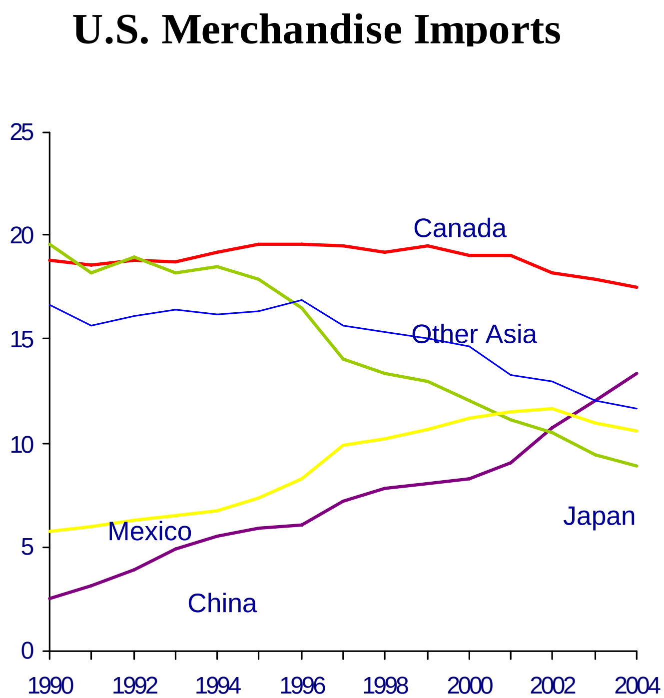


Table 2.8 Growth Rates of China's GDP, Exports and Imports

	2004	2006	2007
GDP	10.1	8.6	8.2
Exports of Goods +Services	24.8	16.8	14.3
Imports of Goods +Services.	17.7	17.5	15.4

Source: EIU March 2006

Table 2.9 China: Main Exports

	% of Total Exports	Growth (%) 2005
Machinery and electrical appliances	42	33
Textiles	14	21
Base metals	8	31
Chemicals	4	30
Plastics	3	38
Footwear	3	24
Total, including others	100	28

Source: General Administration of Customs

2.7 The Vancouver Workshop and Growth Projections

A key element of the work in providing an assessment of the future economic viability of the ACRL is to provide a demand assessment to 2050. It should be pointed out at the outset that preparing a forecast over such a long time horizon is replete with many difficulties, not the least of which is the fact that the key factors driving the trade generating demand can change dramatically over the period. As a way of getting around this problem, a workshop was held in Vancouver on October 20, 2006 to which a number of experts were invited to share their views on what the future might hold in specific areas and to provide some assistance as to how potential change might affect trade and the demand for container handling and inter-modal services in the future.

The invitees whose views were sought included:

1. Dr. Wenran Jiang – University of Alberta - China specialist
2. Dr. Bruce Newbold – McMaster University – Population specialist
3. Rear Admiral Roger Girouard – Canadian Navy – Strategic Security specialist
4. George Stalk – Boston Consulting Group – Logistics specialist
5. Dr. Stephen Easton - Simon Fraser University – Trade Economist

The meeting was hosted by the ACRL and included a number of individuals from the Management Working Group. Dr. Jonathan Beard of GHK facilitated the discussion. The discussions covered a wide range of issues including the possibilities for international and domestic conflict or upheaval in cargo origin areas (including China and India), global population growth, and changing patterns in supply chain management, all with a view to determining what impacts these might have on global trade and in particular Pacific Rim trade. The basis for the assessment of the impacts was founded on past trends. The views expressed, informed the assumptions for future growth scenarios discussed section in 2.8.

Discussions at the workshop were lively but the general consensus was that while the East-West trade would continue to grow, there did not appear to be any factors that would suggest a massive increase in the trade, but rather that it would grow in a fairly predictable manner in line with recent trends. For example, global population growth was discussed with an indication provided by the discussant Dr. Bruce Newbold that it would indeed be significant reaching 9.2 billion by 2050. When dissected, however, only a relatively small proportion of global population growth was expected to occur in North America suggesting that demand could not be expected to grow in a manner that would cause a massive increase in east-west trade.

Discussions also revolved around geo-political and security issues. Once again, however, the general consensus was that there was unlikely to be any events that would either enhance or dampen expectations for the east-west trade i.e. trade would continue in a fashion that is suggested by recent trends. On the other hand, potential political instability arising in China’s western provinces due to growing income disparities between China’s western regions and its coastal areas was seen to have possible traction with the effect of dampening the east-west trade as China’s focus would have to shift more inward. However, the likelihood of this scenario coming to pass was deemed small by the experts.

On the other hand, it was also suggested that if China is successful in establishing a manufacturing economy further west(which it is attempting to do), then China’s domestic market would grow and potentially increase the demand for inbound raw materials from countries such as Canada.

In relation to the environment, the melting of Arctic ice was discussed as a possibility in creating a direct passage between southeast Asia and Europe with the concomitant potential of creating transshipment possibilities in Alaska. It was mentioned, however, that current science does not expect melting to occur at a rate that would allow for successful commercial routing of cargo through the passage until sometime after 2050.

The one area in which some potential for deviations from the current growth trends was thought possible was in the automobile industry. Mention was made of the inexpensive auto parts that are already being manufactured in China and shipped to North American assemblers. This, coupled with China’s intention to manufacture and assemble cheap automobiles for sale in North America (and elsewhere) has the potential for increasing trade to some extent.

It is important to point out, however, that trade cannot continue to outstrip world economic growth in perpetuity. In fact, it can be expected that for many commodities, North American imports will meet their natural market share ceilings and descend to the rate of consumption. While this happens imports of commodities not previously imported may increase but over the long run even these will slow. This suggests that in the long run, the level of imports will converge on real GDP growth. Given the above we summarize our assumptions for trade to 2050 below.

2.8 Summing up and looking ahead: Assumptions for future trade scenarios

- The leading economic forecasting agencies are bullish about the long term prospects for both the World and US economies *as long as current trends towards more liberal policy regimes persists* – this is a key flex point.
- US GDP is forecast to grow at 3% p.a. over the medium term, above the average of 2.7% in 1997-2005 – this is a base line position.
- Scenario differentiator: Degree of adjustment of trade imbalances will shape import growth – base position is adjustments reduce the *rate of import growth* over the NPR Gateway planning period. Alternatively, growing continued trade liberalization, consumer confidence combined with resurgent growth enables more upside on import growth. US import growth assumptions are:
  - Settling Down:
    - 2006 -10: is forecast to average 6% p.a. (in terms of volumes) below the average of 8% p.a. over 1997-2005.
    - 2010-15: is forecast to fall to 5% p.a. for the period 2010-2015 and
    - 2015 – 2024: 4.5%
    - 2024 – 2050: 4%
  - Resurgent growth
    - 2006-10: 9% p.a.
    - 2010-15: 8% p.a.
    - 2015 – 2024: 7%
    - 2024 – 2050: 4%
  - There is a restructuring of trade flows with *China gaining share of US merchandise imports* while other producers, and especially Japan, are reducing.
  - The market driver for the traffic for container traffic is US imports from the Far East on the trans-pacific trade – these are driven by US GDP and import growth – and overall demand conditions are favourable for ACRL prospects.

3 NPR SEA/RAIL CONTAINER ROUTE: DOES THE OFFER FIT?

3.1 Objectives and Scope

The purpose of this section is to address the key elements of the *North Pacific Rim Sea/Rail Container Route* work package. In particular, this chapter seeks "to determine the long range, strategic role of an Alaskan Canada Rail Link in potentially building "bridge" traffic through Anchorage area ports that neither originates nor terminates in Yukon or Alaska."[5] More specifically, this section examines the critical, and timely, challenge identified in the RFP, the "likelihood that international trade routes will continue to overwhelm North American port/rail infrastructure"

Clearly, one central task of this section is to test the robustness of the claim of North American port / rail infrastructure is being overwhelmed by trade growth. In so far as the ACRL offer is contingent on capacity constraints then getting a fix on the issue is essential. In addition, this section will assess what opportunities exist that would attract trade along a NPR sea/rail route.

To address these questions, a number of analytical building blocks are put in place that also form the basis for possible forward planning "scenarios".

- The first step is to provide an overview of the direction and key trends in the shipping, port and intermodal rail sectors. This will provide the strategic context to situate the NPR Sea/Rail ACRL service offer. Given the large scale and long term nature of shipping, port and rail investments it also provides a useful indication of the *direction thinking* around where trade growth is expected and how it will be handled over the medium to long term.
- The second analytical step is to assess *port capacity* in each of the major gateways serving the trades that NPR Sea/Rail container.
- The third step is to undertake an assessment of rail capacity issues to provide a view of key challenges and potential supply constraints.
- Finally, consideration is given to the drivers of port and route choice decision – making and who is making these decisions.

At each step the key issues and implications for ACRL will be identified.

In the case of the container terminal operations, the *relative* emphasis is on the US West Coast and more specifically the San Pedro Bay Ports of LA/LB. Secondary emphasis is focused on alternative gateways on the West Coast including Oakland the Pacific Northwest (PNW) ports (Tacoma, Seattle and Vancouver), all water routes (via Suez and Panama) as well as new entrants (Prince Rupert and North Mexico).

[5] ACRL, RFP, p.6.

Capacity Assessments: A word of caution

Estimating port and rail capacity is complex exercise and depends on an assessment of each of the key components - movement between the quay face and vessel, movement between the quay face and container yard (CY), storage and sorting in the CY and movement between the gate (road and rail) and the CY.

As a working assumption it is prudent to assume that capacity is relatively "elastic" and frequently has considerable upside if demand conditions are favourable. Benchmarking port productivity provides *partial evidence* of potential capacity but caution is warranted as what is and what is not achievable is dependent on specific port market and operating conditions. There has been considerable debate around capacity of the US West Coast ports, much of which is focused on the *likely shortfalls of supply* in relation to future container traffic growth. In short, the common supposition is that individually or in combination, planning, environmental and labor agreements will substantially limit either new port facilities being built and/or improving productivity of existing assets. The argument needs testing.

Evaluating rail capacity is more complex than evaluating marine terminal capacity. Railroads are networks that have a variety of interrelated fixed (infrastructure-overall and lane specific) and variable (train configurations, lengths, speeds; yard and terminal operations; switching) components. The complexity of measuring network capacity is determined by the scope (geographic area, number of lanes, volumes) and complexity (lines of business, e.g. coal, grain, intermodal, automotive, chemicals, merchandise, passenger) of the rail network. The BNSF and UP networks, key to serving the transpacific west coast gateways, are complex. Each have multiple lines of business, i.e. coal, grain, bulk, intermodal, merchandise, chemicals (primarily UP) and passenger (primarily BNSF). Their intermodal rail operations span their networks; have multiple product lines (premium, international, etc.), multiple equipment types and multiple terminal types (domestic, international, intermodal parks, on-dock rail). Suffice it to say the resources of this study preclude a comprehensive assessment of network capacity. Thus, the network capacity assessment was based on our team's experience of working for the western railroads and other maritime clients as well as selected interviews.

3.2 Shipping Line Strategy: Going for scale and control

3.2.1 Strategy, technology and ports

Shipping line strategy is marked by a number of features.

First, there is a general trend toward ***consolidation and concentration*** in the industry. The push to control more slots and TEU capacity is driving fast organic growth, merger and acquisition activity and alliances with slot sharing and service agreements. Maersk is the market leader and is reportedly seeking to secure capacity double to that of its next competitor.

Second, complementing the consolidation strategy is the push to realize ***economies of scale*** via the deployment of larger vessels. Table 3.1 provides a summary of the evolution of vessel technology. The forward order book emphasizes the shift to larger vessels and the quest for economies of scale and reduced costs – Figure 3.1

Table 3.1 Vessel Evolution

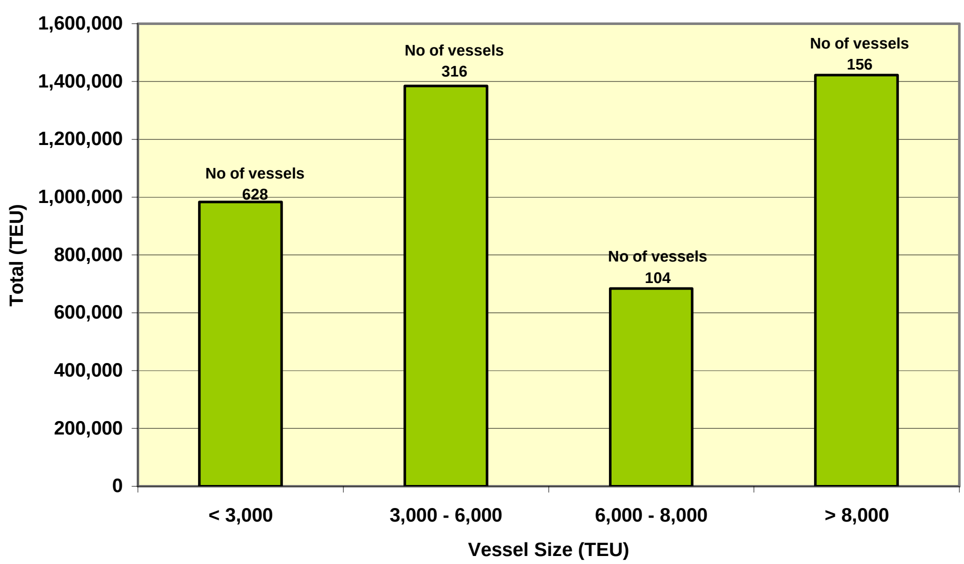
	1st Generation	2nd Generation	3rd Generation	4th Generation	5th Generation
Introduced	1968	1969	1971	1984	1988
Capacity (TEU)	900	1,500	2,300	4,500	4,300
Length (m)	180	220	275	290	275*
Beam (m)	24	25	32.1	32.2	39.4
Draft (m)	9.1	10.7	11.7	10.7	12.5
DWT**	15,000	29,000	37,000	57,800	54,700

* The 5th generation ship is able to carry a similar number of containers to the 4th generation ship with a shorter length (275 v 290metres) because its beam (width) is greater (39.4 v 32.2 metres). The 5th generation ship was the first Post Panamax ship, i.e. its beam was greater than that of the Panama Canal (just over t32.2 metres)

	6th Generation	7th Generation	Suezmax	Malaccamax
Introduced	1996	2003	2006*	2020 ?
Capacity (TEU)	6,400	8,100	12,500	18,000
Length (m)	318	323	380	400
Beam (m)	42.8	42.8	55	60
Draft (m)	14	14.5	15.5	21
DWT**	71,709	99,500	140,000	250,000

Notes: * In August 2006, Maersk launched a vessel of 11,000 TEU (the Emma Maersk). Several observers believe the capacity is close to 12,500 TEUs.

Figure 3.1 Economies of Scale Rule: New vessel order book



The third key feature marking the shipping industry is the drive to control more of the logistics chain and specifically to ***vertically integrate into dedicated port operations***. While the common user port service providers remain among the big players globally, shipping lines also have substantial port operations, as shipping line controlled port traffic data for 2004 reveals:

- Maersk / APM (~32mn TEUs)
- Cosco (~13 mn TEUs)
- Evergreen (~8mn TEUs)
- MSC (~6mn TEUs)
- APL (~5.5mn TEUs)

These strategic changes are fundamentally reshaping the maritime logistics industry. The drive for consolidation, large vessels and the willingness to control port operations has shifted the balance of negotiating power in terms of tariffs and services relatively in favor of the larger lines. Port authorities and operators commercial strategies often look to ***locking in*** the big players, either through virtual container terminal (CT) contract agreements where there are common users or independent CT operators or through longer term CT leases.

Trade patterns and related gateways therefore are being shaped by how shipping lines are organizing services and where they have favorable port positions. Gateway development and traffic volume therefore is often dependent on shipping lines – this is a key feature of the Pacific trade routes and related North American gateways. A challenge for NPR sea/rail route and ACRL will be to have a value proposition that can at least match the existing port offers and lock in a key player in the market.

3.2.2 Far East / PRC – North America Market: The Preferred Shipping Line Gateways

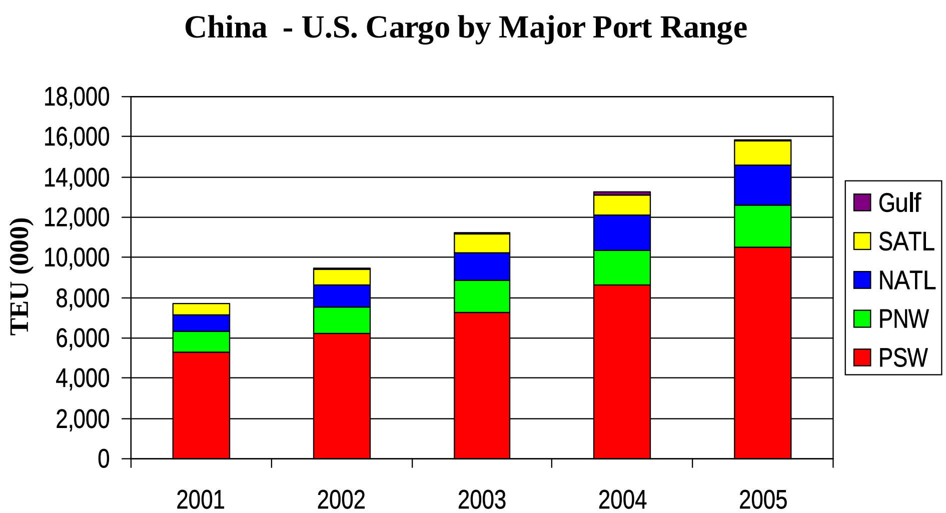
The Far East / PRC – North America (NA) container trade is a key market for the major shipping lines. Four observations are worthy of consideration.

First, the main PRC – NA (primarily US) trade is concentrated with the thirteen largest carriers controlling about 80% of import market. More specifically, CKYH, NWA and Maersk Group handle about 53% of this large and growing trade.[6]

Second, there is a *very strong preference* among the leading players to route container traffic through the PSW ports – and specifically LA/LB. Based on PIERS data, USWC port shares of their target markets are high: they handled 78% of the US's NE Asia's and about 75% of the US's SE Asian containers in 2005. The attraction of LA/LB is built on a very large local cargo base and a well developed inter-modal infrastructure to serve the inland markets. Critically, the leading shipping line players serving the Far East trade also have important port positions to serve their needs.

[6] CKYH – Cosco, K-Line, Yang Ming and Hanjin. NWA is the New World Alliance and this includes Mitsui O.S.K. Lines, Ltd (MOL), APL, and Hyundai Merchant Marine (HMM),

Figure 3.2: The PRC – WCNA Gateway



Third, it is important to differentiate market segments – Table 3.2. The PNW and Pacific Southwest (PSW – the ports of LA/LB and Oakland) serve two broad functions: they serve their immediate local hinterlands (3-4 hours trucking time away), and they serve more distant inland markets via intermodal services (sea – rail being critical).

Critical mass of cargo delivers *external economies* by enabling more frequent shipping services, more scale and choice in terms of infrastructure and more frequent inland connections – all of which are compelling factors determining port choice.

Table 3.2 West Coast Port Market Segments

Port	% of Imports with Inland Destinations	TEU Handled 2005 (000)	% of Imports with Inland Destinations **Weighted average**
Tacoma	75	2,066	
Seattle	70	2,088	
Vancouver	70	1,767	
Average NW Coast		**5,921**	**72%**
Los Angeles	45	7,485	
Long Beach	45	6,710	
Oakland	20	2,273	
Average SW Coast		**16,468**	**42%**

3.2.3 Implications for the NPR sea / rail route

What does this entail for the future and potential new gateway options and ACRL?

- First, it implies that winning market share will be enhanced if ACRL can secure the business of a leading player or alliance – this is the preferred choice. .
- Second, the performance of LA/LB ports is likely to be a critical determinant of the relative attractiveness of alternative port options to shipping lines – if LA/LB does not

manage traffic growth new opportunities will emerge for other port, including new entrants.

3.3 Container Terminals: Can they respond to demand?

The distribution of port traffic across the principal North American ports is summarized in Table 3.3.

Table 3.3 North America Port Traffic (000's TEUs)

	1990	1995	2000	2001	2002	2003	2004	2005	Growth % pa 00-05
PACIFIC NORTH WEST COAST PORTS									
Tacoma	938	1,092	1,376	1,320	1,426	1,738	1,797	2,066	
Seattle	1,171	1,479	1,488	1,315	1,381	1,500	1,775	2,088	
Vancouver	323	496	1,163	1,147	1,458	1,539	1,665	1,767	
Total	2,432	3,067	4,027	3,782	4,265	4,777	5,237	5,921	8.0
PACIFIC SOUTH WEST COAST PORTS									
L Angeles	2,116	2,555	4,879	5,184	6,105	7,174	7,321	7,485	
L Beach	1,598	2,844	4,600	4,463	4,524	4,600	5,780	6,710	
Oakland	1,124	1,550	1,777	1,643	1,685	1,876	2,043	2,273	
Total	4,838	6,949	11,256	11,290	12,314	13,650	15,144	16,468	7.9
EAST COAST PORTS									
NYNJ	1,898	2,244	3,050	3,316	3,749	4,067	4,478	4,792	
Savannah	423	627	948	1078	1327	1,521	1,662	1,901	
Charleston	801	1024	1632	1528	1592	1,690	1,860	1,980	
Virginia	789	1077	1347	1303	1437	1,646	1,809	1,980	
Total for 4 EC ports	3,911	4,972	6,977	7,225	8,105	8,924	9,809	10,653	8.8
TOTAL	11,181	14,988	22,260	22,297	24,684	27,351	30,190	33,042	8.2
West Coast Share	65%	67%	69%	68%	67%	67%	68%	68%	

Key points to note are:

- The PSW ports' share of traffic at the main US ports has been fairly consistent over the past 5 years and in fact, much of the past 10 years.
- The three PSW ports of LB, LA and Oakland have continued to handle two thirds of the total container traffic at US major ports – with the east coast major ports of New York/NJ, Virginia, Savannah and Charleston handling the other one third.

- Approximately ***92% of the West Coast port traffic comes from Asia***, of which about 80% is from North East Asia and 12% from South East Asia. The WC port shares of their markets are high with 78% of the US's total North East Asian containers and 75% of the US's South East Asian containers in 2005.

The primary *competitors for NPR Gateway are the PSW ports of LA/LB.* The future of these ports will be one key determinant of likely ACRL intermodal traffic volume and commercial performance.

LA/LB: 2004 Disruption and the Fall-out

The year of 2004 was marked by acute congestion and inland transport problems at LA/LB and stimulated considerable discussion around the future prospects of severe port and inland transport problems. The causes of the 2004 crisis were a combination of factors including strong demand growth, poor operational performance of both ports (e.g. high dwell times, issues around handling larger vessels) and the railways and labor shortages. The impacts of the 2004 crisis were significant and have *influenced perceptions* of port reliability and managing risks through gateway diversification.

The key question is what has happened since. In fact, the actual changes in behavior and port choice have seemed to be less than what might have been anticipated. Diversion to all water services serving the EC US ports has been modest. The WC share of Asian traffic at US ports (all ports, not just majors) fell by about 1.3%, from 78% to 77% in 2005. Evidence by mid – 2006 suggests that LA/LB is regaining some lost traffic and the problems of 2004 have been largely solved. – at least over the short / medium term. Indeed, traffic growth is high and there are no major problems reported in terms of managing growth.

The problems of 2004 do raise important questions around the likely future capacity and reliability of the all important LA/LB ports. The balance of this section assesses the ability of LA/LB and other West Coast ports to respond to demand growth over the period to 2015.

3.4 Container Port Capacity Assessments

The analysis of port capacity requirements and adequacy was based on a number of steps.

- First, the traffic forecasts above provide an estimate of *potential* capacity requirements against two growth scenarios.
- Second, the physical assets, for example quay length and CY area, of the main competitor ports were collated to provide an inventory of port infrastructure. In addition, proposed expansion plans and improvements were taken into account and assessed in terms of timing, phasing, likely impact and risks.
- Third, given the importance of the CY as a limiting factor on capacity, estimates were made of CT storage areas as a percentage of gross terminal acres.
- Fourth, container traffic was disaggregated in terms of import and export loads and empties. Dwell times were assigned based on port operating characteristics (observed behavior, interviews and trade sources).
- Finally, the volume projections were then "tested" against three operating capacity scenarios (Table 3.4) to assess utilization rates. The issues and potential productivity frontiers are summarized in the following sections.

Table 3.4 CT Operating and Productivity Scenarios

Density	Operating Modes	Productivity Performance
Low	Import loads: mix of wheeled and top-pick Export loads: Top-pick Empties: Block stowed	Up to 5,000 TEU / Acre
Medium	Import & export load: RTG medium density Empties: Block stowed	Up to 7,500 TEU / Acre
High	Import & export load: RTG high density Empties: Block stowed	Up to 10,000 TEU / Acre

3.4.1 *West Coast Ports*

Given the predominance of the Far East, and specifically PRC, trades the critical issue going forward over the next 10 -15 years is how well will the gateway ports serving these trades perform. Table 3.5 provides a quick summary of the potential supply position. Traffic growth profiles were based on two cases:

- Steady Growth Case: 4-6% traffic growth over period ending 2016 (see Section 2).
- Resurgent Growth: 7-9% traffic growth over period ending 2016

PSW: LA/LB is the market driver, capacity is tight but upside is comforting

The PSW ports, and specifically LA/LB, are the key to the market potential of future new gateways. The LA/LB position is complex to analyze, subject to some key uncertainties and fundamental to the prospects for new gateway ports serving the large and growing Far East – PRC trade. Traffic volumes are driven by the in-bound trade, with a high proportion of loaded 40 foot containers. The outbound leg is marked by a much higher share of empties.

Much opinion around the future prospects for LA/LB to handle future trade growth is oriented toward the expectation of severe capacity constraints and congestion. There is merit in these views but the likelihood of severe congestion and gridlock is often dependent on assumptions that are negotiable. It is certainly the case that resolution of planning and environmental issues combined with the favorable labor agreements are necessary if LA/LB are to cope with demand. The challenges extend beyond the port itself to the critical inland transport issues - directly relevant to the question of the opportunities for NPR Gateway entry is the inter-modal capacity linking LA/LB to the main network some 80 or so kilometers inland via the Alameda Corridor.

The fundamental question is whether LA/LB is likely to face capacity shortages that will cause behavioral change among shipping lines and cargo owners - that is, result in significant shifts in port choice and transfer volume to alternative and/or new gateways. The evidence to date is that expansions in new capacity and efficiency improvements, technically well inside the production frontier of good performing ports elsewhere, can deliver much of the needed capacity under the high case scenario. A number of points are worth listing:

- CY Density: Many LA/LB operations are still operating on wheels or with top-picks and dwell times are *beyond* commercial and efficiency requirements – there is significant scope for improvement and some relatively easy wins (e.g. Enforce existing commercial contracts). PierPass has reported improved velocity and capacity. Improvements have also been achieved by increased use of off-dock CY.
- Labor: Significant hiring of labor to meet demand and combining this with the introduction of new IT efficiency measures and better deployment. Evidence indicates better vessel productivity and that automation is delivering benefits at the gate.
- Port – Rail Integration: major capex expenditure is expected to double the LA/LB Corridor capacity over the next 5 years. In addition, better integration between ship (stowage of bridge cargo), port and rail services is currently being implemented.

The fundamental conclusion is that it is prudent to assume that severe capacity constraints at LA/LB over the period ending 2015 are avoidable with achievable actions. The specific position does vary with lines but the big players in the markets in which the NPR Gateway would compete are fairly well positioned. The position going beyond 2015/20 under high growth circumstances will likely be more complex with demand running ahead of supply. Equally, failure to resolve planning, environmental and labor issues will certainly lead to constraints. New entrants at Prince Rupert (PRP) and possibly Punta Colonet (Mexico) could offer reprieve but these are as yet untested offers and timing is not defined.

Table 3.5 CT Capacity Profile

Port*	2010	Beyond 2010
LA / LB	On balance, capacity improvements are achievable to meet demand under base case and high growth – but …	Capacity improvements are achievable to meet demand under base case. High growth likely to be problematic if productivity does not move to much higher density.
	• Uncertainties – Wild cards: - Environmental challenges are resolved – 2007/8 - ILWU negotiations – 2008	Differentiate impacts – capacity constraints will vary by lines – market leaders in the NPR market remain well positioned High growth scenario suggests a tight demand – supply balance.
Oakland	• Scope for significant increase in capacity. • Key issue is port – rail interface if diversion from LA/LB significant. Demand is more likely to an issue.	Available capacity should be satisfactory but high growth scenario without increasing density will likely lead to a capacity shortfall.
Tacoma	Favorable demand – supply balance under base and high case growth if medium density operations, good expansion possibilities.	
Seattle	Demand – supply balance favorable to 2010 if medium density, but position beyond 2010 likely to require further density to accommodate high growth.	
Vancouver	Position is tight beyond 2008 if no expansion or transition to high density.	High density operation can deliver required capacity under at least base case.
PRP	New port offer with expansion capacity … issue will be demand given uncertainty about performance and reliability. Issues: No local cargo, weak westbound cargo volume	
Punta Colonet	New port offer with expansion capacity – *unproven and uncertain timeframe*.	

**Key: Green indicates favorable position over period. Yellow a caution beyond 2015.*

PNW: Scope for capacity upside, demand – supply balance is manageable

The capacity-demand balance varies across these ports. Tacoma is best positioned to accommodate growth and should be able to manage growth beyond 2010, in both the base and high case scenarios under a high density operating mode. Even a medium density operation should be able to accommodate growth through 2010. This is predicated on the port and railroads being successful in addressing rail access issues. Interviews with the Tacoma Executive Director indicated that the future capacity position is favorable and there is significant upside over the next 2-10 years. Specifically, Tacoma has the potential to significantly expand the Maersk facility and bring in a further 100 – 150 acre CT if required.

Seattle may confront potential constraints in the 2009-2010 timeframe. However, under a medium to high density operational mode, available capacity should be able to accommodate anticipated growth under both base and high case scenarios beyond the forecast period.

The downside assessment is that Vancouver faces significant capacity challenges in the next five years that may limit its participation in U.S. inter-modal markets. Barriers to terminal expansion could limit growth if a shift to high density operation cannot be achieved. If high density mode is achieved then it is reasonable to assume the capacity position through to 2010 and beyond is favorable if tight.

3.4.2 *Other Ports: Different markets, Panama Canal limits, capacity upside*

The importance of Gulf and East Coast ports to the potential market opportunities for a new NPR Gateway is conditional on markets.

- First, the *primary markets* served by the Gulf and East Coast ports is essentially different from that of the NPR – they are focused on their more immediate hinterland with their inland reach more limited.
- Second, there is evidence that there is growing penetration of inland markets via the East Coast ports, with the Ohio Valley becoming a more contested terrain. In future planning for NPR Gateways, this market is likely to be increasingly difficult to penetrate.
- Third, all-water services to date are limited from the majority of the key PRC region – the Pacific route makes more sense based on minimizing the costs to shipping lines. It is also faster – a benefit to customers (cargo owners).
- Fourth, the trans-Pacific all water option is also constrained by the Panama Canal. While there are clearly efficiency improvement possible, the full expansion of the canal to accommodate laden vessels above 5,000 TEU is subject to considerable uncertainty. It is reasonable to assume no significant expansion to take on larger vessels that are becoming a more prominent feature of the trans-pacific trade is likely over the next 10 years. This will certainly shape port and route choices and reinforces the importance of the LA/LB role and its ability to handle traffic growth.

Given the above, the question of East Coast port capacity is a secondary concern for the NPR offer. That said, how well are they likely to perform is partially material as their ability to penetrate more inland markets does depend on available capacity. New York (NY) is a key to this. Over the next 5 years NY is not expected to experience capacity issues. If operations are medium to high density, then NY should be positioned to accommodate base and high case scenarios. Services using 6,500+ TEU vessels could potentially create draft and berth constraints. If demand is high and operational efficiency is low then capacity issues are possible inside the 2010 planning horizon.

Hampton Roads net capacity position is likely to be favorable, even under high growth conditions and low – medium density operations. The Maersk Cox property development combined with efficiency improvements and expansion provide significant capacity. Charleston and Savannah both are well positioned over the period to 2010. With medium – high density operations they are also well positioned to handle growth across the high scenario and beyond 2010.

Overall, the position of the East Coast ports is favorable in terms of supply and demand balance – the NPR Gateway offer will unlikely benefit from capacity constraints and moreover there could be further inland penetration to the Ohio Valley. Restrictions on the Panama Canal will constrain growth of all water services from the PRC to the US over much of the next 10 years.

3.5 Inter-modal Services: Railroad strategies and plans

This section focuses on inter-modal services – specifically railroad strategies and plans in the core inland markets. Analysis is structured around the four key railroad companies for the West Coast: Burlington Northern Santa Fe (BNSF); Union Pacific (UP); Canadian National (CP); and Canadian Pacific Railway (CPR).

3.5.1 Strategic Context

There have been three recent developments that shape the context for assessing the strategies and network capacity capabilities of the BNSF and the UP – the principal players serving the core PSW ports. The first was the severe congestion experienced by the railroads and the LA/LB port complex during 2004 – a function of high growth, equipment and crew shortages, gridlock of the LA basin rail network and port related bottlenecks.

The second development is the large capital investment programme in network capacity these railroads have been implementing - reportedly US$8-10 billion on network capacity expansion and maintenance in 2004 and 2005. Investment is continuing in 2006. Capacity expansion initiatives included purchasing locomotives and rail cars, hiring and training crews, double-tracking major intermodal rail corridors, upgrading signaling systems, implementing new operating processes and policies and investing in intermodal terminal capacity at major gateways.

The third development has been the ability of the LA/LB gateway and the western railroads to handle sustained volume growth. In 2005, U.S. west coast container traffic increased by 9.7 percent and will likely be a similar rate in 2006. Despite this significant growth, the west coast ports and the railroads in general and the LA/LB port complex in particular have accommodated the growth.

In addition to the capex programmes the railways serving the transpacific trades are also restructuring their services and improving operational efficiency. Greater integration between shipping lines (stowage of containers on vessels), port operators and railroads is improving operational efficiency and improving velocity of container flows. A second key emerging strategy is the push towards increasing scheduled services across the North American rail industry. A scheduled railroad is one where all trains in a given lane are run on a schedule and the train lengths are fixed. This practice results in maximum usage of each lane in the network since locomotives and equipment are balanced, trains run at uniform speeds and dispatching of train arrivals and departures can be closely coordinated since variability is minimized.

Canadian National (CN) has been the most successful in implementing the scheduled railroad concept. They initiated scheduled railroading with the IMEX (Intermodal Excellence) programme. This programme designed fixed train lengths and schedules for CN's international traffic in its Vancouver and Montreal corridors. This eliminated the historical pattern of supplying train sets to meet the peak import demand only to face major congestion and equipment repositioning costs at inland locations as empty cars built up due to the surge of imports. Through IMEX train schedules and transit times have improved, shipping lines and terminals have done a better job of planning, repositioning costs have declined and CN reports its capacity has increased significantly. The BNSF has also been implementing significant changes in its operations in general and intermodal in particular. It has begun segmenting domestic and international traffic by intermodal terminal, established minimum train lengths for providing on-dock rail service and begun segmenting inland origins/destinations by port gateway - BNSF no longer provides competitive rail services between the PNW and Texas., with Texas traffic now moving via the PSW gateways of LA, LB and Oakland. The remainder of the North American rail industry has been moving more slowly regarding scheduled railroading. However, the financial and operating benefits are clear and given current conditions in the rail industry (tight capacity, growing demand, and increasing market power by the railroads) it can be expected that the remainder of the industry will begin to accelerate scheduled railroad initiatives. While there are very practical limits to how far the rail industry can push scheduled railroading, there is significant room for implementing scheduled railroad initiatives - many of these are likely to be implemented in the next five to seven years.

The following sections provide general descriptions of each of the major players and the challenges going forward in terms of managing traffic growth.

3.5.2 BNSF

In the PNW, the BNSF route structure consists of three primary west to east routes:

1. via the Stampeded Pass
2. via the Stevens Pass
3. via the Columbia River Gorge

It is through these routes that BNSF handles most of the international intermodal business in the PNW. Ports served include Vancouver, Seattle, Tacoma and Portland although it does not currently handle any intermodal traffic at Vancouver. In addition to its intermodal services BNSF's major lines of business include grain, forest products and coal.

In the PSW, BNSF's main route is the Transcom route from the Los Angeles Basin through to the US Midwest, Texas and the southeast. BNSFs route structure results in it not being a major player in Oakland due to the fact its route is longer than UP's running south almost to the LA Basin before turning east. Its intermodal services are supplemented by its merchandise services.

Table 3.6 provides a summary of BNSF's operating capabilities.

Table 3.6 Operating Capabilities

	BNSF	UP
West Coast Gateways Served	PNW: Seattle, Tacoma and Portland PSW: Los Angeles-Long Beach	PNW: Portland PSW: Los Angeles and Long Beach
Major Corridors to Target Markets	PNW (Stevens Pass Route, Stampede Pass Route and Columbia River Route to U.S. Midwest). PSW (Transcon Line from LA-Amarillo-KC-Chicago)	PNW: Portland to Central Corridor Line and Chicago PSW: Central Corridor Line (Oakland to North Platte, NB and Chicago PSW: Sunset Route (LA-El Paso) PSW: Golden State Route (El Paso-Chicago)
Estimated Daily Trains by Corridor	PNW Stevens Pass Route: 28 PNW Stampede Pass Route:20 PNW Columbia River Route: NA PSW Transcon Line: 100-120	Portland to Central Corridor: 24 Central Corridor: 130 Sunset Route: 45 Golden State Route: 22

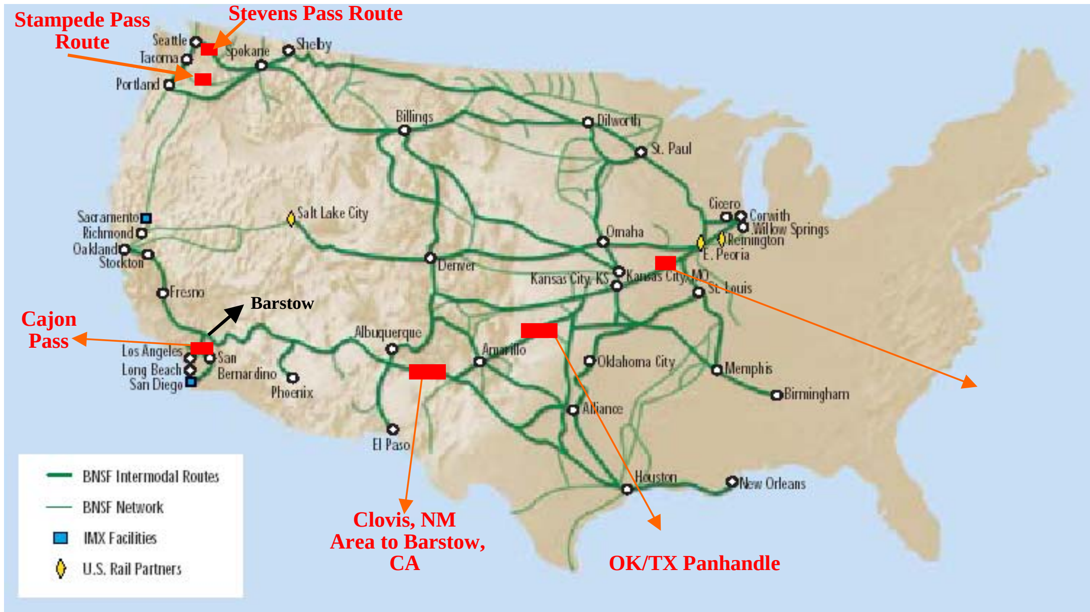
The BNSF Rail network and the capacity constraints it faces are shown in Figures 3.3 and 3.4.

Capacity Issues

The main capacity issue faced by BNSF is on its Transcom line through the Cajon Pass. Cajon Pass is a critical junction for BNSF between Los Angeles and Barstow from where it travels eastbound to Chicago and westbound to the Bay area. The main issue here is that BNSF is operating at or near capacity at the double tracked Cajon Pass. Part of the problem stems from the fact that BNSF shares the Cajon Pass with UP and traffic is reported to be averaging nearly 100 trains per day and peaking at 115 trains during high volume operating hours. Having said this, investment priorities have been established for triple tracking through the Pass but due to difficult terrain and already high traffic volumes, costs are likely to be very high at more than $2million(US) per mile. In addition, because BNSF shares trackage rights with UP it will have to renegotiate its agreements with them. On the other hand, BNSF has very few options but to invest as traffic between LA and San Bernardino and over the Cajon pass is expected to grow by nearly 40% between 2004 and 2010. As such triple tracking is critical to BNSF's future growth and service offer.

At present, about 93% of the Transcom Line between Los Angeles and Chicago is double tracked. Despite this, a number of capacity constraints and bottlenecks remain. For example, traffic on the Clovis to Barstow portion of the line averages 120 trains per day and peaks at 135 on existing track. Because of this, BNSF has begun to triple track portions of the line at certain high intensity traffic locations and additional triple tracking will be required as traffic on the corridor continues to grow.

Figure 3.3 BNSF Capacity Constraints



Source: BNSF Intermodal Facilities Guide

Figure 3.4 BNSF Planned Capacity Improvements

Source: BNSF Bear Stearns Conference Presentation, 2006

3.5.3 UP

UP serves all US west coast gateways and has the most routes for handling international cargo traffic. This coupled with the fact that it has very strong domestic lines of business that must be served, means it has the flexibility to reroute traffic to avoid congestion and maintain network fluidity. UP's premier intermodal route eastwards, however, is the Sunset

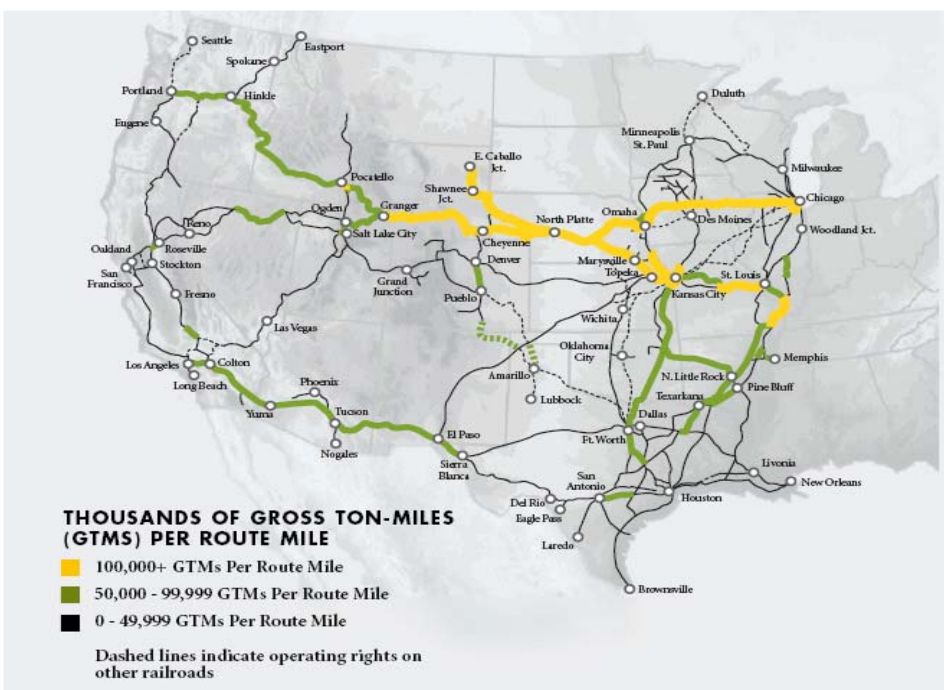
Corridor route from LA/LB to El Paso and Fort Worth. It is the most direct in terms of distance, deals with comparatively lower grades and is a high-density route. In addition to its intermodal services it is a major service provider to the auto industry. UP's second major route from Los Angeles/Long Beach is the Central Corridor running through the Cajon Pass northeast to Salt Lake City and Denver, and then on to Chicago. This route is longer to the Midwest, more mountainous and faces the same capacity BNSF faces in the Cajon Pass.

Capacity Issues

There are three major capacity issues UP faces currently (see Figure 3.5):

- Sunset Line – Los Angeles to the Southeast: The major issue facing the Sunset Line is the capacity problem in the Cajon Pass. The 600 mile portion of the line between Colton and El Paso runs as a single line track and is in need of modernization and repair.
- Golden State Line – El Paso to the Midwest: The line between El Paso and Tucumcari operates as a single track line with no centralized traffic control. Incremental increases in signalling, sidings and siding lengths in response to traffic growth will be needed and is likely to occur over the next 2-4 years.
- Los Angeles-Las Vegas-Salt Lake City Line – connecting to UP Central Corridor Line – This line also faces the capacity issues of the Cajon Pass. The mountainous route reduces operating efficiency and increases operating costs relative to other routes.

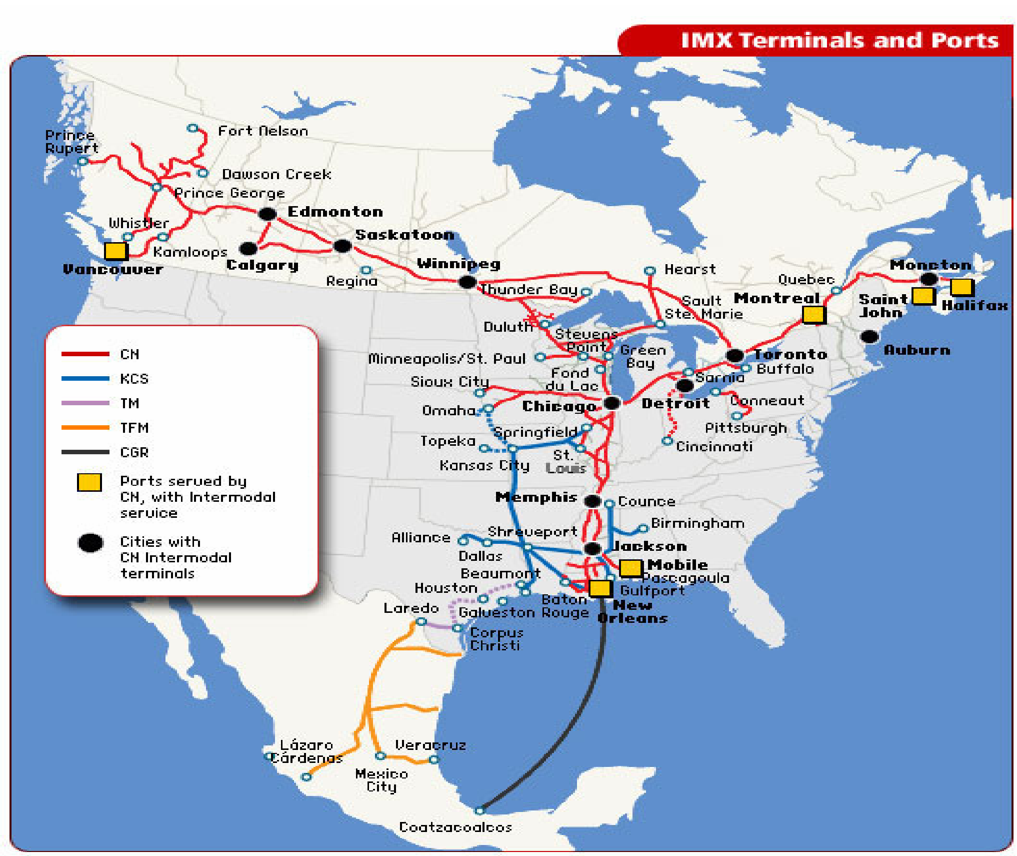
Figure 3.5 UP Capacity Constraints



3.5.4 CN

CN Rail operates the largest Canadian rail network and is the only transcontinental railway in North America. CN provides rail services for both east-west and north south trade. CN's main west to east route originates in Vancouver heading through Edmonton, Calgary Winnipeg and down into Chicago - Figure 3.6. The main lines are high capacity and congestion free. An alternative gateway for CN is now under construction at the Port of Price Rupert which under current planning will have the capacity to handle 2 million TEUs after completion of the second stage. CN, as the only rail carrier into Prince Rupert, would have a monopoly on this traffic. Connection to the main east west line occurs through Prince George to Edmonton.

Figure 3.6 CN Rail Network



3.5.5 Canadian Pacific

CPR's network is comprised of four primary corridors: the Western, Southern, Central and Eastern Corridors. The Western Corridor links Vancouver with Moose Jaw, the western end of both CPR's Southern and Central Corridors. With service through Calgary, it provides a short rail route for products transported from western Canada to the Port of Vancouver. Main services include bulk and resource products from western Canada as well as import/export intermodal containers and domestic general merchandise handling. The western Corridor connects with UP at Kingsgate and with BNSF at Coutts, Alberta and New Westminster and Huntingdon British Columbia. CPR's Southern Corridor connects Moose Jaw with Minneapolis-St. Paul and heads from there to Chicago. Traffic includes automotive and bulk products as well as intermodal containers originated in Vancouver. At Chicago, the Southern Corridor connects with BNSF, UP, CSX and NS. The Central Corridor connects Moose Jaw with Winnipeg, Toronto and Montreal and forms a key element of its transcontinental intermodal services. The Eastern Corridor links population centres in eastern Canada with the US mid west and northeast. Its main services include intermodal container traffic, automotive, forest and industrial products as well as ro/ro service for motor-carrier trailers. The Eastern Corridor connects with all major US railways at Chicago.

Figure 3.7 CP Rail Network

Capacity Issues

At present there appears to be few capacity issues on the CP network. The average number of trains per day at the busiest point in the Western Corridor (including passenger) was 33 in 2005. Corresponding numbers for the Southern, Central and Eastern Corridors was 28, 21 and 24 respectively - Figure 3.7.

Figure 3.7 CPR Traffic Density (GTMs)

3.6 Port and Route Choice Determinants

Trade and interview evidence suggests that the port choice / gateway decision – making process is changing. Increasingly there seems to be a balancing act between shipping lines (greater scale, control of slots and CTs), port operators (locking in key players, investing in new land and operational improvements), railways (given a tight demand/supply balance on inter-modal services and the need to improve asset utilization and financial performance) and beneficial cargo owners.

Where beneficial cargo owners control large volumes their influence is relatively strong – the proverbial Walmart, Home Depot, Target and other larger retailers. Evidence of their influence is made manifest through directing port / route choice and through their investment decisions in logistic / warehouse facilities. Walmart, Target and Home Depot have been building regional distribution centres near East Coast and Gulf ports including Savannah, Hampton Roads (Virginia) and Houston.

Beneficial cargo owners often express a desire to ensure reliability yet remain sensitive to minimizing total through costs – the specific tipping point of the trade–off is largely an empirical question. This was made manifest in the post 2004 LA/LB environment where disruption to supply / logistics chains stimulated interest in gateway diversification. In practice, there would appear to have been a rather limited migration of traffic away from the preferred LA/LB gateway, in part due to improvements in reliability and in part due to limits on choice. Two points are worthy of notice. First, changing behaviour is likely to be dependent on real and sustained/recurrent reliability problems and not simply one off or very short term disruptions. Second, alternative gateways will require at least a similar service level if not superior. In to the mix should be added that the primary gateways have the benefit of local cargo and frequent shipping services and intermodal services. A key part of the reliability equation is shipping and intermodal *options* (number of calls and departures, number of connections etc).

Going forward, an issue will be whether perceived or actual reliability concerns of the existing gateways are sufficient to compel beneficial cargo owners to incur additional costs to route cargo through alternative routes. In principle, the higher the value the cargo and the more time definite / critical the requirement the more likely this trade off will be made – with the cost of inventory in transit a factor as well as potential loss of sales due to late delivery. This is an issue for ACRL to monitor. In particular, ACRL should continue to track how the market is developing (port and route performance), revealed behaviour (as opposed to simply statements of intention among beneficial cargo owners) and solicit views of beneficial cargo owners on willingness to pay for alternative route and service options.

Gateway Diversification: Evidence is mixed

The problems at the US PSW ports gave rise to claims for the need for gateway diversification as part of supply chain risk management. In theory this sounds sensible and a rational response to the 2004 disruption. Certainly, discussions with new entrants into the port market at Prince Rupert and North Mexico suggest this is one element of their value proposition to shipping lines and cargo owners. To date, the revealed behavior still points to the LA/LB gateway as the preferred choice. Alternative gateways and new entrants have to offset the intrinsic advantage of a large local cargo base that supports inbound and some backhaul traffic. Congestion and very high costs are the counter that could lead to new market choices – but it requires putting in place a secure, reliable and cost effective ship – port – inter-modal offer. Prince Rupert's performance will perhaps act as a signpost how far the gateway diversification strategy takes hold.

3.7 Summary and Implications for ACRL

3.7.1 Port Issues

The three PSW ports of LB, LA and Oakland handle nearly three quarters of total West Coast traffic and 50 percent of NA throughput – a market share that has persisted for much of the past 10 years. The core target market for the NPR sea / rail link, the PRC – North American trade, is primarily routed through the LA/LB gateway. Thus, one key determinant of potential market success and winning traffic volume will be how well LA/LB performs in terms of managing growth and providing a cost effective solution for cargo owners.

- **LA/LB Capacity - It is prudent to assume the demand–supply balance is manageable to 2024/5:** Capacity assessments suggest that while the demand-supply balance is tight, and perhaps at risk under a resurgent growth scenario, it is prudent to assume that demand is manageable over the next 10-15 years. The types and impacts of improvements are well within existing technology and operational practices tested elsewhere and proven to deliver better productivity. Beyond 2020 uncertainty increases and the overall position will be sensitive to growth rates and successful implementation of expansion and operations improvement plans – in effect, getting CY density up. In our steady growth profile combined with reasonable operational improvements and delivery of expansion plans then the LA/LB position is favourable with headroom for growth.
- **Risks – Alternative gateways can benefit from resurgent growth and weak supply responses:** There are challenges to managing traffic growth if environmental

requirements are not met and / or if management and labour are unable to agree new productivity focused union agreements. If these turn out to be unfavorable then the demand–supply balance will certainly move adversely and require new capacity improvement options or gateways. Under the resurgent growth profile, then LA/LB will face difficulties with demand outpacing supply unless significant improvements are achieved. These improvements will require a step change in capacity improvements.

3.7.2 Shipping Line Issues

Shipping line strategies are key to gateway success. First, they are the primary customers of ports and thus their vessel deployment strategies and services are critical to potential gateway traffic. Second, their quest for economies of scale is also changing port and related infrastructure requirements. The deployment of 8,000 and new, beyond 11,000 TEU vessels is necessitating new infrastructure and equipment, compelling ports to increase capex to stay in the game. However, these vessels are only part of the equation. There are mixes of vessels and all need to be serviced. To attract shipping lines the port / gateway requirement is both handling a mix of vessel types but also handling speeds and turnaround time.

The critical issue for ACRL is to secure a leading shipping line or alliance as a client. The downside is the leaders in the target markets are generally well positioned in terms of port facilities and future expansion requirements. Of course, the shipping lines are dependent on the port sector (which they are a part of) to achieve capacity increases.

A possible upside for other gateway ports and their intermodal service providers is that the various shipping lines in the core target market are not all well positioned in terms of port facilities and future expansion.

3.7.3 Intermodal Issues

Gateway success is not only dependent on shipping lines. In the case of a new NPR option, an integrated and reliable inter-modal service is required that can match the value proposition of competitors in terms of finding the right balance between total through cost – reliability – time for cargo owners, good base volume for ships and fast vessel turnaround time and then providing rail partners with volume and good asset utilisation.

On the downside, the analysis has demonstrated that the existing gateways for the trans-pacific trade are the focus of large and sustained capex programmes that are dramatically increasing capacity and operational efficiency that will have long run importance. In the case of UP, BNSF and CN these improvements are important for them to increase their share of the growing and profitable intermodal traffic – making the existing gateways work is a key business priority.

4 ALASKA/YUKON DEVELOPMENT: ACRL ISSUES

4.1 Introduction

This section focuses on a number of the issues raised in the third work package – North Pacific Rim supply chain integration / processing. The analysis takes a broad overview of the economic development potential of the local and regional Alaska and Yukon economies given policy direction towards diversification.

4.2 Yukon Economic Profile

The Yukon is a large territory with a small population and the heavy reliance on government that is typical of relatively remote northern jurisdictions. Although the Yukon has a variety of economic and industrial sectors, government — largely financed through federal transfers — is by far the largest. It can be said that Canadian sovereignty is the Yukon's largest export. The Yukon's strong public sector and its continued growth through increased federal government transfers has proved to be a double-edged sword — it has provided economic stability but has done little to generate new growth and exports. In a sense, the Yukon can be viewed as a single industry economy. And, although that industry is unlikely to abruptly close, throwing the economy into depression, like all such economies, the Yukon would benefit greatly from greater diversification. Having said this, the further development of the Territory's extensive resources could contribute significantly towards it becoming a more sustainable economy.

4.2.1 Population, Labour Force, Education, and Incomes

In June of 2006 the estimated population of the Yukon was 31,608, up 1.2% from a year earlier. The Yukon's population has been increasing slowly since 2000 — when 30,776 people lived in the territory — but has not yet reached its 1997 peak of 33,519. Fully 75% of Yukoners live in Whitehorse or its immediate vicinity with most of the rest distributed in 16 small, widely scattered communities.

The territory's population is evenly divided between men and women; there is no frontier-style skew toward men. In the 2001 Census, approximately 23% of respondents identified themselves as aboriginal. The median age of the Yukon's population is currently estimated by Statistics Canada to be 38.0, only slightly under the Canadian figure of 38.8 years and up sharply from the 2001 figure of 35.8. The territory therefore cannot be said to have an unusually young population. However, the Yukon has proportionately far fewer seniors aged 65 and up than the Canadian average (7.4% versus 13.2%) and very similar proportions of the population aged 19 and under (25.7% Yukon and 24.0% Canada). These figures point to a skew in the population structure toward working-aged adults.

Labour Force and Employment

The Yukon has been enjoying a growing labour force, growing levels of employment and falling levels of unemployment. The most recent data shows a labour force of 16,200 in September 2006, with 15,400 employed and an unemployment rate of 4.9%. This compares favourably to Canada's unemployment rate of 6.4% during the same month.

The Yukon has tended to have a very high labour force participation rate. The 2001 Census found 79.8% of Yukoners aged 15+ in the labour force compared to only 66.4% for Canada as a whole. (This high rate is not a result of people choosing work over schooling. The proportion of people attending school full-time in the territory is almost identical to the Canadian average). In 2004 the Yukon's participation rate had dropped to 76.2%, but it has been as high as 80.3% (in 1996). The number of Yukoners directly employed by the federal, territorial, and municipal governments in the territory was 5,661 in June of 2006. With that month's employed labour force estimated at 15,600, the three levels of government directly employ 36.2% of working Yukoners. If the employees of First Nation governments are added, that figure likely approaches 40%.

Education

Yukoners are, on average, at least as highly schooled as Canadians as a whole. The 2001 Census found that the proportion of those aged 20-34 years who have not yet completed high school was 15.2% in the Yukon compared with 15.6% for Canada as a whole. More than 17% of Yukon adults over the age of 20 have trade certifications, a substantially higher proportion than the approximately 12% for Canada as a whole. And the proportion of older adults — those aged 35 to 64 years — with university degrees is also higher in the Yukon than in Canada.

Earnings and Incomes

Not surprisingly, average weekly earnings are higher in the Yukon than in Canada as a whole. The difference between the territory's industrial aggregate weekly wage and the national average tends to be in the 11 to 12% range. The latest figures for July 2006 put average weekly earnings (including overtime) at $843.74 in the Yukon. The 2001 Census, however, found that overall average earnings in the Yukon were slightly lower than in Canada as a whole (and more than $4,000/year lower for men). For those working full-time and year-round, average earnings were $44,605, or $1,300 higher than the Canadian average. Yukon women do exceptionally well, out earning their Canadian sisters by $4,000 to $5,000 per year on average. The 2001 Census found a median income of $26,488 in the Yukon, almost 20% higher than the Canadian median of $22,120. And Yukoners rely more heavily on earnings for their incomes — 85.6% versus the Canadian average of 77.1%. The Yukon's personal income per person (based on GDP) was $38,032 in 2004 — 25% higher than the figure for Canada. And 2004 personal disposable income was $31,806.

4.2.2 GDP, Industrial Structure, and Inflation

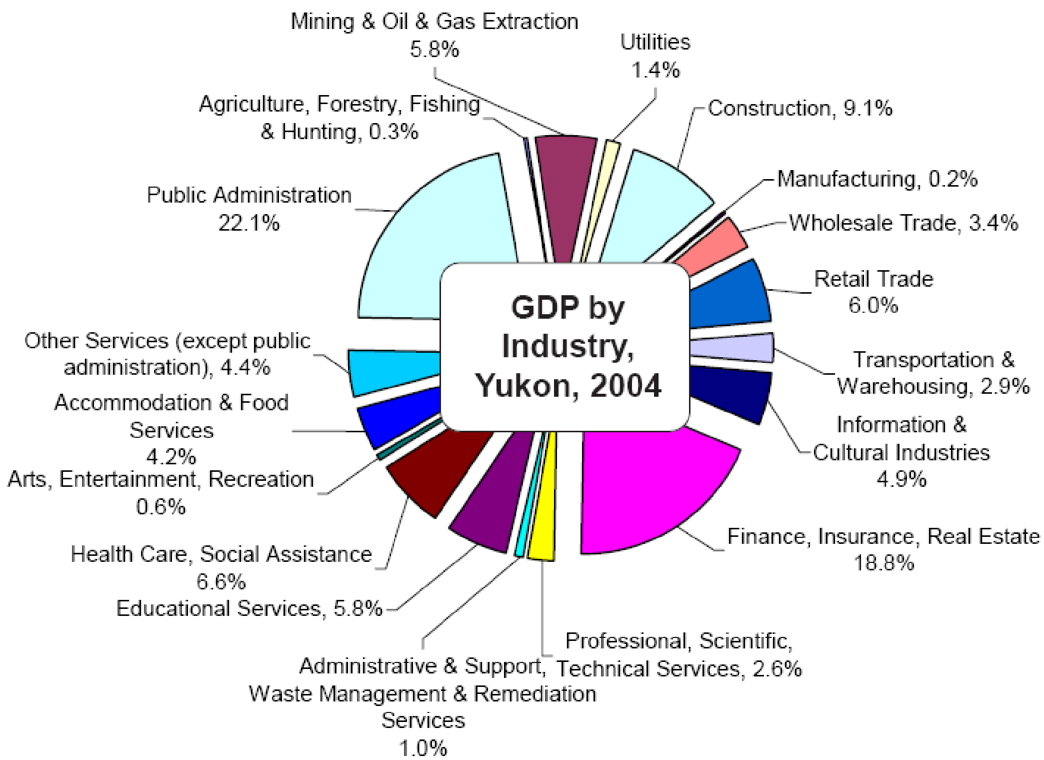
The Yukon's GDP at market prices totaled $1.41 billion in 2004, or $45,548 per person. Real GDP growth has been strong, 3.5% in 2004, and an estimated 3.4% in 2005. The territory's 2004 GDP by industry is summed up in the Table 4.1 and Figure 4.1 below.

Table 4.1 Yukon GDP Contribution

Industry	Percentage of GDP
Public administration	22.1%
Finance, insurance and real estate	18.8%
Construction	9.1%
Health care and social assistance	6.6%
Retail trade	6.0%
Mining and oil & gas extraction	5.8%
Educational services	5.8%

Information and cultural industries	4.9%
Other services (except public administration)	4.4%
Accommodation and food services	4.2%
Wholesale trade	3.4%
Transportation and warehousing	2.9%
Professional, scientific and technical services	2.6%
All others	3.4%

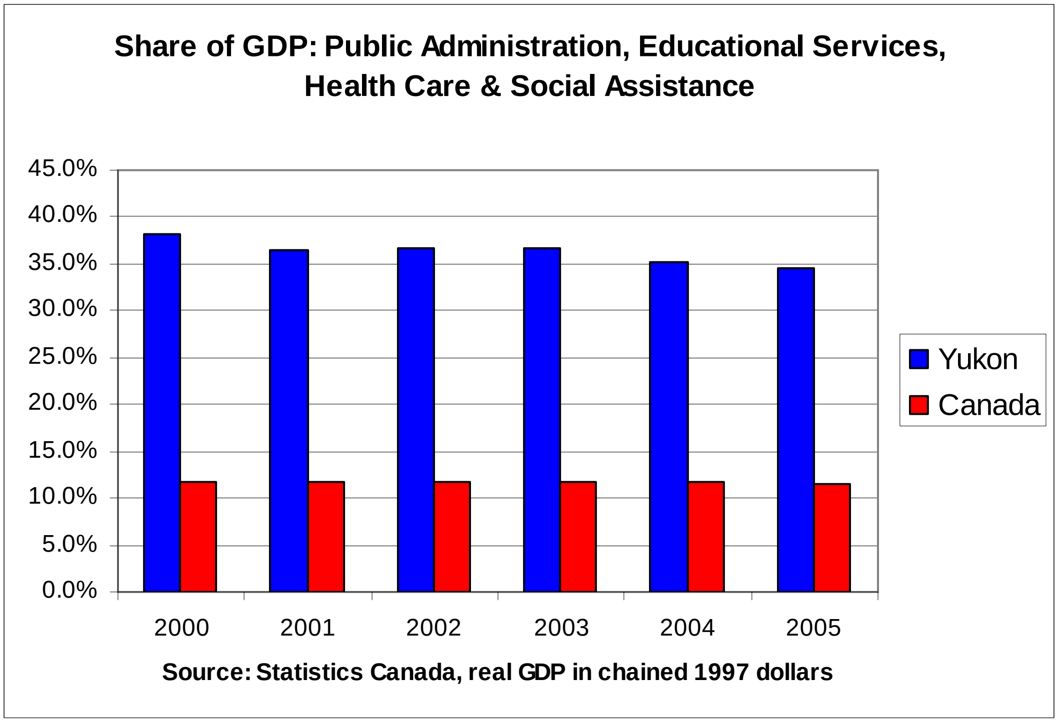
Figure 4.1 Yukon GDP by Industry, 2004



Government

The territorial economy is dominated by industries that are largely the purview of governments. The public sector contribution to GDP tends to be in the range of 40% of the Yukon's overall economic activity, compared to the Canadian average of about 15% as is shown in Figure 4.2.

Figure 4.2 Public Sector Contribution to GDP



Federal government transfers to the Yukon government have been increasing, in part because of the devolution of some powers to the territorial government. Total transfers to the Yukon government were $473 million in 2003/04 and are expected to reach $554 million in 2006/07. Over 90% of the transfers are a result of territorial formula financing, a policy designed to fill the gap between the expenditure requirements and revenue-raising capacity of all of Canada's northern territories. Federal transfers account for approximately 70% of the Yukon government's budget. The federal government also spends directly in the Yukon and provides some funding to First Nation governments.

Mining

Although the Yukon has traditionally relied on mining as an economic mainstay, the industry entered into a prolonged slump following the closure of the Faro lead-zinc mine in January of 1998. By 2002 there were no operating hard-rock mines in the Yukon, mineral exploration spending had declined steeply, and even placer gold production had fallen to a 23-year low. The total value of mineral production in the territory fell from $225 million in 1997 to $82 million in 2003. In 2004, the value of total mineral production rose to $96 million and mineral exploration expenditures have risen sharply through to 2006. Two mineral properties — the Minto copper deposit and the Wolverine lead-zinc deposit — have seen considerable development expenditures over the past two years. Sherwood Copper is expecting to bring its Minto property into production by mid-2007.

Oil & Gas

The Yukon has one producing natural gas field, Kotaneelee, located in the territory's south-eastern tip. Production at Kotaneelee peaked in 1999 at 486.7 million m3 and has been declining since. By 2004 production had dropped below 150 million m3. Devon, the operator at Kotaneelee drilled a development well in 2004 to boost production levels. The well came into production in May 2005 and initially production was boosted by about 40%. However, production has since fallen again. Despite the strong rise in oil & gas prices, the Yukon has not been attracting significant investment in oil & gas exploration. Devon Canada drilled a wildcat well on its Eagle Plain permit in early 2005 to fulfill its work commitment requirements. This is the first exploration well drilled in the Yukon in 20 years but was not successful. No drilling activities were planned for 2006. The Yukon Government conducted its fourth Call for Bids in the Peel Plateau basin in late 2004. No bids were received. No new dispositions have occurred in 2006.

Construction

A booming construction sector helped drive the Yukon's economy through 2003 and 2004. The value of building construction rose sharply in 2004 on top of an already very busy 2003. In 2005, however, the sector began to cool, with total value dropping by 2% from 2004 levels. Building the necessary infrastructure for the 2007 Canada Winter Games has played a large role in the strong performance of the sector. But residential construction has also been very strong, with building permits valued at $37.3 million issued in 2004 and $44.1 million in 2005.

Tourism

The Yukon's tourism industry has recovered somewhat following a decline precipitated by the September 2001 terrorism attacks. The 2004 Visitor Exit Survey estimated that 252,000 visitors came to the Yukon in 2004. The estimated number of visitors in 2005 is approximately 290,000.

Other Sectors

Manufacturing does not play a large role in the Yukon's economy, accounting for only 0.2% of GDP in 2004. Similarly, agriculture, forestry and fishing together account for a similar sliver of GDP at 0.3%. Total value of agricultural production in the Yukon is less than $5 million per year, and forestry has largely been confined to local fuel wood and very small-scale valued added milling for local consumption.

Inflation

Inflation, as measured by the consumer price index, has been somewhat lower in Whitehorse than in Canada as a whole over several years (note that inflation is measured for Whitehorse rather than the Yukon as a whole). The latest data, for August of 2006 show a 1.8% annual inflation rate in Whitehorse, 0.3% below the Canadian rate of 2.1%. From 2002 through 2004, Whitehorse's inflation rate was 1.1% below the Canadian rate on average.

Future growth opportunities

Although a range of economic sectors are represented in terms of employment in the Yukon, in general, the Territory's economy is dominated by government or sectors related to government. It could be argued that the long term sustainability of the Yukon economy would be questionable in the absence of government related activity. The lack of an industrial base, in particular, would tend to limit the possibilities for future diversification. Having said this, it is necessary to evaluate the opportunities the presence of the ACRL might present for economic diversification in the future. The dominant economic asset that the Territory possesses resides in its resource base. Future opportunities for economic diversification would most likely emerge from this base. Based on analysis of the future potential of the resource base conducted by KPMG, Table 4.2 shows the actual potential for mineral extraction in the Yukon based on currently known mineral assets.

Table 4.2 Yukon Mineral Extraction

	Total Shippable (Tonnes Millions)	Project Life (Average Years)*
Iron Ore	1220	>30
Coal	28	13.7
Base Metals	0.323	12.2
Other	0.141	21.5

Notes: *Represents the average life expectancy of a variety of projects for each known deposit

From the point of view of the ACRL, two things need to be kept in mind in considering these numbers. First, the types of commodities to be extracted typically do not travel by container. Although there may be possibilities for doing so, forecasting exactly how much could be shipped out by containers is not really possible currently. In all likelihood an overwhelming proportion of the material extracted would be carried as bulk cargo. Second, the actual sources of the mineral deposits are often remote adding considerable transportation costs and access to labor is difficult. On the other side of the equation, exploiting the resources would mean carriage opportunities for ACRL to bring equipment in for developing the resource, for bringing equipment out once the project's life has come to an end and for on-going re-supply.

In relation to economic diversification, opportunities may present themselves for some intermediate processing of the raw materials extracted. However, a small and slow growing population, and a tight labor market resulting from the extraction activities themselves would limit the effectiveness of doing so. Unless, broad scale in-migration to the Yukon was occur, this could remain a limiting factor over the long term. Already, tight labour markets exist in Alberta even with broad scale in-migration there. These factors coupled with the fact that any given mineral extraction project has a limited life span and a situation emerges in which the long term inward investment necessary to generate economic diversification would be unlikely. This would apply equally to long-term investment in manufacturing and services.

Similar issues confront developing carriage opportunities for the ACRL in the forestry industry. First, there is considerable debate about how much of the resource can be reasonably harvested. The problem here relates to maintaining harvesting at levels that will ensure that current and future needs are met and to protect the existing forestry industry (which is relatively small at any rate). In addition, many of the forest locations in the Territory are remote. This remoteness adds a significant amount to transport costs and labor availability. In fact, PWC has estimated that the working environment and cost structures in the Yukon make lumber production 40% higher there than anywhere else in Canada.[7]

[7] PWC, Economic Assessment of the Forest Industry in Southwest Yukon, August 2005

4.2.3 Summary

The major opportunities for the ACRL (not including the international container trade) are for inbound traffic and would largely be based on resource and infrastructure projects i.e. machinery and equipment, fuel, timber, iron, pipes steel, other construction material, re-supply and outbound resource exports (although, the level of outbound resource based traffic may be somewhat constrained by the remoteness and costs -transport and labour - of the locations in which the resources are located). Finally, opportunities for economic diversification may be constrained by the very small base of economic activity currently as well as by the risks associated with investing in projects which will have a limited life span i.e. determined by the life expectancy of the resource extraction activities themselves.

4.3 Economic Profile: Alaska

Alaska is a very large (covering nearly 572,000 square miles), relatively wealthy, but sparsely populated state. The state economy is dominated by the twin pillars of oil & gas extraction and government. Those pillars are strongly interconnected as royalties and taxes from the oil & gas sector provide nearly 85% of the State of Alaska’s revenues. Other important economic sectors in Alaska include tourism, construction, mining, and, to a smaller extent, fishing and seafood processing.

4.3.1 Population, Labour Force, Education, and Incomes

The United States Census Bureau estimated Alaska’s population at approximately 664,000 in 2005. The state’s population is growing at a slightly faster rate than the population of the US as a whole, rising 5.9% between 2000 and 2005. Anchorage is by far the largest city in the state, with its population of approximately 273,000 making up 41% of Alaska’s population. Fairbanks and its immediate vicinity is the next largest centre, with a population of approximately 83,000. Together with the state capital of Juneau, Anchorage and the Fairbanks area contain about 58% of Alaska’s population. However, the remaining 277,000 people are widely dispersed over a very large area and more than 140 communities. The US Census shows that men are in the majority in Alaska — making up 51.7% of Alaska’s population compared to 49.2% for the US as a whole. But there is no heavy, frontier-type skew in population. In 2004, the US Census Bureau reported that 15.8% of Alaska’s population was Native American or Alaska Native, far outstripping the US national average of 1.0% of the population. Alaska has a younger population than does the US as a whole. The 2000 Census found the median age of Alaskans to be 32.4 years, 3 years younger the US national median of 35.3 years. And in 2004 the Census Bureau shows the state to have proportionately greater numbers of children under the age of 5 years (7.6% to 6.8% for the US) and children under18 years (28.7% to 25.0% for the US). At the other end of the age scale, Alaska has proportionately far fewer older people, with those aged 65 years or older making up only 6.4% of the population compared to the national average of 12.4%

Labour Force and Employment

Alaska has been generally enjoying a steadily rising labour force and increased employment over the past 10 years. The US Bureau of Labour Statistics data shows the state’s labour force growing by approximately 10% between 1996 and 2005, and employment growing at a slightly higher rate over the same period. But Alaska’s current unemployment rate is estimated to be 6.4%, substantially higher than the 4.4% estimate for the US as a whole. The state’s labour force participation rate was found to be 71.3% in the 2000 Census, far higher than the US national participation rate of 63.9%.

Education

Alaska appears to have, on average, a somewhat better educated workforce than the US as a whole. The 2000 Census found 88.3% of Alaskans aged 25 and higher had achieved at least high school graduation compared to the national figure of 80.4%. However, the percentage of Alaskans over the age of 25 with bachelor's degrees or higher (24.7%) almost exactly matched the national figure of 24.4%.

Earnings and Incomes

In 2005, the average monthly earnings across all industries in Alaska were $3,309 (or $39,700 per year) according to Alaska Department of Labour statistics. The highest earnings were in the oil & gas extraction industry where workers earned an average monthly wage of $12,116 or $145,400 per year. The 2000 Census found a median household income of $51,571 in Alaska, 23% higher than the figure of $41,994 for the US as a whole. The median family income in Alaska, $59,036, was 18% higher than the US median of $50,046. However, per capita income in Alaska, at $22,660, was only 5% higher than the national figure. The Census found the median male full-time year-round worker had total earnings of $41,257 while the female full-time year-round worker lagged behind at $31,151.

4.3.2 GDP, Industrial Structure, and Inflation

The US Bureau of Economic Analysis estimates Alaska's GDP at $39.9 billion in 2005 up from $34.4 million in 2004. GDP growth is wildly unstable in Alaska, swinging from +8.8% growth in 2002 to -1.1% in 2003, back to +7.2% in 2004 and then stagnating in 2005. The unstable GDP growth rates are an indicator of the importance of oil production to the state's economy. As oil prices fluctuate, Alaska's GDP moves in tandem. Gross State Product (GSP). As a measure of the overall performance of the Alaska economy, GSP growth is a reasonable indicator. Figure 4.3 shows the pattern of GDP growth in Alaska between 1997 and 2004 the period for which the most recent data are available.

Figure 4.3 Scale of Economic Activity: Alaska GSP 1997-2004 $Billions

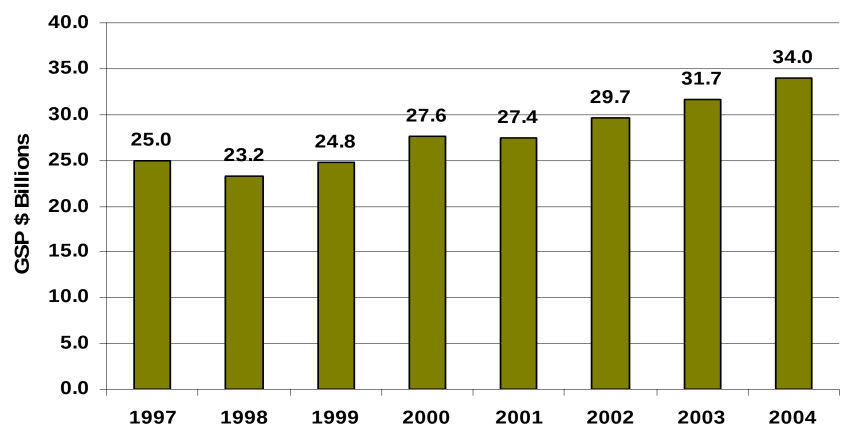


Table 4.2 shows 2005 employment by industry as provided by the Alaska Department of Labour.

Table 4.2 Alaska Employment Structure

Industry	No. employed	Percentage of employment
Total Non-farm industries	309,900	—
Goods Producing	41,700	13.5%
Services Providing	268,200	86.5%
Natural Resources & Mining	10,700	3.5%
Logging	500	0.2%
Mining	10,300	3.3%
Oil & Gas Extraction	8,700	2.8%
Construction	18,600	6.0%
Manufacturing	12,400	4.0%
Wood Products Manufacturing	400	0.1%
Seafood Processing	8,600	2.8%
Trade/Transportation/Utilities	63,200	20.4%
Wholesale Trade	6,300	2.0%
Retail Trade	35,900	11.6%
Food & Beverage Stores	6,300	2.0%
General Merchandise Stores	9,100	2.9%
Trans/Warehouse/Utilities	21,000	6.8%
Air Transportation	6,200	2.0%
Truck Transportation	3,100	1.0%
Information	6,900	2.2%
Telecommunications	4,200	1.4%
Financial Activities	14,700	4.7%
Professional & Business Services	23,800	7.7%
Educational & Health Services	35,700	11.5%
Health Care	25,800	8.3%
Leisure & Hospitality	31,100	10.0%
Accommodation	8,000	2.6%
Food Services & Drinking Places	18,800	6.1%
Other Services	11,400	3.7%
Government	81,400	26.3%
Federal Government	17,000	5.5%
State Government	24,200	7.8%
State Education	7,200	2.3%

Industry	No. employed	Percentage of employment
Local Government	40,200	13.0%
Local Education	22,400	7.2%
Tribal Government	4,100	1.3%

The percentage share of employment by industry gives one view of the industrial structure of the state's economy.

Oil & Gas

The oil & gas industry looms very large in Alaska especially in the value of its exports and the critical role the industry's royalty payments play in financing the state's public sector. In its 2002 economic census, the US Census Bureau put the value of shipments of the oil & gas extraction industry, along with its support industries, at approximately $7.7 billion. The industry, along with its drilling and other support industries, employed approximately 8,800 people and had a payroll totaling approximately $558 million in 2002. Currently, oil & gas employs 8,700 people or 2.8% of state employment. Despite its critical economic importance, the industry is not a big provider of direct jobs.

Tourism

Tourism is not classified as a separate industry, instead, a number of industries provide the goods and services that tourists require. Visitor numbers to Alaska continue to rise, driven in large part by growing cruise ship arrivals. Alaska welcomed approximately 1.56 million visitors in 2002/03 and 1.70 million in 2003/04 (visitor numbers are counted from fall of one year through the summer of the next). A 2004 study commissioned by the Alaska government estimated that tourism spending and sales totaled $2.4 billion in 2002 and the total direct and indirect economic impacts were $1.6 billion. It was calculated that tourism accounted for 9.1% of Alaska's employment in 2002.

Mining

Mining, historically an economic mainstay of Alaska, has become far less important to the state economy. In 2002, all forms of mining (including quarrying) in Alaska had shipments valued at approximately $525 million by the US Census Bureau. The Bureau estimated industry employment at 1,500 and total payroll at $92 million. Currently the industry, along with directly supporting industries such as mineral exploration, employed approximately 1,600 people in the state, a tiny percentage of total employment.

Construction

The 2002 economic census put the value of business done by the construction industry — including the construction of buildings, heavy and civil engineering construction, and specialty trade contractors — in Alaska at approximately $4.4 billion. The industry employed 21,300 Alaskans and had a total payroll of $938 million in 2002. In 2005 the construction industry employed 18,600 in Alaska a substantial drop from 2002. Those jobs made up 6.0% of employment in the state.

Fishing and Seafood

Fishing, along with mining, was one of the original pillars of the Alaskan economy. And, like mining, fishing — along with the related processing of fish and seafood — has declined in importance but remains a significant industry. The 2002 economic census found the value of shipments from the seafood processing industry to be $1.3 billion while it employed 7,400 Alaskans at a total payroll of $199 million. Seafood processing accounts for approximately 35% of all Alaskan manufacturing by value of product. In 2005 seafood processing employed 8,600 people, or 2.8% of the workforce. Direct employment in commercial fishing itself is very small.

Government

Government plays a large economic role in Alaska, despite the state's fondness for its frontier spirit of rugged self-sufficiency and individualism. In 2005 the number of civilian government employees was 81,400 or 26.3% of the labour force. When military employees are added to the total, about 32% of the labour force was employed directly by government. The US federal government is a very important economic player in Alaska, where it spent $8.44 billion in 2004 or $12,700 per Alaskan. However, despite the large presence of government, Alaskans appear particularly reluctant to pay taxes. Alaska collects no state income taxes on its citizens and there is no state sales tax. Instead, the state relies heavily on resource royalties and taxes on the oil & gas industry to fund its operations. In 2005 the Alaska Department of Revenue reported total revenues of $3.3 billion, of which:

- oil & gas royalties were $1.4 billion;
- corporate income taxes on the petroleum industry were $524 million; and,
- severance taxes on the oil & gas industry were $863 million.

In total, the oil & gas sector directly provided nearly 85% of Alaska's state revenues in 2005.

Other Sectors

Other sectors of significant importance to the Alaskan economy are largely providers of services such as health care and education. Manufacturing — outside of seafood processing — is a small part of the economy as is logging and related wood product production. Agriculture is a tiny industry in the state.

Inflation

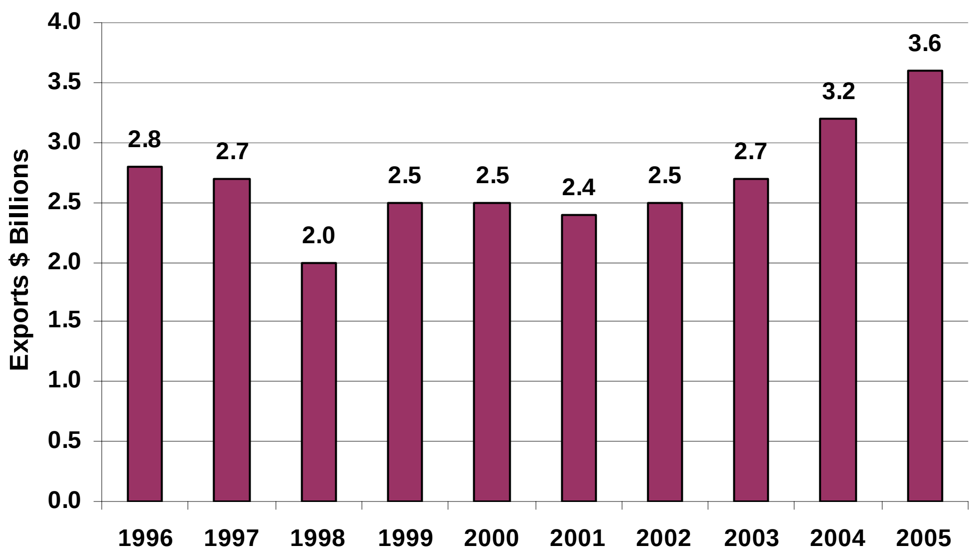
The US Bureau of Labour Statistics tracks consumer inflation in Anchorage, not Alaska as a whole. Inflation in Anchorage is running at 4.2% for the first half of 2006, slightly higher than the US average of 3.8%. Inflation in Anchorage was 2.4% in 2005, lower than the US average of 3.0% for that year.

4.3.3 Gateway Opportunities for Alaska

Alaska's Exports

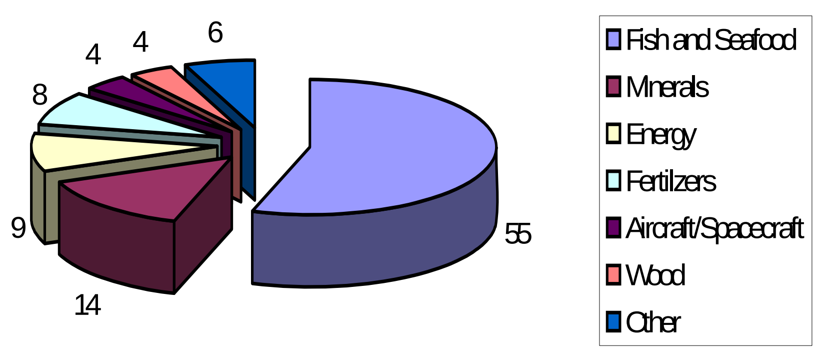
In 2005, Alaska's exports totalled $3.6 billion. This was 13% above 2004 levels. Indeed, international trade is a foundation of the Alaskan economy. Figure 4.4 shows the value of Alaskan international exports between 1996 and 2005.

Figure 4.4 Value of Alaskan Exports, 2005 $Billions



Of the major products exported, fish and seafood dominate accounting for about 55% ($1.9 billion) of all Alaskan exports by value in 2005. Other major exports include minerals (14%) energy (9%) and fertilizers (9 8%). Figure 4.5 shows Alaska's export mix by value.

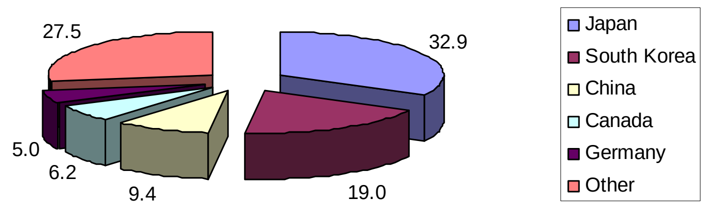
Figure 4.5 Alaskan Exports by Product by Value (%)



Alaskan Export Destinations

Japan, South Korea and China dominate as destinations for Alaska's exports accounting for 61.3% of all exports by value. Japan is Alaska's largest export market importing $1.3 billion in Alaskan goods in 2005. These exports to Japan are dominated by seafood, energy, minerals and wood products. Korea is also major importer of Alaskan seafood as well as Alaskan fertilizer, minerals, energy and wood products. The distribution of Alaska's exports by value is given in Table 4.6.

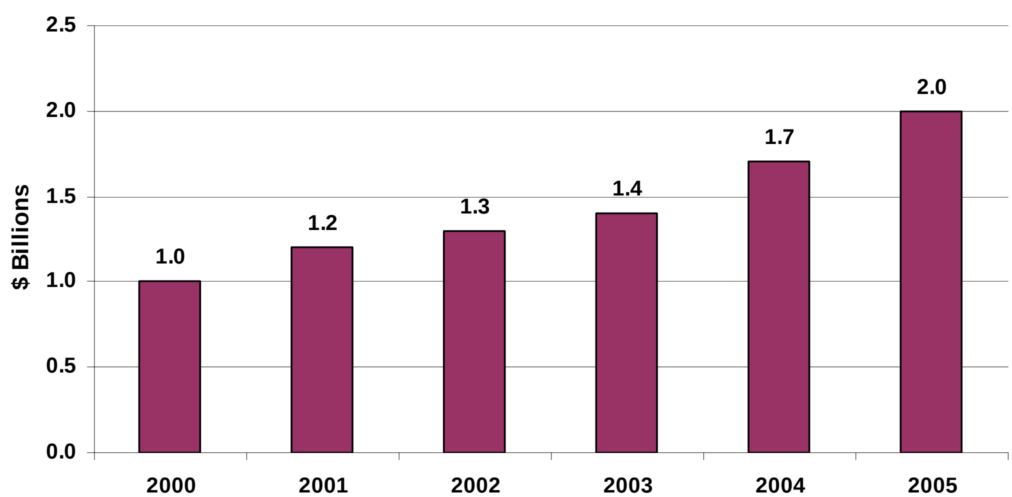
Figure 4.6 Alaska's Major Export Markets (% by Value)



4.3.4 Export Challenges and Gateway Opportunities

Alaska is a major producer, processor and exporter of fish and seafood – Figure 4.7. In 2005 the total harvest of all fish and seafood species was approximately 4 billion pounds. A total of 206 million salmon were caught in 2005 while the 5 year average salmon harvest is 158 million fish.

Figure 4.7 Value of Alaska Seafood Exports 2000 –2004



Most fish and seafood landed in Alaska is processed at or near the landing port. By far the biggest fishing port in Alaska (by weight of landings, 886 million pounds) is Unalaska/Dutch Harbour about half way along the Aleutian Island chain. Next is Kodiak (313 million pounds) on Kodiak Island. Next are Petersburg and Ketchikan, at the southern end of the panhandle, at 103 and 97 million pounds respectively. A glance at a map shows that these ports are widely scattered and lacking in easy transportation access to either Anchorage or the proposed route of the Alaska-Canada rail link.

Alaska's seafood exports face significant challenges. For example, the Alaska seafood industry faces considerable challenges arising from the increasing productivity of aquaculture in many countries. With the overall catch declining and the need to increasingly exploit more remote fisheries, the Alaskan seafood industry needs to adopt new technologies or face the potential loss of its export markets. Similarly, in order for its exports of other commodities to grow, Alaska will need to maintain existing export relationships and develop new ones in the future. Amongst the most important of these relationships currently relates to the demand for fresh salmon in Japan. This trade, represents a relatively small opportunity for container traffic[8]. On the other hand, as a major air cargo hub for high value added cargo traffic from Southeast Asia, Anchorage is well positioned to offer backhaul air services for fresh seafood especially salmon. On the other hand, based on our stakeholder discussions, a view was expressed with respect to opportunities that may arise for an air-rail link involving the backhaul of salmon to Southeast Asia through an express air service. The view expressed is that high value added goods able to bare the high costs of air transport could be consolidated into containers and placed on to a rail service originating in Anchorage and destined for the US Midwest (e.g. Chicago). The backhaul flight could then be loaded with fresh salmon destined to Southeast Asia. As demonstrated above, the costs associated with moving containers by rail from Anchorage to the US Midwest are uncompetitive with other gateway options. A more likely scenario might be for high value added goods originating in Southeast Asia travelling by air to Anchorage being deplaned and then enplaned on to a domestic air service in an express service. Backhaul opportunities still exist for air services but the demand for inland services for rail is unlikely to materialize for rail in such a scenario.

Minerals

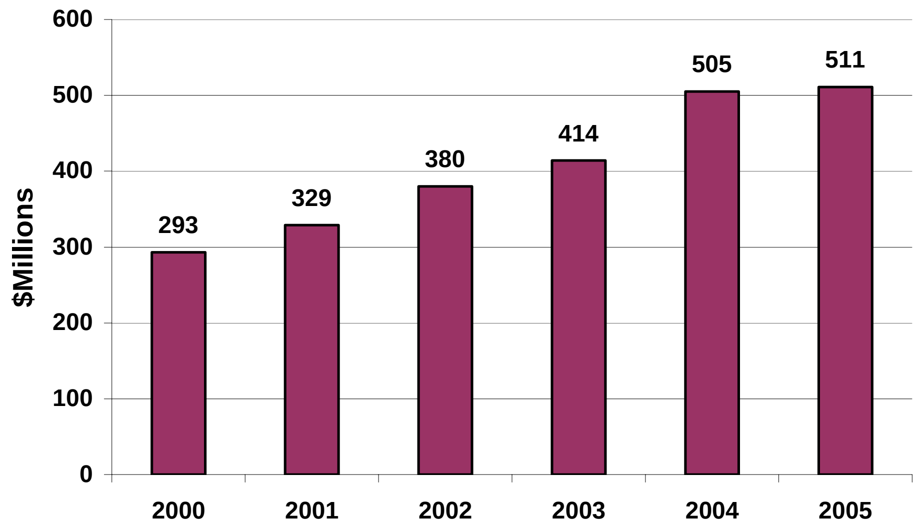
As mentioned above, although mining has become proportionately less important to the Alaska economy as a whole in recent years, it has nevertheless grown in terms of the value of exports. In 2005, the total value of mineral exports stood at $511 million compared with $293 million in 2000 – Figure 4.8. In part, this is a reflection of increased mineral prices but it also reflective of relatively strong mining project development and exploration that allows Alaska to maintain a position in mineral export markets. Amongst current mine development projects are:

- Pogo: $347 million construction of the Pogo Mine near Delta Junction is Alaska’s most recent gold mine that will process 2,500 tons per day and produce 400,000 ounces of gold per year for 10 years of mine life
- Kensington: $105 million construction of gold mine north of Juneau
- Rock Creek: set to open in 2007, $40-$50 million in investment to produce 100,000 ounces of gold per year from mine north of Nome.
- Donlin Creek: continued evaluation of gold deposit with construction expected to begin in 2009 and projected construction costs of $1 billion.
- Chuitna Coal: $650 million in construction expected to begin in 2007 with production expected to begin in 2009

[8] Roughly 80% of the catch does not hit Alaskan land. It is handled and frozen at sea on industrial fishing vessels headed to export destinations. A much smaller portion of the catch is containerized at sea on to tramp reefer vessels providing on-demand services. The remainder is handled via reefer barge with some container reefer trucking occurring as well.

- Pebble Copper: Announced resources include 31.3 million ounces of gold, 18.8 billion pounds of copper and 998 million pounds of molybdenum. The deposits are still being delineated through intense exploration drilling and baseline sampling.

Figure 4.8 Alaska Mineral Exports 2000-2005



With mineral exploration going on currently in virtually every corner of Alaska and global demand for mineral resources increasing rapidly Alaska's mining industry may be well placed in the future to expand its export markets. To some extent the commercial viability of the projects is contingent upon accessibility to the deposits; however, access to markets through road, rail and sea will become an increasingly important determinant of the future of Alaska's mining industry. These resources, in particular, offer a significant market for bulk carriage on the ACRL. On the other hand, it should be noted that the transport of minerals is not amenable to the use of containers. Appendix F shows the comparative economics of bulk goods (coal) transport for containers versus traditional bulk carriage methods. While the analysis focuses on export markets, the same logic would apply to products destined for mainland markets. The ACRL market for this traffic should therefore be expected to be on traditional bulk transport modes.

Petrochemicals

In general, the transportation economics of oil & gas (and the products of oil & gas) favour:

- the location of petroleum refineries near their markets;
- the location of naphtha and gas-oil based petrochemical plants near refineries; and,
- the location of natural gas petrochemical plants near their sources of feedstock.

Therefore transportation economics tend to favour the location of natural gas petrochemical plants in Alaska for product export.

Existing Industry

The state of Alaska has an existing petroleum processing and petrochemical industry. The major products of the oil refineries — gasoline, jet fuel, diesel, kerosene, and asphalt — are consumed in Alaska. Two refinery products that are largely exported to the Lower 48 are fuel oil and sulphur. There are two plants that process natural gas, one producing liquefied natural gas for export to Japan and a fertilizer plant producing anhydrous ammonia and urea, both largely exported from the state. A review of Alaska's existing and potential petrochemical industry as a possible source of demand for shipping goods to Asian markets using shipping containers bringing goods in the other direction is not encouraging. Obviously, the use of containers would only be possible for dry petrochemical products. The container shipping option would also need to compete with any bulk shipping options available to transport the product to Asian markets.

Agrium's Kenai fertilizer plant currently produces fertilizer-grade urea, a dry product. The plant's urea production capacity is 640,000 tonnes per year, but it has been operating well below capacity for some time due to difficulties in securing sufficient supplies of low-coast natural gas from the Cook Inlet gas fields. Agrium has been examining the option of switching its feedstock from natural gas to liquefied coal in order to allow it to increase capacity. The possibility of a spur line from the proposed Alaska Highway gas pipeline offers another possible means of having the plant run at full capacity. Because of intense competition from other urea plants worldwide — and particularly plants in the Middle East where the natural gas feedstock price is very low — competitive urea production tends to require both low feedstock prices and a high degree of plant operating efficiency. However, the Kenai fertilizer plant is not a likely source of demand for container shipping whether it runs at full capacity or not given that it is located on tidewater and has its own terminal that currently loads product directly on bulk carriers. Any effort to offer a container-based shipping alternative would require competing with this highly efficient and relatively inexpensive shipping system. (For example, a current US Department of Energy study[9] estimates urea shipping costs from Alaska to Mexico to be $0.009 per tonne/mile).

Potential Industry

In June 2006 the US Department of Energy released a study[10] examining possible sources of demand for North Slope natural gas by existing and potential industries in Alaska. One of the potential industries examined was a world-class petrochemical complex in south-central Alaska that would manufacture polyethylene (PE, the world's most widely used plastic) and ethylene glycol (EG, used as antifreeze and as an input for certain plastics and polyester). Such a complex would require 75,000 bbl/day of ethane feedstock, 3 MMcf/day of methane and 100MW of electric power. To be economically attractive, it would also require its feedstock price to not exceed $4.60/MMBtu. The study identified polyethylene and ethylene glycol as the most likely major products for a plant located on tidewater along the Cook Inlet. Both can be manufactured in standard grades and shipped in bulk. Ethylene glycol is a liquid and therefore not a candidate for shipping by standard containers. Polyethylene is a solid and therefore a theoretical candidate for container shipping, however, as with the existing and potential urea production, container shipping of the PE would need to compete

[9] Alaska Natural Gas Needs and Market Assessment. June 2006. National Energy Technology Laboratory.

[10] Alaska Natural Gas Needs and Market Assessment. June 2006. National Energy Technology Laboratory.

with standard bulk shipping practices. The study estimates PE bulk shipping costs at $0.010/tonne/mile for moving product directly from a tidewater plant by ship to China or Korea. Container shipping of PE could not be competitive at these prices.

Insulated Wallboard Manufacturing

One potential Alaskan manufacturing industry that could potentially ship its products to Asian markets by container is an insulated wallboard manufacturing plant. At least two manufacturers have expressed an interest in developing such a plant in Alaska but the idea appears to be very much at a conceptual stage. Were this market to grow, some container export traffic might be expected. Unfortunately, the direction this market might take is completely unknown at this time and is not open to speculation.

4.4 Implications for ACRL: Are there volume and revenue opportunities?

As the above sections indicate, there are considerable opportunities for growth in the Yukon and Alaskan economies. These opportunities are largely focused on the resources sector with few opportunities currently apparent for manufacturing for export or supply chain logistics activities that would add volume to ACRL. Population and workforce growth trends would not appear to support this eventuality. Having said this, the current and future outputs of the resources sectors are likely to be heavily export oriented particularly as the demand for them increases in China and Asia. The nature of these outputs, does not, however, lend itself to container transport. Indeed, it is extremely unlikely that the economics of bulk versus container transport will change sufficiently in the mid to long-term to support large-scale loaded container exports out of Anchorage. This does not deny the importance of these resources contributing to the eventual success of the ACRL. In fact, there could be considerable domestic and North American (Canada and Mexico) demand for bulk resource imports that the ACRL could carry. These resources represent a considerable market for the ACRL in the future as the resource sites become developed.

On the other hand, it should be pointed out that westbound traffic originating in Alaska or the Yukon Territory is not likely to enhance the ACRL offer. It will, however, offer considerable opportunities for the Port of Anchorage but primarily for bulk transport. This applies to minerals, semi-processed petrochemicals, seafood and wallboard. Table 4.4 summarizes growth prospects and the potential for containerized cargo over the ACRL planning period. On balance, the container market is deemed to be of low potential.

Table 4.4 Local and Regional Development Prospects: Implications for ACRL

Growth Areas	Growth Prospects to 2025	Growth Prospects post 2025 - 2050	Potential for Containerized Transport	Potential for Bulk Transport
Minerals	High – a variety of known deposits of various minerals	Medium – developments post 2025 should be known now	Low – container transport uncompetitive with bulk transport	High – bulk services at Anchorage will grow
Seafood	Medium – competition from aquaculture and increasingly remote fisheries will limit growth	Low - competition from aquaculture and increasingly remote fisheries will reduce growth	Low – likely to be air transport to east Asia	Low – likely to be air for fresh fish to east Asia
Petrochemicals	Low – no current capacity	Low – future capacity unknown	Low – some possibilities may exist for transport of PS pellets	Medium – transport costs will favour bulk carriage
Wallboard	Unknown	Unknown	Medium	Medium

5 MARKET VOLUME AND ACRL COMPETITIVENESS

5.1 Introduction

The purpose of this section is to assess the potential for the ACRL sea / rail link to win market share in the Far East – North America container trade over the period ending 2050. The analysis progresses through a number of steps.

- First, the target market for ACRL is defined.
- Second, volume forecasts for the target market are provided giving the broad volume of container traffic ACRL might hope to compete for. The forecast cover the period 2005 – 2050.
- Third, the relative competitiveness of the ACRL offer is assessed relative to alternative port and route choice options.
- Finally, the potential traffic volumes for ACRL are suggested under varying assumptions relating to market growth, port / rail capacity assessments and ACRL competitiveness.

Overall, this section takes view on the volume, revenue and timing of container traffic that ACRL could expect to capture. In addition, a key issue for this section is determining under what conditions the ACRL might succeed and whether these conditions are likely to persist over the long term.

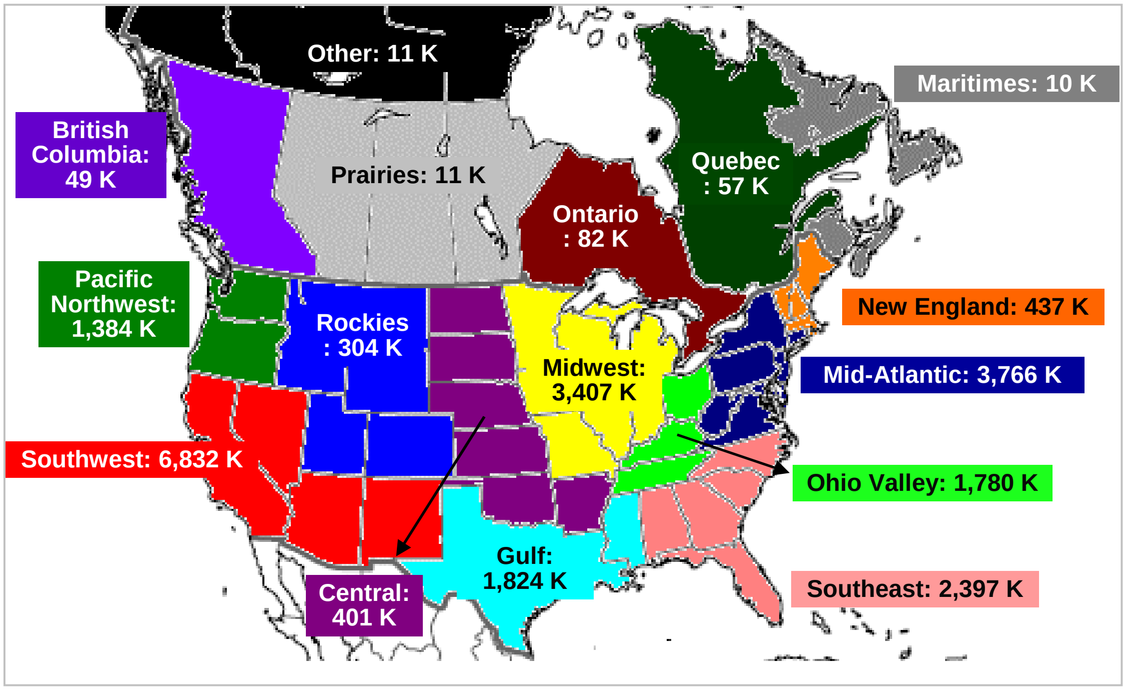
5.2 The Target Market

The key trade for ACRL is traffic flowing to / from North and East Asia to North America. Figure 5.1 shows an indication of the volume of cargo flowing to / from Asia allocated according to inland origin / destination (O/D).

A number of points are worth considering. First, the seeming large cargo base of the trans-pacific trade and west coast ports potentially available for the NPR sea/rail – ACRL offer is reduced once local cargo is stripped out. Second, the analysis in Section 3 indicated that existing ports and their related intermodal services had relative competitive strengths serving designated markets – for example, the PSW ports are well placed to serve the Southwest and Gulf markets relative to PNW ports. This second level of segmentation further limits the market that is likely to be available to the NPR further.

Based on this segmentation process and emerging evidence of how markets are being served suggests that the NPR sea / rail target market is likely to be focused on the Canadian Prairies, Ontario and the large US mid-west market focused on Chicago. Other regions are in principle likely to be better served by alternative gateways where transport infrastructure is place and proximity provides competitive advantages.

Figure 5.1 2005 Container Traffic Flows: To / from Asia by Final O/D



5.3 Container Traffic Forecasts: Growth Prospects are Favourable

Given the target market definition and the growth assumptions outlined in section 2, the Far East – North America container traffic which the ACRL could reasonably expect to compete for is summarized in Table 5.1. The total cargo pool is clearly large and given the high base position even modest growth contributes to substantial increases in TEUs per year. Under the growth assumptions, West Coast North American container trade would grow to 80.1 million TEUs under the steady growth case and 169.6 million TEUs in the resurgent growth case.

Table 5.1 ACRL Far East – North America Container Market Potential

	Steady Growth Case (Millions TEUs)		Resurgent Growth Case (Millions TEUs)	
	Overall Market	Available to ACRL (1)	Overall Market	Volumes Available to ACRL (1)
2010	14.4	3.4	16.5	3.9
2015	18.3	4.3	24.3	5.7
2020	22.9	5.4	34.1	8.0
2025	28.5	6.7	47.9	11.2
2035	44.5	9.8	81.6	19.1
2050	80.1	17.7	169.6	39.8

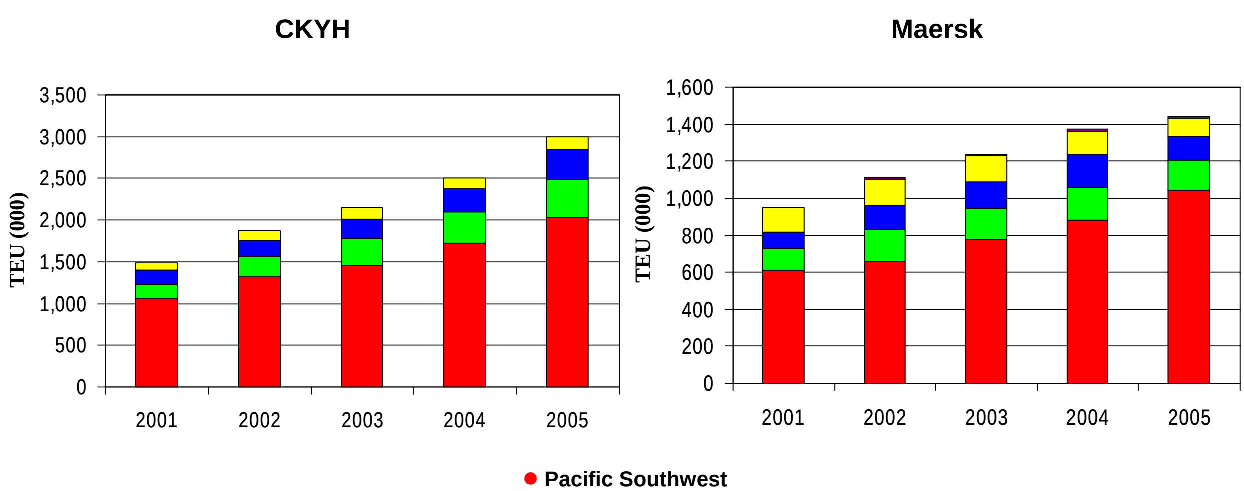
Notes:
1 Estimates of Prairies, Ontario and Mid-West market with Chicago the key target.

5.3.1 ACRL Market Penetration: How footloose is the market?

The cargo volumes available are potentially large implying that ACRL would require only modest market penetration to secure traffic volumes in line with initial business planning assumptions. Section two indicated that the trans-pacific trade routes are controlled by a relatively few players. A key question therefore is the *likelihood* of these players to divert cargo to port and intermodal routes (it is recognized that shipping lines are one of the decision makers but their willingness to deploy vessels remains a key consideration).

The thirteen largest carriers control about 80% of the trans-pacific US/Canada container import market. Drilling down further, CKYH (COSCO, "K" Line, Yang Ming and Hanjin), New World Alliance (NWA - APL, MOL and HMM) and Maersk Group handle about 53% of this key trade. In the critical PRC-NA trades, CKYH is the largest player controlling 26% of the market. The New World Alliance (NWA) has a 15% market share and its principal gateway is the PSW as the preferred gateway although it is less dependent than the other key alliances / key lines. Thus, virtually across the big players, the PSW is the principal gateway to serve these by a substantial margin. Figure 5.2 provides a summary of the CKYH and Maersk positions, as is evident the Pacific South West centred on LA/LB is the key market drive and the preferred gateway for the market leaders.

Figure 5.2 PSW is the Main Gateway for the Key Carriers on the US Import Services



The strong position of the leading carriers in trans-pacific container markets suggests that their strategies and their respective port positions are a key factor shaping ACRL market penetration potential.

Getting a Fix on the Target Market: Access to Port Capacity Matters

One factor to consider in defining the target market is how well the carriers are positioned in terms of access to port capacity and services going forward; the hypothesis being that the willingness and need to diversify gateways on the part of shipping lines will in part depend on how secure their access is to port capacity and related intermodal services. The leading players in the target and most significant mid-west Chicago markets tend to have important port positions (CT operations) at LA/LB to serve their needs, although all are not as favourably positioned. Table 5.2 provides a broad assessment of the current position of the leading players in crucial mid-west import market and segments them in terms of port access position; ranging from carriers with control of terminals and unlikely to meet capacity constraints over the next 10 – 15 years (subject to the degree to which improvements are made), to carriers who control (lease directly or through a subsidiary, sister or joint venture company and have a majority interest) terminals and that are likely to face capacity constraints in the medium term and finally carriers with no dedicated terminal and likely to face significant capacity constraints in the next five years. The market leader Maersk, a shipping line aggressively pursuing scale, share and control, has excellent intermodal facilities, good marine access and ample CY space – 484 acres, with the potential for an additional 200 acres. Maersk's position suggests it would likely have less of a need or desire to route cargo through a NPR gateway.

Table 5.2 Market Share by Shipping Line and Port Access (2005)

	Midwest		PSW Port Access*	
Rank	Carrier	% of total	Control of CTs and/or reasonable capacity access	Capacity Uncertainty and/or no dedicated CT
1	Maersk	10.4		
2	Hanjin	7.1		
3	APL	6.5		
4	Evergreen	6.4		
5	Hyundai	6.0		
6	K-Line	6.0		
7	COSCO	5.1		
8	OOCL	5.0		
9	Hapaq Lloyd	4.3		Exposed
10	NYK	4.2		

* Green indicates well positioned, orange a potential for significant constraints. Red is a key player with limited access.

Source: GHK-Norbridge Analysis of PIERs data.

By way of contrast, those carriers that are most likely to be express interest in a new gateway offer tend to be have smaller market shares in the key Midwest market. As an initial cut, CMA CGM, CSAV, Hamburg Sud, Hapaq Lloyd, Wan Hai, Zim are among the carriers most exposed on the PSW terminal access front. Less exposed carriers in the market include CSCL, MOL, MSC, and Yang Ming.

5.3.2 Volume is Not Enough

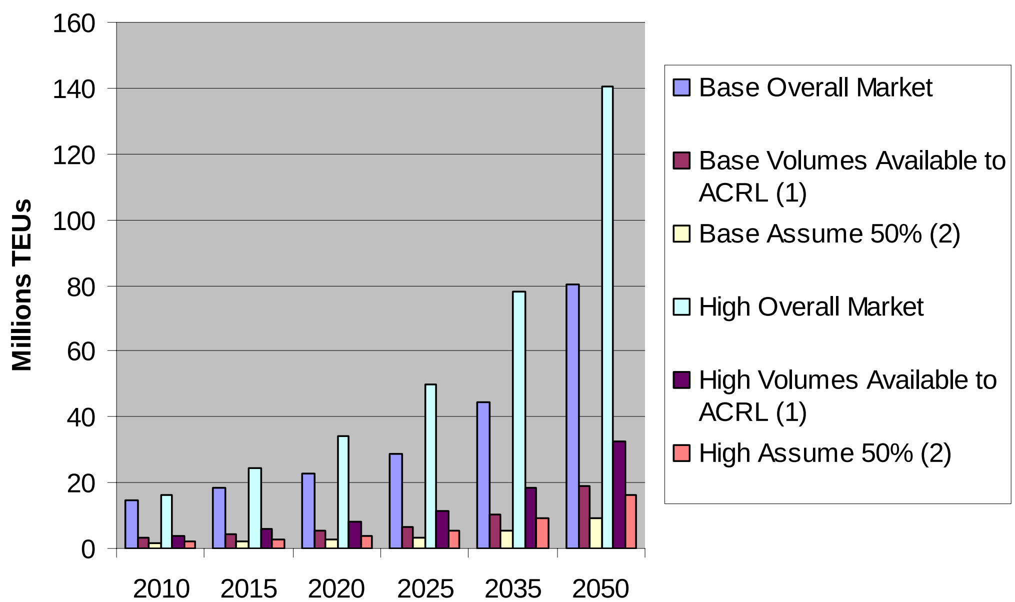
The effect of market segmentation and shipping line control over port access and route choices is to significantly scale back what the likely overall market potential would be - Table 5.3.. The market for which an NPR sea / rail gateway and hence the ACRL could compete ranges from 3.4 to to 5.6 million TEUs in 2025 under the steady and resurgent growth assumptions, well below the total size of the market.

Table 5.3 Container Traffic Forecasts: An Initial Fix on Volume

	Steady Growth Case			Resurgent Growth Case		
	Overall Market	Target Market (1)	Relatively Footloose 50% (2)	Overall Market	Target Market (1)	Relatively Footloose 50% (2)
2010	14.4	3.4	1.7	16.5	3.9	2.0
2015	18.3	4.3	2.2	24.3	5.7	2.9
2020	22.9	5.4	2.7	34.1	8.0	4.0
2025	28.5	6.7	3.4	47.9	11.2	5.6
2035	44.5	9.8	4.9	81.6	19.1	9.6
2050	80.1	17.7	8.9	169.6	39.8	19.9

Notes:
1 Mid west is the largest component and includes Ontario and the Prairies.
2. Broad estimate. Indicates deduction from total owing to amount controlled by shipping lines with good terminal positions or partial constraints to growth over medium to longer term – variations among carriers requires more detailed analysis.

Figure 5.2 Container Market for NPR Gateway and ACRL



Testing Market Share Requirements

Discussions with the client group around possible traffic volume scenarios suggested a test of whether 500,000 TEUs would be achievable as an "opening" position for ACRL operations to plan for. Table 5.4 provides a summary of level of market share required to achieve this volume under the steady growth and resurgent growth assumptions. As is evident, it is challenging for ACRL to achieve this volume of activity at 5% market share under either case. If 10% market share is assumed then the target volume could be achieved shortly after 2035 under the steady growth case and at sometime around 2025 under the resurgent case. Critically, this test does not take into account the competitiveness of ACRL relative to other port and route choices or significant changes to capacity – this is now the next step in assessing ACRL volume and revenue potential.

Table 5.4 Potential Container Volume by Market Share Penetration

Steady Growth Case

	Year					
Market Share	**2010**	**2015**	**2020**	**2025**	**2035**	**2050**
			TEUs 000s			
5%	85	110	135	170	245	445
10%	170	220	270	340	490	890
15%	255	330	405	510	735	1335

Resurgent Growth Case

	Year					
Market Share	**2010**	**2015**	**2020**	**2025**	**2035**	**2050**
			TEUs 000s			
5%	100	145	200	280	480	995
10%	200	290	400	560	960	1990
15%	300	435	600	840	1440	2985

5.4 ACRL Competitiveness: Stacking Up to the Competition

The primary market for the ACRL is container traffic from the Far East to the Canadian Prairies, Ontario and mid-west US centered on Chicago. The purpose of this sub-section is to test the NPR sea / rail – ACRL service offer against existing and potential future competitors. The principal competition is PNW (Seattle, Tacoma, Vancouver and Prince Rupert) and PSW (LA/LB and Oakland) with a possible new entrant in North Mexico. This is the focus of this analysis.

ACRL competitiveness is summarized in the strengths and weaknesses assessment in Table 5.5. The criteria for assessing competitiveness is based on port and route choice determinants as viewed by shipping lines and beneficial cargo owners (the end customer) taking into consideration intermodal service provider influences.

Table 5.5: ACRL SWOT Analysis

Factor	ACRL	NA West Coast
Shipping	**Advantage: Shorter sea distance** ~ 1 day time saving relative to PRP ~2.6 days time saving relative to LA/LB *Up to* $200 cost advantage over main competitors, but actual advantage is dependent on ship size economies and generally less than maximum.	Advantages: More frequent sailings and proven connections at the major USWC ports. Benefit from economies of scale of larger vessels LA/LB have very large and growing local cargo base & greater domestic back-haul market
Port	**Advantage:** Cargo handling costs should be lower than LA/LB and other PSW and PNW ports. Potential savings relative LA/LB $ 100 / TEU or more Prudent to assume no savings relative to PRP.	Handling costs are expensive and unlikely to decline in real terms over the medium term Uncertainty relating to long term capacity relative to a demand. Key factors: – *If demand growth >7.5 – 8.5 %* over sustained period (2020+) then pressure on supply if no Panama option and no major improvements – *Impact of Panama expansion* – this could lead to new route choices freeing up capacity on the West Coast (assume around 2020) Leading carriers have dedicated terminals in the key markets – relative lock in to existing ports.
Intermodal	1738 miles of track to link to principal network – **key cost penalty.** If average speed is 35mph then about 2+ days time to meet connection point. If $0.30/TEU/Mile then about $521/TEU cost to connect. Price path is likely to be real increases on rail freight costs over medium term; prudent to assume ratio of rail to sea costs per TEU will increase.	**Advantages result from critical mass and external economies**: Closer to main markets with more frequent services and density. Greater back haul market (excluding PRP) Major investments by principal inter-modal operators to improve networks and services in the existing gateways, with specific emphasis on LA/LB as the core market for UP and BNSF.

5.4.1 *Critical Factor I: Shipping Time and Cost Savings*

A central marketing feature of the NPR sea / rail – ACRL offer is potential time savings accruing as a result of being the shortest sea link between the fast growing PRC – North America trades. Anchorage's distance advantages relative to other North American ports are shown in Table 5.6. Anchorage's advantage over the dominant ports of LA/LB is about 1500 nautical miles.

The critical point is how this translates into real time and cost savings at sea. Anchorage's sea voyage time advantages relative to other North American ports are given in Table 5.7. *Anchorage's sea time advantage over the dominant ports of LA/LB is about 2.6 days and a day relative to Prince Rupert.* The all water options, in particular via the Panama, results in much longer steaming time for East Coast ports and thus time disadvantages.

Table 5.6 Close Encounters: Anchorage's Sea Distance Advantages

From:	Yokohama	Kobe	Shanghai	HK
To:	Nautical miles			
Anchorage	…	…	…	…
LA/LB	*1,522*	*1,541*	*1,535*	*1,533*
Prince Rupert	505	505	505	525
Vancouver	964	958	941	930
New York	7,267	7,271	7,298	6,757

Table 5.7 Time Trial: Anchorage's Sea Voyage Time Advantages

From:	Yokohama	Kobe	Shanghai	HK
To:	Days, One Direction, Speed at 24.5 nm/hr			
Anchorage	…	…	…	…
LA/LB	*2.59*	*2.62*	*2.61*	*2.61*
Prince Rupert	0.86	0.86	0.86	0.89
Vancouver	1.64	1.63	1.60	1.58
New York	12.36	12.37	12.41	11.49

Shipping Costs: Balancing Distance and Scale Factors

The costs to the shipping line of serving the Far-East/US West Coast routes via various competing ports are summarised in Table 5.8 The principal observations are:

- First, the maximum cost advantage of Anchorage over their main competitors, LA/LB, is, for any given ship size, around $200 per TEU.
- Second, the actual competitive landscape varies depending on likely vessel deployments. Anchorage's advantage may be less than $200 because the services calling at competing North America West Coast (NAWC) ports, especially LA/LB, would generally use larger ships than those likely to call at Anchorage, giving the other ports economies of scale. For example, the 2000TEU ship which might be used at Anchorage on an express service would not be competing with 2000 TEU ships, but 8000 TEU ships at LA/LB. In the case of the Shanghai trade the advantage would be around $110. In other cases, Anchorage's advantages are much reduced – certainly its competition with Prince Rupert and Vancouver.
- Third, there is not a smooth and consistent pattern behind the cost comparisons. The main reasons for the apparently uneven pattern are that:

  a) The benefits of ship time resulting from shorter sea distances cannot always be "used". This is because services are almost always scheduled to take a certain number of weeks - typically 4, 5 or 6 weeks. This can be a benefit or a disbenefit for smaller ships, depending on several characteristics of the particular service (route distance, ship size, handling speed, etc). For example, it will be a disadvantage for a given service if the route distance is such that there are 6 slack days, but an advantage if there is only half a day slack (i.e. the ship is transporting or handling cargo for all except half a day).

b) Terminal handling charges vary widely between ports.

- Fourth, Anchorage can save 1.6-2.6 days transit time, relative to LA/LB and Vancouver.
- Fifth, NPR route offers substantial time savings relative to the Panama options in serving Ohio Valley and Chicago, although they are not the prime competitors.

Table 5.8 Route Choice and Shipping Costs: Scale Matters

$/TEU, in one direction by route and vessel size*					
Anchorage		**2000 TEU**	**4000 TEU**	**6000 TEU**	**8000 TEU**
	Kobe	622	550	584	579
	Yokohama	617	546	532	497
	Hong Kong	605	592	563	547
	Shanghai	563	490	523	499
PRP		**2000 TEU**	**4000 TEU**	**6000 TEU**	**8000 TEU**
	Kobe	649	576	609	585
	Yokohama	644	571	605	582
	Hong Kong	821	808	764	740
	Shanghai	572	572	530	506
Vancouver		**2000 TEU**	**4000 TEU**	**6000 TEU**	**8000 TEU**
	Kobe	736	736	694	670
	Yokohama	731	657	690	666
	Hong Kong	903	814	850	819
	Shanghai	659	657	614	590
LA/LB		**2000 TEU**	**4000 TEU**	**6000 TEU**	**8000 TEU**
	Kobe	747	745	702	678
	Yokohama	742	740	698	674
	Hong Kong	915	814	835	804
	Shanghai	765	667	688	659
New York New Jersey		**2000 TEU**	**4000 TEU**	**6000 TEU**	**8000 TEU**
	Kobe	851	779	731	725
	Yokahama	846	775	745	704
	Hong Kong	1,068	934	877	847
	Shanghai	1,183	1,007	927	882

*See Appendix I for details.

The costs in the table above include:

(a) ship operating costs at sea and in port;

(b) the cost of the containers;

(c) terminal handling charges; and

(d) port charges

5.4.2 Critical Factor II: Rail Distances

The shorter sea distances that ACRL will benefit from are offset by the additional inland distances. Based on an average operating speed of 35mph, it will take about 50 hours, or just over 2 days, to reach the CN mainline connection point. Table 5.9 summarizes the approximate variations between an Anchorage to Chicago vs alternative routings in terms of distance, additional rail freight costs and time.

The first critical point is that rail time more than offsets the short steaming time advantage in the case of PRP – the first competitor offering a similar dedicated intermodal service – and severely reduces it in the case of the other potential new entrant aiming at the same market, North Mexico. In the latter case, the advantage is probably down to about one day. The second critical point which is perhaps even more important, and that is that the additional rail journey severely reduces the time saving relative to LA/LB – about a half day advantage on this front. The importance of these time savings will in part depend on inland transport variations with the key here being how well the intermodal links actually perform and schedules are kept.

Overall, ACRL has to absorb a major time and cost penalty in terms of inland transport links to its core end market. ***These penalties erode ACRL time and cost savings at sea***.

Table 5.9 Comparative Rail Distances

Origin	Distance to Chicago	Port of Anchorage Variation		
		Miles	Extra Rail Cost $/TEU	Time extra Days
Anchorage	4125	0		
Prince Rupert	2587	1538	460	+2
Vancouver	2394	1731	520	+2
LA/LB	2227	1898	570	>2
North Mexico	2427	2100	725	>2
New York	1100	3025	907	

* Figures rounded. Cost per mile assumed at $0.30 per TEU in this calculation. It is prudent to assume that $0.30 is base number and costs could be higher as real rates are increasing.

5.4.3 *Putting the Pieces Together: Total Through Costs Metrics*

Port and route choice decision making is increasingly a balance between time, service quality (which includes a bundle of factors such as reliability, frequency of services and connections) and total through costs. With comparable service levels the issue of total through costs is of central importance notwithstanding variations in transit time. To position the ACRL offer an assessment of the total through costs it takes to reach the inland markets is necessary. Table 5.9 provides illustrative comparisons of through costs for selected routes. Appendices .E and F provide the detailed cost data for various routes.

Table 5.9 Testing the ACRL Service Offer: An Illustration

ROUTE COMPARISONS: HONG KONG TO CHICAGO VIA FOUR NORTH AMERICAN PORTS				
	Via Anchorage	Via LA/LB	Via Vancouver	Via Prince Rupert
Ship Capacity (TEU) (a)	2,000	8,000	4,000	4,000
COSTS ($/TEU)				
Shipping costs from Hong Kong (b)	471	608	618	602
Port handling charges in N America	121	200	200	121
Rail costs to Chicago	1,268	750	796	848
Total Costs	1,860	1,558	1,613	1,571
TRANSIT TIMES (days) (c)				
Sea and port	10	16	13	12
Rail	7	5	5	5
Total Transit Time	17	20	18	17
Assumptions:				
Voyage distance (one way, n. miles)	4,830	6,363	5,760	5,355
Round voyage time (days) (d)	21	35	28	28
Slack time on voyage, (days) (e)	1.4	4.0	2.1	3.4
Rail distance (km)	4,125	2,227	2,394	2,587

Notes:

(a) Based on current practice on the Transpacific trades and relative economics of differing ship sizes.

(b) Including all charges by shipping lines except for port handling charges in North America, see next line

(c) Excluding delays/dwell time in port, which is assumed to be similar at all port

(d) In practice, all voyages take either 3, 4 or 5 weeks.

As shown, the Anchorage service has an advantage over competing services for the ship sizes compared.

(e) There is often surplus time left in addition to that necessary for steaming and handling containers in port .

As shown, the Anchorage service has an advantage over the competing services.

COMMENTARY

COSTS

Anchorage has sea distance and shipping cost advantages over the other ports. Its low shipping costs are the result of a combination of (i) short sailing distance and (ii) the low ship size selected in the example above, which make a three week round voyage possible.

The Anchorage service is also assumed to have lower port tariffs than LA/LB and Vancouver

But these advantages are nevertheless outweighed by much higher rail costs, which make routes via Anchorage more expensive than via the other ports.

TRANSIT TIMES

Anchorage has the lowest shipping transit times of the four ports shown, because of the short sea distance and the small ship size which requires limited time in port.

But the shipping time advantage is partly offset by the longer rail journey.

Anchorage has a net transit time advantage over LA/LB. But this is partly dependent on the fact that the 2000 TEU ship selected for Anchorage has little “slack” time in its schedule. Otherwise, if all services shown had the same slack, Anchorage’s transit time advantage would be lower.

Is ACRL competitive?

Critically, neither the shipping cost nor the transit time savings are likely to be sufficient to offset the additional rail costs and transit time – there are major service cost and time challenges facing the ACRL port – rail offer.

ACRL can potentially command up to a $200/TEU shipping advantage relative the established West Coast gateways and critically LA/LB. However, this cost advantage is not sufficient to overcome $500 plus rail cost disadvantage ACRL will likely face to connect to the mainline and then serve the core Chicago market.

Given there are no significant time savings, this cost disadvantage is not commercially sustainable *if* port and rail capacity is satisfactory. Even if a gateway diversification strategy were being pursued by shipping lines and beneficial cargo owners, it would seem that either Prince Rupert or North Mexico could serve this role with a superior commercial offer. To the extent that cargo destined for the Ohio Valley or perhaps Chicago routes via the Panama then NPR does command a considerable time saving – about 12.5 days – although this is not the principle competitive benchmark. In terms of nominal cost, these extra days have a “price” to beneficial cargo owners i.e. inventory in transit. Dimensioning this is dependent on the nature and value of the cargo in transit. For illustration, if we assume a FEU with a cargo value of $60,000 and a cost of capital of 12% then the cost of inventory in transit would be around $250 for the additional time, below the ACRL rail cost penalty. If the value of the FEU cargo is $50,000 then the cost of inventory is closer to $200. Simply put, the higher the value of the cargo the greater the cost. To this must also be added the potential loss of sales where time critical deadlines are missed – however, very high value and time critical cargo may also switch to air.

5.4.4 Panama Canal Expansion Creates New Choices and Releases Capacity

A new factor re-shaping the trade route pattern is the impact of the potential expansion of the Panama Canal. This will open up new gateway options and capacity and more aggressive port and route competition. It is prudent to assume that over the period 2015-20 the Panama Canal will be expanded and operational post 2020 for large vessels – 8000 TEU plus vessels. As a result, it is also sensible to consider a scenario where a sizeable share of cargo destined for east of the Mississippi, except for higher value/time sensitive cargo and Chicago, will move via the east coast by 2020. If this occurs, then a measurable portion of existing inter-modal traffic, grown at about 5% to 2017, gets diverted to U.S. East Coast ports. Further, the U.S. Gulf traffic moving via the PSW is also subject to diversion to all-water services. Two implications directly emerge from these developments;

- First, there is considerable pressure released on West Coast ports which when combined with capacity and productivity improvements reduces the likelihood of major bottlenecks; and
- Second, it is reasonable to assume the western railroads will aggressively pursue protection of their core international inter-modal traffic and invest in new capacity developments to secure quality services.

On balance, given emerging and plausible demand and supply relationships, ACRL entry into the market will be a major challenge as new capacity and port choices are opened up by the Panama Canal. It is advisable for ACRL to track progress on the market responses to Panama expansion plans to assess possible changes to port calls and market segmentation.

5.4.5 Can the ACRL work for the container trade? Yes.

Given the analysis above, what are the conditions and factors that could make the ACRL work for the transpacific container trade

- First, sustained traffic volume growth on the trans-pacific trade in line with the resurgent growth assumptions is realized thus dramatically increasing the available cargo pool – growth in excess of these assumptions would stretch capacity and open up new gateway options.
- Second, demand growth is not met among the existing West Coast ports because of planning, environmental and labour resistance to port expansion plans and productivity improvements on the West Coast (PNW and PSW) – in effect, there is a lack of supply response among the existing gateways leading to traffic diversion – something not typically observed elsewhere.
- Third, a further factor likely to significantly shape ACRL market penetration will be the extent to which new entrants into the port market are able to benefit from failure to expand at existing West Coast Ports. Thus, a third key assumption is that new

entrants with potentially superior commercial offers do not fill the market void sufficiently to meet a capacity gap. Specifically, Prince Rupert Port *does not* expand beyond its initial phase (about 500,000 TEUs) or phase two (up to 2mn TEUs). Perhaps more importantly, the North Mexico option does not progress – this is material, as North Mexico reportedly has potential expansion opportunities of perhaps 15 – 10 berths with an indicative capacity of upwards of 15mn TEUs over the next 25-30 years.

- Fourth, a minimum success factor is to ensure that there is significant railway commitment to the service and in particular, a rail operator with a strong market presence and good links to the end customer in the target markets. CN would seem to be one obvious partner given its control over the mainline that ACRL would connect to. However, it is to be expected that UP and BNSF will aggressively defend their core positions in this market – this will place further pressure on the ACRL offer and specifically on pricing.

- Fifth, given the need to secure volume in a market served by multiple players many of which have good port/intermodal positions a further success factor would be to partner with a shipping line (s) with good market positions in the target market (ie, not a port to port player). This is a challenge as the market share leaders are well positioned for grow. There are other lines but unless the overall commercial logic is improved, ACRL does not have a competitive through cost service offer. By extension, ACRL should target those shipping lines that have weak port positions on the West Coast and have either good penetration of the intermodal market or ambitions to build market share. Defining these players will need further investigation.

The key assumptions required to make ACRL an acceptable service to win container traffic are demanding.

Over the next 25 – 30 years, the success of ACRL would seem to rely on severe market and policy failures to be combined with bullish growth assumptions. On the one hand, it relies on existing shipping lines, ports and intermodal operators failing to make reasonable and very achievable expansion and productivity improvements over the next 10-15 years. Much progress is already underway and there are reasonable grounds to expect further improvement; there are risks but it is prudent to plan to a fair degree of success here over the long term.

The ACRL would also rely on already identified corridor "solutions" such as an expanded Panama Canal, North Mexico and Prince Rupert all to fall well short of market opportunities. It is accepted that investment costs to support the Panama Canal expansion are demanding then this could delay timing. Equally, significant investments are required at both North Mexico and Prince Rupert; but Prince Rupert is already under development and reportedly is fast tracking Phase 2 expansion. The overall capacity envelop can be expected to exceed the 2mn TEU headline.[11] Prince Rupert is also understood to have an intermodal service commitment from CN – a necessary selling point. The North Mexico proposition is further

[11] The CEO of the Prince Rupert Port Authority, Mr. Don Krusel, in his presentation to the House Standing Committee on Finance – Pre-budget Consultations indicated that future plans for PRP include an additional CT with headline capacity of a further 2 million TEUs by 2013. 3 October 2006, Vancouver.

into the future but offers a Greenfield site with significant scope to expand quay and CY capacity as well as introduce operational practices that can be expected to yield high productivity and vessel handling speeds at lower costs than the existing PSW / PNW players. New capacity here could reach 15 million TEUs if demand continues to put pressure on existing port expansion capacity and pace. However, North Mexico could be exposed to new port choice options and the freeing up of capacity resulting from a Panama Canal that can handle the 8000 plus TEU vessels that are increasingly coming onto the trans-pacific trade routes.

6 SUMMARY AND CHALLENGES

ACRL's competitive offer to win container traffic in the crucial inter-modal market focused on the Canadian Prairies, Ontario and the mid-West centered on Chicago faces challenges. The critical issues are:

- The port – rail link is too far from inland cargo destinations – being situated 1,738 miles from a mainline rail connection results in a severe cost penalty, in the region of $500/TEU plus.
- The port – rail link offers no significant time savings relative to the alternative West Coast gateways as the higher inland transport transit time to connect to the mainline effectively offsets shorter steaming time at sea.
- ACRL will be in a position of being a price taker as the current service offer does not have any compelling superior performance attributes relative to other gateways.
- Going forward it is reasonable to assume real rail freight price increases over time – this adversely affects the ACRL offer as the cost penalty increases by virtue of its greater reliance on the more expensive rail move (as compared to the other ports that use greater sea transit).
- There is no significant local origin – destination cargo for the container trades relative to the established gateways in the PSW and PNW.
- The target markets are currently fairly well served by existing ports and operators with potential for capacity expansion at the competing PNW ports – e.g. PRP Phase 2 build out programmed for around 2010 would take capacity there to about 2mn TEUs *if* Phase 1 gains market acceptance. This would be a direct competitor. Additional expansion at Vancouver and Tacoma are also possible over the 25 year time frame.
- The increasing likelihood of the Panama Canal expansion makes it prudent to assume significant changes in how inland markets are served with more port choices and route options combined with freeing up capacity on the West Coast.
- North Mexico provides a further option for significant new capacity to fill demand and supply imbalances and can likely offer a better commercial offer to shipping lines and beneficial cargo owners.
- ACRL will need to offer significant revenue sharing with a railway if access to end markets is to be achieved.

6.1 ACRL volume risks are high

Overall, while container traffic volumes are expected to be large and growing, ACRL's ability to capture a significant share of these trades is likely to be challenging over the planning period. The basic issues:

- First, ACRL does not have a compelling value proposition – it is neither a premium service in terms of transit time nor is it likely to be able to offer a price point to attract traffic;

- Second, there are considerable changes occurring in the shipping and port sectors which are likely to adversely affect ACRL. These relate primarily to new supply developments within the shipping, ports and inter-modal sectors. These developments are likely to further competition and further segment the inland market.

- Third, the large market is in fact highly segmented as outlined in the previous sections and moreover more detailed analysis would be beneficial to further explore likely footloose traffic in the primary target market. The Chicago market is served well by the LA/LB services – a number of major carriers are well represented here (e.g. Maersk, Evergreen, Hanjin APL) and well positioned in terms of gateway ports and inter-modal links. If ACRL is primarily competing in the Canadian market as is the case with PRP and Vancouver (about 85% Canada destined inbound cargo), then the market is much smaller and fairly well served by existing players (e.g. Maersk, Evergreen, COSCO, Hanjin, CSCO, the major alliance and ZIM). This will make entry difficult if commercial considerations are not superior to the current offers.

The above suggests the possible market entry is unlikely to be viable over the long term. The demand – supply balance is expected to improve with both capacity improvements coming on stream at ports and inter-modal services combined with significant new entry planned at the Panama Canal, PRP and potentially North Mexico – all of which have adverse market implications for ACRL.

Revenue to ACRL from container traffic is not likely to be material.

6.2 Going Forward: Tracking Changes and Identifying Market Gaps

A significant ACRL entry into the container market would appear to be long way into the future. Given the dynamics of demand and supply it is sensible for ACRL to monitor the market and report on key developments at periodic intervals.

On the demand side, periodic updates of overall traffic forecasts and critically market segmentation would be useful. Given the large cargo base, even small growth rates contribute large absolute volumes of additional cargo. Growth rates beyond our “resurgent growth” case will undoubtedly put a lot of pressure on existing infrastructure and services.

On the supply side there are a number of issues to monitor. First, it is useful to undertake periodic updates of port capacity and expansion plans to assess how well port authorities and operators are responding to demand growth.

Second, it is sensible to review trends and vessel deployments in the shipping sector to assess how the balance between scale economies, transit times and port choice are being played out. Related to this is the need to track the players who are active in the target intermodal market and to assess how well they are positioned in terms of access to port and rail infrastructure and services. Equally, it is useful to assess how lines are likely to respond to new Panama options in terms of vessel ordering and deployments.

Third, it is necessary to review market developments on the rail side – especially in the critical LA/LB region. Again, demand growth is critical as even modest growth rates deliver high incremental cargo volumes in absolute terms. A key set of issues to assess are: the real price path of intermodal services and comparing these to all water options (the relationship between costs at sea and on the rail) and how rail service offers are developing (e.g. scheduled services, customer partnerships etc).

Finally, it is worth investigating how beneficial cargo owners are planning for their port and route choices over the medium term. Their willingness to pay for gateway diversification is a factor likely to shape the attractiveness of the ACRL offer.

Perhaps a signpost of the emerging market will be Prince Rupert – its success may signal market acceptance to a pure port – rail intermodal service offer.

7 APPENDIX A: PLANNED AND POSSIBLE PORT EXPANSIONS

This Appendix presents a summary of future container capacity at major west coast gateways. It addresses future container terminal capacity in detail at the Los Angeles/Long Beach (LA/LB) port complex and the Pacific Northwest (PNW) ports of Seattle, Tacoma and Vancouver at a summary level. The LA/LB and PNW gateways handle the majority (estimated at 80-85%) of international intermodal rail traffic moving between Asia and inland North American markets via West Coast ports. Oakland, due to its location and rail connections, and marine terminal configuration has not been a significant player in the intermodal rail market. The analysis presented is based on our ongoing work in the North American container shipping and port industries during the past ten years.

Methodology

The container terminal capacity analysis presented here focuses on estimating container storage yard capacity. While storage yard is only one of 5-6 components of marine terminal capacity, it is most often the limiting capacity component in North American container terminals. The methodology used to estimate marine terminal capacities includes eight steps.

1. Selectively update Norbridge's existing marine terminal database for the major North American container ports for the ports of Los Angeles, Long Beach, Seattle, Tacoma and Vancouver.

2. Incorporate all in process and planned (in a port's capital development plan, in the process of obtaining permits, under construction) container terminal expansions

3. Segment each major container port's traffic based on Norbridge's experience and estimates. The traffic segments include direction, loaded vs. empty, rail vs. truck.

4. Develop stacking and dwell time estimates for each segment based on Norbridge's experience and knowledge of each port and terminal.

5. Develop storage acre to total acre estimates based on Norbridge's analysis and type of terminal

6. Develop alternative capacity estimates based on mode of operation (wheeled, top-pick, medium density RTG, high density RTG and combinations thereof.

7. Apply a peaking factor.

8. Review and refine estimates as required.

Capacity Estimates

Updated terminal capacity was estimated at two levels:

- Priority #1: Los Angeles and Long Beach
- Priority #2: Seattle, Tacoma and Vancouver
- Priority #3: Oakland

The following paragraphs describe the results of the analysis.

LA/LB

1. Overview

The LA/LB port complex includes 13 container terminals and an estimated 2,970 gross terminal acres. LA/LB face multiple challenges to expanding port capacity. These challenges include environmental, community, political, governmental and financial. The port authorities have recently embarked on a joint approach to addressing air quality issues - one of the most important environmental issues facing the two ports. While the ports face significant and extensive environmental challenges and community opposition, Norbridge believes the ports will ultimately be successful in addressing these issues, expanding the ports and accommodating growth.

Capacity Estimates

The estimated capacity for the existing port complex, based on a medium density RTG operation is 22.2 million TEUs, i.e. 2,970 acres * 75% (CY portion of total terminal acres) * 225 TEUs per acre (RTG medium density) * 52 turns per year (average seven day dwell * 85% (peaking factor).

The LA/LB ports (port authorities, carries, terminal operators) can and will likely pursue three options for expanding capacity:

- Physical expansion of port facilities, i.e. terminal acres and berths.
- Organic expansion of existing capacity
- Productivity

The port authorities have primary responsibility for expanding port capacity. Their announced, planned and potential expansions include:

- New terminals: Pier S (estimated 198 acres in Long Beach) is the only known new terminal currently planned.
- Expansion of existing terminals
- Consolidation and reconfiguration of existing terminals.

Both LA and LB have significant plans to consolidate and reconfigure terminals. LA's expansion plans include:

- **Terminal Island Terminals**

– Maersk Pier 400: up to 200 acres of fill

– APL Pier 300: up to 40 acres of fill

– LAXT: conversion of this 100 acre former coal export facility to an intermodal rail yard for use by APL, Evergreen and Yusen (NYK) terminals. This will enable APL to convert its on-terminal rail facility to container storage and enable Evergreen and Yusen to convert their respective portions of the TICTF intermodal yard into additional storage

– Evergreen Berths 226-236: a major renovation and reconfiguration of this 205 acre terminal to improve efficiency and capacity.

– Berths 206-209: this 91 acre terminal is available for lease. It was to be leased to P&O Nedlloyd until Maersk acquired P&O Nedlloyd.

– In the long-term, conversion of Berths 210-211 (22 acre facility that lies between Yusen and Berths 206-209) from export scrap metal to containers. This facility, in combination with Berths 206-209 could be leased as a single 113 acre facility or an extension of the Yusen terminal

– *Subtotal Terminal Island: 544 acres*

- **West Basin Terminals**
    - China Shipping Berths 100-102: double the berth length to 2,400 feet and add an estimated 24 acres of backland
    - Yang Ming Berths 121-131: add 3,500 feet of berth and 28 acres of backlands
    - Berths 136-147: reconfiguration and modernization of 110 acres, addition of 2,600 feet of berth and 53 acres of storage area
    - *Subtotal: 105 acres*
    - **Total LA expansion potential 649 acres**

The Port of Long Beach's long-term development plans involve two projects: Pier S and the creation of mega terminals through the consolidation and reconfiguration of existing terminals. Pier S is a 198 acre terminal that is scheduled to come on line in a 2008-2010 timeframe. It is located on Terminal Island across from the Hanjin Pier T facility. The mega-terminal plan involves the following projects:

- Consolidate Piers G (K-Line) & portions of Pier J (COSCO) into a 300 acre terminal-estimated addition of 54 acres.
- Consolidate Piers E (Hyundai) and F (breakbulk, multipurpose) into a 338 acre container terminal-estimated net addition of 45 acres
- Develop an expanded Pier J (370 acre) container terminal-estimated net addition of 100 acres

- Expand the Pier A (MSC) terminal be transferring land from the Pier B (Toyota) auto terminal-estimated net addition of 15 acres
- In the long-term create a new, estimated 200-300 acre terminal in the West Basin
- Potential net expansion: 414 acres to 514 acres
- The primary benefit of the mega terminal plan will improved efficiency and scale economies from creating larger, consolidated terminals.

If the ports are successful in implementing their expansion plans, they could add an estimated 1,060-1,160 acres of container terminal acreage. This represents an increase of 36-38 percent.

The larger opportunity for the ports and their terminal operators lies in improving efficiency and productivity of their terminals. In 2005, the two ports handled an estimated 14.2 million TEUs on approximately 3,000 gross container terminal acres. This represents an average throughput per gross terminal acre of 4,731 TEUs per gross terminal acre and 6,300 TEUs per net storage acre assuming 75 percent of the gross terminal acres are available for storage. There are several important points to note about this level of terminal utilization:

- It is about a third of the average utilization level for average Asian terminals
- It is about half the average utilization of European terminals
- It is about one third the utilization that could be achieved if the terminals used a medium density RTG (average stacking height of 2.5 containers per slot) operation and enforced current storage times (4 days)

The key point is there is significant, latent capacity potentially available in the existing asset base. This latent capacity, in combination with the 1,000+ acre expansion potential, suggests the LA/LB port complex has significant potential to accommodate future growth. Potential throughput capacity can be estimated as follows:

Organic expansion of existing terminal capacity through conversion to medium density RTG operations and a conservative average dwell time of 7 days per container: 22.2 million TEUs (3,000 acres * 75% * 225 TEUs per storage acre * 52 turns per year * 85% peaking factor)

Terminal expansion/consolidation (1,060 acre basis): 7.9 million TEUs (1,060 acres * 75% * 225 TEUs per storage acre * 52 turns per year * 85% peaking factor)

Total estimated throughput per acre: 7,500+ TEUs per gross terminal acre which is slightly below European terminal operations today and is still significantly below average Asian terminal operations (excluding major transshipment terminals)

This estimate is potentially conservative for the following reasons:

- It assumes an average dwell of seven days per TEU. Current free time is 4 days.
- It excludes consideration of the following effects:
  - Restricting the number of empties allowed on the terminal
  - Use of off-dock CYs for empties and local import deliveries

- Technology improvements which are currently being implemented
- High density operations (average stacking heights of 3.5 TEUs vs. the assumed 2.5, i.e. a 40% improvement0
- Productivity improvements

While Norbridge's analysis suggests the LA/LB complex has capacity to double current throughput in the long run, Norbridge recognizes the port complex faces significant environmental, community and landside access challenges. Norbridge believes that LA/LB can be successful in meeting these challenges, although it will require a long, sustained effort. Norbridge's view is based on the following:

- In 2002, the combined ports handled 10.6 million TEUs
- Since 2002, the combined ports have experienced:

The lockout of the ILWU by management during the 2002 contract negotiations

- The 2004 "meltdown"
- The China Shipping Terminal lawsuit
- The "no net increase in air pollution initiative"
- Significant changes in leadership at both ports
- No significant increase in marine terminal acreage
- Significant increase in East Coast distribution centers and all-water services to the East Coast
- Rapidly increasing intermodal rail rates by the western railroads
- Diversion of intermodal cargoes to the PNW ports due to the 2004 "meltdown"

Yet, in 2006 the ports will handle an estimated 15.6 million TEUs or 47% more volume than four years ago

Projecting container terminal capacity by time period for LA/LB is complicated by the fact that many projects have been delayed and no overall schedule is publicly available. Norbridge's best estimates, based on its knowledge of the projects and ports is as follows:

- 2006: 22.2 million TEUs
- 2010: 23.8 million TEUs assuming 210 acres of expansion, a medium density RTG operation and average seven day dwell
- 2015: 30 million TEUs assuming 850+ acres of expansion and a medium density RTG operation and average seven day dwell

Assuming the combined ports grow at 7 percent per annum through 2010 and 6 percent annum through 2015, total throughput in 2010 is estimated at 20.4 million TEUs in 2010 (86 percent of estimated capacity) and 27.4 million TEUs or 91 percent of estimated capacity in 2015. It is important to reemphasize the conservative nature of Norbridge's capacity projections, i.e. seven day dwell time, no implementation of management and operating options to improve capacity, and no consideration of the effects of information technology on terminal capacity.

Implications and Opportunities for an Alaskan Gateway

A capacity constrained LA/LB should not be a fundamental basis for moving forward with an Alaska Gateway. As Norbridge's capacity analysis indicates, LA/LB should have container terminal capacity to at least double its throughput. The successful implementation of higher density operations, enforcement of current free time regulations, automation, operational changes and productivity improvements could significantly increase capacity beyond the estimated 30 million TEUs.

PNW Ports

The PNW container ports include Seattle, Tacoma, Vancouver and Portland, Oregon. In 2005, these ports handled 2.1 million, 2.1 million, 1.8 million and 0.2 million TEUs respectively. Portland is a small niche player that will likely continue to play a small niche role in future PNW container port development.

Historically, Seattle and Tacoma have served two roles: intermodal rail gateways to the U.S. Midwest and East Coast in general and the upper Midwest (Chicago) in particular and gateways for the regional market. In 2005, Norbridge estimates 3.2 million TEUs or 75 percent of the combined ports throughput was associated with intermodal rail traffic. The following paragraphs present a brief overview of current and projected marine terminal capacity for each port.

Seattle

The Port of Seattle (POS) owns four container terminals that total 501 acres as follows:

- APL Terminal 5: operate by Eagle Marine (APL subsidiary) under a long-term lease with the POS. T-5 has 182 acres, a large on-dock rail terminal and 2,900 feet of berth
- SSA Terminal 18: T-18 is the POS's public container terminal. SSA operates the terminal under a long-term lease. T-18 has 196 acres, on-dock rail and 4,440 lineal feet of berth. The major lines calling T-18 include COSCO, China Shipping, CMA-CGM and the Grand Alliance.
- Matson Terminal 25: T-25 is operated by SSA. The terminal is leased to a joint venture of SSA and Matson. T-25 is the smallest of the four container terminals. It has 35 acres and 1,200 lineal feet of berth.
- Hanjin Terminal 46: T-46 is leased by Total Terminals, Inc., a joint venture between Hanjin and Marine Terminals Corporation. Hanjin recently sold a majority of its terminal interests to Macquarie Bank. The terminal has 88 acres of property and 2,300 lineal feet of berth.

Norbridge understands the POS does not have any major, long-term development plans for container terminal expansion. The conversion of Terminal 91 from breakbulk to container is the most logical development, but a longstanding POS board policy prevents this conversion. In the past, the POS has also considered converting bulk, breakbulk and private operations on Harbor Island to containers but there are significant environmental issues and property acquisitions required to implement this expansion. It is uncertain as to whether or not this conversion is financially viable.

Norbridge's estimate of POS assuming a medium density RTG operation and an average seven day dwell to be 3.7 million TEUs. This equates to 7,385 TEUs per gross terminal acre which is slightly less that the average European terminal and significantly less than the average (excluding transshipment ports) Asia terminal utilization. If the terminals successfully converted to a high density (3.5 average stacking height) the capacity would increase to 5.2 million TEUs. These capacities exclude consideration of the other operating and management practices the terminal operators could implement to improve capacity. These practices include:

- Restricting the number of empties allowed on the terminal
- Use of off-dock CYs for empties and local import deliveries
- Technology improvements which are currently being implemented
- Productivity improvements

Tacoma

The Port of Tacoma (Tacoma) has five container terminals with a total estimated area of 533 acres. Tacoma also has a RoRo terminal leased by TOTE, a carrier whose business is focused on serving the Alaskan market. Tacoma leases its container terminals to operators. An overview of the five container terminals is as follows:

- APMT: leased by APMT and served by Maersk and Horizon Line. The terminal has 135 acres, 2,200 lineal feet of berth and is served by the contiguous South Intermodal Rail Yard.
- Husky Terminal: leased by Husky Terminals, a subsidiary of K-Line. The terminal has 93 acres, 1,900 lineal feet of berth and is supported by the contiguous North Intermodal Rail Yard. The terminal serves K-Line and the CKYH alliance.
- Olympic Terminal: is operated by Marine Terminals Corporation, reportedly under a joint venture arrangement with Yang Ming. The terminal has 54 acres, 1,100 lineal feet of berth and is supported by the North Intermodal Rail Yard. The terminal serves Yang Ming and the CKYH alliance.
- Pierce County Terminal: is operated by Marine Terminals Corporation, reportedly under a joint venture arrangement with Evergreen. The terminal has 171 acres, 2, 260 lineal feet of berth and an on-terminal intermodal rail facility. The Evergreen Group serves the terminal.
- Washington United Terminals (WUT): the terminal is leased to Hyundai and serves the New World Alliance. WUT has 80 acres, 2,000 lineal feet of berth and a contiguous, dedicated intermodal rail facility.

Norbridge estimates the capacity of Tacoma's existing container terminals to approximate 4.2 million TEUs assuming a medium density RTG operation. This capacity equates to 7,956 TEUs per gross terminal acre which approximates the average European container terminal and is significantly below the average (excluding transshipment ports) Asian terminal. The deployment of a high density RTG operation would increase this capacity to an estimated 5.9 million TEUs. These estimates exclude consideration of the other operating and management practices the terminal operators could implement to improve capacity. These practices include:

- Restricting the number of empties allowed on the terminal

- Use of off-dock CYs for empties and local import deliveries
- Technology improvements which are currently being implemented
- Productivity improvements

Tacoma has significant capacity plans. These plans include:

- A new Blair Waterway Terminal: 110 acre terminal with on-dock rail and 2,500 lineal feet of berth
- A doubling on the Maersk Terminal from its current 135 acres to 290 acres and 1,500 additional lineal feet of berth
- 155 acres of additional container terminal area for the other existing terminals.

The timeframe for these expansions is reported to be 2006-2020. Norbridge believes the Maersk and other terminal expansions are likely to occur within a 2007-2012 timeframe with the new Blair Waterway Terminal more likely to occur in a 2015-2020 timeframe. Collectively, these expansions could add an additional 400 acres of container terminal area and 3.2 million TEUs of capacity assuming a medium density RTG operation. This would increase Tacoma's capacity to 7.4 million TEUs under a medium density operation or 3.5 times its existing container throughput.

Vancouver

The Vancouver Port Authority (VPA) owns three container terminals totaling 306 acres. The VPA estimates the capacity of these terminals to approximate 2.3 million TEUs. In 2005, the VPA handled 1.8 million TEUs. The VPA's three container terminals are:

- Centerm: operated by Dubai Ports World (formerly P&O Ports) under a long-term lease from the VPA. The facility is a multipurpose facility that handles containers and breakbulk forest products. The terminal includes 73 acres, 2,133 lineal feet of container berth and a contiguous intermodal rail yard. The terminal also has 220,000 square feet of shed space for handling pulp and four breakbulk berths which approximate 3,100 feet in length. Centerm estimates in container terminal capacity at 780,000 TEUs. This equates to 10,685 TEUs per gross terminal acre which approximates the low end of the average (excluding transshipment terminals) for Asian terminals.
- Vanterm: operated by TSI (subsidiary of OOIL) under a long-term lease from the VPA. The facility has 76 acres of property, 2,030 lineal feet of container berth and on-terminal rail. The VPA estimates Vanterm's capacity at 600,000 TEUs per year which equates to 7,895 TEUs per gross terminal acre. This is substantially less that Centerm's estimate, even though the Vanterm facility is slightly larger in container area than Centerm.
- Deltaport: operated by TSI (subsidiary of OOIL) under a long-term lease form the VPA. Deltaport has 160 acres, 2,198 lineal feet of berth and a large, on-terminal intermodal rail facility. The VPA estimates Deltaport's capacity at 900,000 TEUs which equates to 5,625 TEUs per gross terminal acre. This estimate is low compared to Centerm and Vanterm. However, in contrast to these two terminals, Deltaport is currently berth constrained rather than storage constrained.

Norbridge's estimate of VPA terminal capacity, using the same assumptions as for LA/LB, Seattle and Tacoma, is that same as the VPA, i.e. 2.3 million TEUs. The difference is

Norbridge estimates a lower capacity for Centerm (550,000 TEUs vs. 780,000 TEUs) and a higher capacity for Deltaport (1.2 million TEUs vs. 900,000 TEUs). As with Norbridge's other estimates, the Vancouver estimates are believed to be conservative and exclude consideration of the management and operational options cited above for improving terminal capacity.

There are currently three container terminal-related expansion initiatives underway in Vancouver. The first of these is the addition of a third berth and approximately 49 acres of backlands at Deltaport. The VPA estimates this project, which is scheduled for completion in 2009, would increase Deltaport's capacity to 1.3 million TEUs from the current 900,000 TEU estimate. Norbridge would estimate the expansion would increase capacity to 1.6 million to 1.7 million TEUs.

The second of the initiatives, which is not official, is the conversion of the Lynnterm breakbulk terminal to container operations. Lynnterm is a 135 acre terminal located on the north side of the inner harbor. It has 4,974 lineal feet of berth and currently handles a wide range of forest products. The concept plan is to convert Lynnterm to container operations in two phases with the first phase completed in a 2010 timeframe and the second phase in a 2012-2014 timeframe. Norbridge estimates the capacity of the proposed expansion, using the same methodology as the other ports, at 1.0 million TEUs. This estimate equates to 7,460 TEUs per gross terminal acre.

The third initiative is the development of a new terminal, Terminal 2, at or near the current Deltaport site. This terminal is currently in the concept phase of development and consequently the specifications are limited. The VPA estimates its capacity at 1.9 million TEUs with three berths. These estimates would imply it would approximate 200 acres or about the same size as the expanded Deltaport. Norbridge would estimate the size of the terminal to approximate 250 acres applying its methodology. Terminal 2 will likely face significant environmental and community opposition as well as major capital investment requirements. The timing of Terminal 2 is most likely in a 2015 to 2020 timeframe at the earliest.

Based on Norbridge's capacity estimates, the VPA's container terminal throughput is as follows:

- Today: 2.3 million TEUs
- By 2010: 3.9 million TEUs (Deltaport Berth 3)
- By 2015: 4.9 million TEUs (with both Phases of Lynnterm)

Prince Rupert

The Prince Rupert Port Authority, in conjunction with Maher Terminals and the Canadian National Railroad, is converting the existing Fairview Terminal from a multipurpose operation to a container operation. When completed in the third quarter of 2007, the terminal will have 58 acres, 1,300 feet of berth and on-terminal rail. Its estimated throughput is 500,000 TEUs based on a rail-road split of 95%-5% or less.

Phase II, which is currently estimated to become available in a 2010-2011 timeframe depending on demand, incorporates an additional 107 acres and 1,300 feet of berth. The estimated capacity for Phase II is 1,500,000 TEUs.

PNW Container Terminal Capacity

Norbridge's container terminal capacity estimates for the PNW ports are as follow:

- 2006: 10.2 million TEUs
- 2010: 16. 1 million TEUs (includes Prince Rupert Phase II)
- 2015: 17.9 million TEUs (includes Lynnterm but excludes VPA Terminal 2)

Oakland

The Port of Oakland (Oakland) handled 2.3 million TEUs in 2005. Historically, Oakland has fulfilled two roles: gateway for Northern California and a secondary export gateway for selected inland intermodal markets. Oakland's historic status as the second port of call on PSW services, in combination with a secondary emphasis on the part of the UP and BNSF vs. LA/LB, underlie Oakland's status as an export rail gateway. Although several carriers have called Oakland first on selected services and BNSF has increased its emphasis on serving Oakland, the port remains a secondary rail gateway to LA/LB.

Oakland owns nine container terminals which it leases to container shipping lines and terminal operators. Collectively, the nine terminals have aggregate berthing of 23,000 feet and 759 gross terminal acres. In contrast to LA/LB and the PNW ports, Oakland's terminals are comparatively small, i.e. averaging 84 acres. If the two largest terminals (APMT and OICT) are excluded, the average gross terminal acres are 65 acres. Oakland's container terminals include:

- Berths 20-24 (APMT): this facility is the second largest terminal in the port and primarily services Maersk and Horizon Lines. It has 4,433 lineal feet of berth and 158 acres.
- Berths 25-26 (Transbay Container Terminal): Transbay is a subsidiary of K-Line and the terminal serves the CKYH alliance. The terminal has 1,050 lineal feet of berth and 49.3 acres.
- Berth 30 (TRAPAC): TRAPAC is the terminal operating subsidiary of MOL and the terminal serves the New World Alliance. The terminal has 1,075 lineal feet of berth and 33.1 acres.
- Berth 32-34 (Outer Harbor Container Terminal): This terminal is currently vacant and used as an overflow by TRAPAC and the Ben E. Nutter (Marine Terminals Corporation) terminals. Over time, the Berth 32-34 facility is reportedly going to be split between TRAPAC and the Ben E. Nutter facilities as their respective volumes reach certain thresholds. The terminal has 2,481 lineal feet of berth and 65.3 acres.
- Berths 35-38 (Ben E. Nutter Container Terminal): this terminal is operated by Marine Terminals Corporation and primary serves Evergreen and portions of the CKYH alliance. The terminal has 3,213 lineal feet of berth and 58.1 acres.
- Berths 55 & 56 (Hanjin): the terminal is operated by Total Terminals Inc. which is a joint venture between Hanjin and Marine Terminals Corporation. Hanjin recently sold a majority of its interest in terminals to Macquarie Bank. The terminal serves the CKHY alliance. The terminal has 2,400 lineal feet of berth and 120 acres. It is the third largest terminal in the port.

- Berths 57-59 (Oakland International Container Terminal): The terminal is leased to SSA and serves the Grand Alliance, China Shipping and Zim among others. The terminal is the port's largest, with 3,600 lineal feet of berth and 146 acres.
- Berths 60-63 (APL): The terminal is leased to APL and serves the New World Alliance. The terminal has 2,743 lineal feet of berth and 79.4 acres. The terminal is currently undergoing a major renovation program.
- Berths 67 & 68 (Charles P. Howard Terminal): This terminal is currently vacant and its primary use is reportedly as overflow storage for empty containers. The terminal has 2,016 lineal feet of berth and 50.3 acres.

Two rail yards support the container terminals. The BNSF facility is located directly behind the TRAPAC, Hanjin and OICT terminals. It has 85 acres of property and a reported throughput capability of 300,000 lifts. The UP facility is located behind OICT and APL. It has 110 acres of property and a reported throughput of 450,000 lifts. Collectively, the two rail facilities have a combined lift capacity of 750,000 lifts or 1.3 million TEUs. This capacity represents 56.1 percent of Oakland's 2005 throughput. Historically, Oakland's rail volumes have averaged 25 percent or less of the total throughput. This would indicate Oakland has significant surplus rail terminal capacity although the BNSF facility has been reportedly operating near its capacity for several years.

Norbridge estimates the capacity of Oakland's existing facilities to approximate 6.0 million TEUs assuming a medium density RTG operation and average seven day dwell. This capacity exceeds the 2005 throughput by 260 percent.

Oakland's major expansion plan involves redeveloping the Oakland Army Base property. This property encompasses 366 acres of property that lies behind Berths 20-24. The property is jointly owned by the Oakland Reuse Authority and the Port of Oakland. The Port of Oakland reportedly has access to 226 acres that includes 170 acres of land area and 56 acres of submerged lands which are to be used for the Berth 21 development. The current plan calls for the development of a new intermodal rail facility (Outer Harbor Intermodal Terminal) and a new container terminal (Berth 21). The specific details of the size of the intermodal terminal and Berth 21 terminal are not currently available. The proposed rail terminal has the potential to significantly increase the BNSF's capacity in the port since the new terminal is designed to be integrated with the current Joint Intermodal Terminal (JIT) facility which is essentially a BNSF terminal. Give Norbridge's current estimate of existing terminal capacity, the Berth 21 project will only further increase the already significant surplus of container terminal capacity.

8 APPENDIX B: CONTEXT FOR GATEWAY INVESTMENT IN NORTH AMERICA

A key factor that will affect the risks associated with gateway investment in Alaska relates to the priorities for investment that have already been established across the continent. Many of the priorities established follow directly from national and sub-national policy initiatives related to gateway development brought about by the realization that the continued globalization of trade will necessitate improving capacity and efficiency at key gateways and corridors. This realization arose in part due to the capacity constraints that emerged in North American gateways in 2004. In general, the policies and priorities for gateway development that have been put in place work towards creating a risky investment profile for investment in an Alaskan gateway.

This section of the report outlines some of the key gateway and corridor policy initiatives already in place in Canada, the US and Mexico that will impact on the ultimate success of an Alaskan option.

Canada

Canada is in the process of establishing a national gateway and corridor policy that will have a significant impact on investment patterns in infrastructure development for the next several years. The overall object of the gateway and corridor policy is to create the conditions under which Canadian west coast ports will be able to capture increasing portions of the Asia-Pacific trade particularly trade destined for US markets. Currently, only 9% of Canada's container traffic serves US markets.

A major first element of this initiative is the Asia-Pacific Gateway and Corridor Initiative (APCGI). Announced in October of this year, by Transport Canada Minister Lawrence Cannon and David Emerson Minister of International Trade, the APGCI is a collaborative undertaking involving all levels of government (including all four western provinces) and the private sector. Essentially, the initiative consists of a number of separate infrastructure, transportation and border security projects focused on strengthening Canada's capacity for global competitiveness. This includes projects related port, rail, road and air infrastructure, as well as border security and the environment. Specifically, the APCGI seeks to:

- Boost Canada's commerce with the Asia-Pacific REGION;
- Increase the Gateway's share of North American container imports from Asia; and
- Improve the efficiency and reliability of the Gateway for Canadian and North American exports.

Asia-Pacific Gateway and Corridor Initiative

The immediate federal government financial commitment for the APGCI totals $591 million (CAD). This is coupled with approximately $3 billion in private sector commitments to the initiative. Although priority projects will be identified on an on-going basis, amongst current priorities are:

- Roberts Bank Railway Corridor – construction of road and rail grade separations to improve rail capacity to complement investments being made by the Vancouver Port Authority at Roberts Bank as well as investments made by CN and CP.
- Twinning of the Trans Canada Highway in Banff National Park – eliminate choke point in trucking between Vancouver and Calgary.
- South Fraser Perimeter Road and Deltaport Connector – east-west truck route to bypass municipal road networks and to allow free flow access between Deltaport and Highway 99.
- Dredging at Fraser River Port Authority – to sustain operation water depths for navigation and flood prevention.
- Intelligent Transportation Systems – traffic management centre for BC lower mainland to help improve traffic conditions with a specific view to improving international and inter-provincial goods movement.
- Border Service at Port of Prince Rupert – Customs Marine Terminal Program to ensure secure and efficient border services comparable to what exists at other high volume ports in Canada.
- Air Liberalization – Expanded air service agreements with China and India as well as a new Open Skies Agreement with the US.

These projects are complemented with a November 16, 2006 announcement of a $42 million commitment to enhance security at Canadian ports and marine facilities.

Although Canada's eventual national gateway and corridor policy will address the needs of Atlantic Canada, Quebec and Ontario, the APGCI demonstrates clearly Canada's commitment to, in the first instance, focus on enhancing the capacity and efficiency of west coast gateways and corridors from Vancouver to Prince Rupert. Secondly, it is important to note that private sector investment is complementing government expenditures.

US

The US does not have a comprehensive national gateway strategy, however, it is committing funds to corridor and gateway projects on a priority basis. One example is the Heartland Corridor Project.

Heartland Corridor Project

The Heartland Corridor project is designed to provide a seamless, efficient intermodal rail route that starts at the Port of Norfolk and terminates in Columbus, Ohio. In Columbus, Heartland Corridor trains will link up with western rail networks and/or the existing Norfolk Southern rail network that is double stacked cleared to Chicago. The money will be used to link existing rail systems, build new rail lines where needed and raise tunnel and bridge heights to allow for passage of Norfolk Southern's double-stacked trains.

The Heartland Project will increase the competitive position of the Port of Norfolk by cutting the rail route to the mid-west by 250 miles. The main highlights of the project are:

- Clears 28 tunnels and obstructions throughout Virginia, West Virginia and Kentucky to allow for double-stacked trains.

- Building of inter-modal facility at Pritchard, West Virginia.
- Building of inter-modal terminal capacity at Roanoke and Columbus.
- Western Freeway Rail Relocation – removal of at grade crossings in highly urbanized areas.

In addition to goods movement efficiencies the project will provide, it makes the Heartland Corridor more attractive for international cargo which, in turn, makes investment in a project dependent on the container trade in Alaska riskier due to the capacity enhancements it provides. In addition, the actual expansions planned at west coast ports described above coupled with future potential capacity improvements in both port and rail operations on the west coast adds to the risk profile for an Alaskan gateway.

Mexico

Considerable interest has been expressed recently in port and gateway investments on the west coast of Mexico. Already, port developments have been undertaken in Manzanillo and Lazaro Cardenas but interest has been expressed in investment in Punta Colonet as well. The object of these investments is to provide viable alternatives to LA/LB in the context of the potential for capacity constraints emerging there. The investments in these ports, while largely driven by major container operators is of great interest to the Mexican government who appears willing to enter into negotiations for concession agreements with the terminal operators. Between Lazaro Cardenas and Punta Colonet planned developments could add 7.2 million TEUs in terminal handling capacity on the west coast of North America. These developments, represent first mover investments based on preferred logistics options for the Asia-Pacific trade. Other options are secondary by definition.

Panama

The Third Set of Locks Project is a mega-project whose estimate costs run at over $5 billion (US) that will expand the Panama Canal more so than any previous expansion since the Canal's initial construction. The Panama Canal Authority proposed the project after years of study and the plan was presented to the people of Panama on April 24, 2006. The plan was approved by Panamanian citizens in a national referendum by 76.8% of votes on October 22, 2006. The project will double the canal's shipping capacity and could begin operations in 2014 or 2015..

The project will create a new lane of traffic along the Canal by constructing a new set of locks that will be able to accommodate the new generation of container ships – up to 10,000 TEUs. Importantly, the containerized cargo segment transiting the canal is now the largest and is expected to be the key driver of Canal growth in the future. Details of the project include the following integrated components:

- Construction of two lock complexes — one on the Atlantic side and another on the Pacific side — each with three chambers, which include three water-saving basins;
- Excavation of new access channels to the new locks and the widening of existing navigational channels; and,
- Deepening of the navigation channels and the elevation of Gatun Lake’s maximum operating level.

The main competition for the Panama Canal is the US intermodal system in the North Asia – US East Coast route. At present, the Panama Canal has a 38% share of this US East Coast market and this has been growing steadily since 1999. One of the main current advantages of the west coast intermodal option is the ability of the west coast ports to handle post-panamax ships. With an expanded Panama Canal system capable of handling post-panamax vessels, expectations in Panama are that it will be able to capture increasing amounts of the US East Coast container trade.

Should the expansion of the Panama Canal be completed, in addition to providing greater efficiencies to Asia-East Coast trade, the main impact will be to release capacity on west coast ports thereby creating greater levels of risk for investments dependent on the container trade in Alaska.

9 APPENDIX C: CANADIAN WEST COAST PORT DEVELOPMENTS

Port of Kitimat

- Private ice-free, sheltered deepwater passage and harbour handling 250-300 deep sea vessels/year
- 4 deep sea berths, 2 deepwater RO/RO barge facilities, ferry berth, seaplane aerodrome locations, tug and scheduled barge services
- 2863 hectares of industrially zoned harbour/back-up land available
  - 100 hectares fully serviced
  - 2032 hectares partially serviced
  - 730 hectares not serviced
- 11,660 hectares suitable for development
- Rail connection to CN/Illinois Central and other US alliances – 2520 miles and 108 hours to Chicago
- All development driven by private enterprise

Port Investments Known 2006 - 2010

1. Methanex Corporation – Kitimat terminals to continue the import of methanol to markets
2. Encana/Methanex terminal modifications – to increase condensate imports railed to Alberta oil sands producers
3. Eurocan Co-generation power project - -production of power using excess steam from paper mill
4. Alcan Expansion – subject to board approval
5. Cascadia Materials – marine terminal for aggregates export
6. Kitimat LNG
7. Pacific Trail Pipeline – expansion and flow reversal to North American gas interconnect
8. Enbridge Gateway project –marine terminals and tank farm for pipeline expansion used for bitumen and condensate
9. Pembina Pipeline – condensate pipeline and tank farm

Port of Prince Rupert

The Port Authority of Prince Rupert in partnership with the governments of British Columbia and Canada, Canadian National Railways and Maher Terminals and Logistics Inc. have announced plans to invest up to $175 million in the first phase of in the development of a 1.2 million TEU throughput container terminal at the Port of Prince Rupert. Phase 1 of the development plan is scheduled to begin in late 2005 with completion scheduled for early 2007. Upon completion, Phase 1 will have a throughput capacity of 500,000 TEUs per year.

Phase 2 is expected to be completed by 2009 and will add an additional 1.5 million TEU capacity. The investment profile for Phase 2 is not known at this time.

Phase 1 Detail

Phase 1 is to be built on 58 acres of land and have a capacity for handling 500,000 TEUs (twenty foot equivalent units) per year. Other elements of the plan include:

- A 400 metre quay with one shipping berth
- Water depth of 55 feet
- 3-4 super post-Panamax gantry cranes for container handling
- 7500 TEU container storage yard (stacked 4-high)
- Refrigerated container (reefer) stacks with 144 plugs
- 17,000 feet of rail on 3 sets of tracks
- Administrative buildings to accommodate Canada Border Service Agency, administration, long shore workers, maintenance and repair and security staff.[12]

Phase 2 Details

Phase 2 is to be built on 107 acres and have a handling capacity of 1.5million TEUs per year. Other aspects of Phase 2 include:

- An additional 1000 metres of quay and 2 berths
- An additional 18,000 TEU container storage yard
- An additional 200 reefer plugs
- 13,000 feet of additional rail track
- 12,000 foot departure track
- 8-12 super post-Panamax gantry cranes[13]

To accomplish the above, the development plan is to convert a major portion of the Fairview Terminal from a break-bulk facility to an intermodal terminal while maintaining limited bulk and break-bulk handling capabilities. The conversion of Fairview will include:

- Decommissioning terminal facilities that will not be used at the terminal site
- Construction of an 18.5 metre wide plied block extension to the existing wharf face
- Navigational dredging and placement of scour-protecting rip-rap at the birth
- Construction of a yard access overpass
- Installation of container crane rails, cranes and power service at the berth

[12] BC Ports Strategy and Prince Rupert/Port Edward Container Port Business Opportunities Study, Economic Growth Solutions, July 2005

[13] BC Ports Strategy and Prince Rupert/Port Edward Container Port Business Opportunities Study, Economic Growth Solutions, July 2005

- Installation of additional working and storage rail tracks for the intermodal yard
- Installation of new pavement infrastructure for the container storage yard
- Security infrastructure
- Ancillary utilities and services – i.e. electrical substation, lighting, water, sanitary and storm water management, fire protection, vehicle fuelling, fencing, and parking.

Current Conditions at PRP

The Port of Prince Rupert expects its first container vessel call in October of 2007. Cranes are scheduled to be delivered in July and with 5 shipping lines expected to call, PRP expects to be operating at its Phase 1 capacity of 500K TEU in the first year of operation. Announcements are expected to be made in the coming weeks as to which lines will be calling, the size of vessels they will be using and the service they will be providing.

Based on expectations of reaching the Phase 1 capacity, embarking on Phase 2 of the development plan is being moved forward. In addition, PRP is actively looking for backhaul opportunities including, specialty grains, beef, cotton from the southern US, and recycled paper.

10 APPENDIX D: SHIPPING COSTS

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1 EXISTING SERVICES

This Appendix examines the potential for the shipping lines on Transpacific routes to achieve savings in ship operating costs and transit times by using the port of Anchorage

The main features of the existing Transpacific services with which Anchorage would have to compete are as follows:

- There are about 50 services on the direct route between North American west coast ports and Far East ports - with only Maersk-Sealand/PONL handling over 10% of the total. The other main shipping groups are the CHKY alliance, the New World Alliance, the Grand Alliance and Maersk/PONL.
- The average number of port calls per service is about 8.
- The most frequent round voyage time is 5 weeks, i.e. 35 days. There are, however, three 28 day round voyage shuttle services – two run by CHKY from Shanghai and Busan, and one by Evergreen from Hong Kong
- The shortest time between the last port of call in Asia and the first in North America is 7-8 days. The main “last ports” in the Far East are Busan and Tokyo with Hong Kong and Yokohama next (see Table 1 for details).
- Ship capacities generally range from about 3500 TEU to 8000 TEU
- Ship speed is about 24-25 knots.

The transit times between the last Asian ports and the first north American ports range from 7 to 14 days, as shown in Table 1.

The transpacific traffic is dominated by the ports of LA and Long Beach, which account for 63% of the total traffic at the main ports in 2005 – Table 2.

Table 1

Shipping Line/Alliance	Last Asian Port	First US Port	Transit Time (days) Last Asian port to First US
CHKY	Busan	LB	9
Maersk	Busan	LA	11
New World Alliance	Busan	LB	8
New World Alliance	Busan	LA	10
Grand Alliance	Busan	LB	9
CSCL	Busan	Vancouver	8
CSCL	Busan	Vancouver	8
Zim	Busan	LA	11
CCNI	Busan	Vancouver	9
CHKY	HK	LB	11
Grand Alliance	HK	LB	11
Grand Alliance	HK	LA	11
Evergreen	HK	LA	12
Maersk	Kaohsiung	Tacoma	10
Grand Alliance	Kaohsiung	LA	11
Evergreen	Kaohsiung	LA	11
CHKY	Keeling	LA	10
Maersk	Kobe	LA	10
Evergreen	Nagoya	Tacoma	10
CHKY	Ningbo	LA	12
Evergreen	Ningbo	Oakland	13
Grand Alliance	Sendai	LA	8
CHKY	Shanghai	LB	12
Evergreen	Shimizu	LA	8
New World Alliance	Tokyo	LA	8
CHKY	Tokyo	Tacoma	7
CHKY	Tokyo	Seattle	8
CHKY	Tokyo	LB	8
New World Alliance	Tokyo	Tacoma	7
Grand Alliance	Tokyo	Seattle	

Evergreen	Tokyo	Tacoma	7
CSCL	Tokyo	LB	14
CHKY	Xiamen	LB	10
New World Alliance	Yantian	LA	12
CMA CGM	Yantian	LB	11
CCNI/Hamburg Sud	Yantian	LB	11
Maersk	Yokohama	Oakland	8
Maersk	Yokohama	LA	8
New World Alliance	Yokohama	LA	8
CHKY	Yokohama	Seattle	9

Source: Containerisation International

Table 2 The Port of Anchorage' s Main Competitors' Traffic Volumes, 2005

NORTH WEST COAST PORTS	
Tacoma	2,066
Seattle	2,088
Vancouver	1,767
Total north west	5,921
SOUTH WEST COAST PORTS	
Los Angeles	**7,485**
Long Beach	**6,710**
Oakland	2,273
Total south west	16,468
Total, 6 main West Coast ports	**22,389**

2 Assessing the Competitiveness: POA's Advantages

The sea distances between North American West Coast ports, including Anchorage, and the main Far East ports are shown in Table 3. Anchorages distance advantages relative to other North American ports are shown in Table 4. As shown, Anchorages advantage over the dominant ports of LA/LB is about 1500 nautical miles. The sea voyage times between North America west coast ports and the main Far East ports are given in Table 5. They assume vessel speed of 24.5 knots. Anchorage's sea voyage time advantages relative to other North American ports are given in Table 6.

Table 3 Sea Distances (N miles)

From:	Yokohama	Kobe	Shanghai	HK
To:				
Anchorage	3,320	3,596	4,173	4,830
LA/LB	***4,842***	***5,137***	***5,708***	***6,363***
Prince Rupert	3,825	4,101	4,678	5,355
Vancouver	4,284	4,554	5,114	5,760
New York	**10,587**	**10,867**	**11,471**	**11,587**

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Table 4 Anchorage's Distance Advantages (N Miles)

From:	Yokohama	Kobe	Shanghai	HK
To:				
Anchorage	…	…	…	…
LA/LB	***1,522***	***1,541***	***1,535***	***1,533***
Prince Rupert	505	505	505	525
Vancouver	964	958	941	930
New York	**7,267**	**7,271**	**7,298**	**6,757**

Table 5 Sea Voyage Times (days, one direction)

From:	Yokohama	Kobe	Shanghai	HK
To:				
Anchorage	5.6	6.1	7.1	8.2
LA/LB	***8.2***	***8.7***	***9.7***	***10.8***
Prince Rupert	6.5	7.0	8.0	9.1
Vancouver	7.3	7.7	8.7	9.8
New York	**18.0**	**18.5**	**19.5**	**19.7**

Table 6 Anchorage's Sea Voyage Time Advantages (days, one direction)

From:	Yokohama	Kobe	Shanghai	HK
To:				
Anchorage	…	…	…	…
LA/LB	***2.59***	***2.62***	***2.61***	***2.61***
Prince Rupert	0.86	0.86	0.86	0.89
Vancouver	1.64	1.63	1.60	1.58
New York	**12.36**	**12.37**	**12.41**	**11.49**

3 SHIPPING COSTS

The costs of serving Far-East/US West Coast routes via Anchorage and competing ports are calculated in detail in Appendix I and summarised in Table 7[14].

Table 7 Shipping Costs, $/TEU, in One Direction ($ per TEU)

		2000 TEU	4000 TEU	6000 TEU	8000 TEU
Anchorage					
	Kobe	***622***	***550***	584	579
	Yokohama	***617****	***546***	532	497
	Hong Kong	***605***	***592***	563	547
	Shanghai	***563***	***490***	523	499
Prince Rupert					
	Kobe	649	576	609	585
	Yokohama	644	571	605	582
	Hong Kong	821	808	764	740
	Shanghai	572	572	530	506
Vancouver					
	Kobe	736	736	694	670
	Yokohama	731	657	690	666
	Hong Kong	903	814	850	819
	Shanghai	659	657	614	590
LA/LB					
	Kobe	747	745	702	***678***
	Yokohama	742	740	698	***674***
	Hong Kong	915	814	835	***804***
	Shanghai	765	667	688	***659***
New York					
	Kobe	851	779	731	725
	Yokahama	846	775	745	704
	Hong Kong	1,068	934	877	847
	Shanghai	1,183	1,007	927	882

* This could be reduced to $520 if ship speed were raised to 25.5 knots instead of the 24.5 knots assumed for all other routes.
See Appendix I for details. The costs in the table above include:
(a) ship operating costs at sea and in port;
(b) the cost of the containers;
(c) terminal handling charges; and (d) port charges

[14] The assumptions are listed in the tables in this Appendix I, and at the end of the Appendix.

4 Conclusions and Signposts

The main conclusions to be drawn from Table 7 are as follows:

First, the maximum cost advantage of Anchorage over their main competitors, LA/LB, is, ***for any given ship size,*** around $200 per TEU. In most cases, however, Anchorage's advantage is lower, because the services calling at competing North America West Coast (NAWC) ports, especially LA/LB, would generally use larger ships that those likely to call at Anchorage, giving the other ports economies of size. For example, the 2000-4000 TEU likely to be used at Anchorage would not be competing with 2000-4000 TEU ships but 6000-8000 TEU ships, at LA/LB. Taking his into account, Anchorage's advantage is reduced.

Second, there is not, however a smooth and consistent pattern behind the cost comparisons. The main reasons for the apparently uneven pattern are that:

a) The benefits of ship time resulting from shorter sea distances cannot always be "used". This is because services are almost always scheduled to take a certain number of *weeks* - typically 4, 5 or 6 weeks. For example, on route 3 in Appendix I the 2000TEU vessel would have only 1.4 days of surplus time while the 4000 TEU ship would have 5.2 days. But the 4000 TEU ship would not be able to exploit this spare time, as the saving is insufficient to introduce a 21 day, rather than a 28 day, round trip (see Note 2 at the end of this section).

b) Terminal handling charges vary widely between ports (see assumptions at the end of Appendix I)

Third, Anchorage can save 1.6-2.6 days transit time, relative to LA/LB and Vancouver respectively.

Strategic Issue:

Neither the cost nor the transit time savings are likely to be sufficient to offset the additional rail costs and transit time – there are major service and time challenges facing the ACRL port – rail offer for inbound transpacific container trade.

SHIPPING LINE COSTS (16 routes)

ROUTE:	1	**Kobe-Anchorage-Kobe**			
To					
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		2000	4000	6000	8,000
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		3,596	3,596	3,596	3,596
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		12.2	12.2	12.2	12.2
Additional sea time for other ports		5.6	2.4	6.2	6.3
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	21	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		509,253	778,762	1,002,897	1,214,399
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		241,975	349,009	791,122	938,337
Ship costs per voyage (both legs)		751,228	1,127,772	1,794,020	2,152,736
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	324,895	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a		1,005,676	1,636,667	2,719,810	3,387,124
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		387	315	349	326
Handling costs ($/TEU)					

THC Anchorage		121	121	121	121
THC Kobe		132	132	132	132
TOTAL COST, $ PER TEU		640	568	602	579
Transit time to USWC (days)		8	9	11	11

Assumptions on next page and note at end of this Appendix.

	ASSUMPTIONS (i)					
1	***SHIP OPERATING COSTS***					
	Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
	Construction Cost ($ mn)		35.0	58.3	78.2	96.0
	Annual Operating Costs ($000)					
	Capital costs p.a. (a) (b)		*4,833*	*8,056*	*10,793*	*13,257*
	Insurance		*700*	*1,167*	*1,563*	*1,920*
	Maintenance and repair		*875*	*1,458*	*1,954*	*2,400*
	Crew		*1,250*	*1,250*	*1,250*	*1,250*
	Others		*2,000*	*2,000*	*2,000*	*2,000*
	Total p.a.		***9,658***	***13,931***	***17,560***	***20,827***
	Daily cost in port		***27,595***	***39,802***	***50,170***	***59,506***
	Fuel cost per day at sea		*14,040*	*23,868*	*31,824*	*39,780*
	Daily cost at sea		***41,635***	***63,670***	***81,994***	***99,286***
2	***CONTAINER COSTS***					
	Ship Capacity (TEU)		***2000***	***4000***	***6000***	***8000***
	No of sets of containers		*3*	*3*	*3*	*3*
	Containers per ship		*6,000*	*12,000*	*18,000*	*24,000*
	Container purchase price ($ per TEU)		*2000*	*2000*	*2000*	*2000*
	Cost of containers		*12,000,000*	*24,000,000*	*36,000,000*	*48,000,000*
	Capital Costs p.a.		2,167,461	4,334,923	6,502,384	8,669,846
	Insurance p.a		240,000	480,000	720,000	960,000
	M&R p.a		300,000	600,000	900,000	1,200,000
	Container cost p.a.		2,707,461	5,414,923	8,122,384	10,829,846
	Container costs S per day		*7,736*	*15,471*	*23,207*	*30,942*

Assumptions continued…..

3	***OTHER ASSUMPTIONS***					
	Ship length(metres)	200	*250*	*300*	*350*	
	Handling speeds(TEU/day)					
		2448	*3060*	*3672*	*4,284*	
		2142	*2142*	*2142*	*2,356*	
	No of port calls per voyage	*4*	*4*	*4*	*8*	
	Port Charges(port dues, tugs, pilots) $ per GT	*0.5*	*0.5*	*0.5*	*0.5*	
	Canal charges	*n.a*	*n.a*	*n.a*	*n.a*	
	Assumptions for Ship Operating Costs:					
	Interest (%)	*12.5%*	*12.5%*	*12.5%*	*12.5%*	
	Life (years)	*20*	*20*	*20*	*20*	
	Annual capital cost factor	*0.1381*	*0.1381*	*0.1381*	*0.1381*	
	Insurance, % of ship building cost	*2.0%*	*2.0%*	*2.0%*	*2.0%*	
	M&R, % of ship construction cost	*2.5%*	*2.5%*	*2.5%*	*2.5%*	
	Crew ($ mn) (Philippine, Indian)	*1.25*	*1.25*	*1.25*	*1.25*	
	Fuel price ($/tonne)	*150*	*150*	*150*	*150*	
	BHP	*30,000*	*51,000*	*68,000*	*85,000*	
	Fuel consumption, kg/BHP/hour	*0.13*	*0.13*	*0.13*	*0.13*	
	Daily fuel consumption (tonnes)	*94*	*159*	*212*	*265*	
	Daly fuel cost at sea	*14,040*	*23,868*	*31,824*	*39,780*	
	Assumptions for Container Costs:					
	Interest (%)	12.5%	12.5%	12.5%	12.5%	
	Life of containers (years)	10	10	10	10	
	Annual capital costs factor	0.1806	0.1806	0.1806	0.1806	
	Insurance	2.0%	2.0%	2.0%	2.0%	
	M&R	2.5%	2.5%	2.5%	2.5%	

ROUTE:	2	Yokahama-Anchorage-Yokahama			
To					

Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		2000	4000	6000	8,000
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		3,320	3,320	3,320	3,320
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		11.3	11.3	11.3	11.3
Additional sea time for other ports		6.5	3.4	0.2	0.2
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	21	21	21
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		470,167	718,991	925,923	1,121,192
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		267,881	386,374	487,028	577,656
Ship costs per voyage (both legs)		738,048	1,105,365	1,412,951	1,698,848
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	324,895	487,343	649,791
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a		992,496	1,614,260	2,176,294	2,716,638
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		382	310	279	261
Handling costs ($/TEU)					
THC Anchorage		121	121	121	121
THC Yokahama		132	132	132	132

TOTAL COST, $ PER TEU		635	563	532	514
Transit time to USWC (days)		7	9	10	10

For assumptions see notes to Route 1

ROUTE:	3	Hong Kong-Anchorage-Hong Kong			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		2000	4000	6000	8,000
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		4,830	4,830	4,830	4,830
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		16.4	16.4	16.4	16.4
Additional sea time for other ports		1.4	5.2	2.0	2.1
Transit time for Canal		0	0	0	0
Time in port (days)		1.3	2.6	3.9	3.4
		1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	28	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		684,008	1,046,002	1,347,051	1,631,131
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		126,150	460,562	580,543	688,572
Ship costs per voyage (both legs)		810,158	1,506,564	1,927,594	2,319,704
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voygae		162,448	433,194	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a		1,064,606	2,123,758	2,853,384	3,554,091
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		409	408	366	342

Handling costs ($/TEU)					
THC Anchorage		121	121	121	121
THC Hong Kong		185	185	185	185
TOTAL COST, $ PER TEU		716	715	672	648
Transit time to USWC (days)		10	11	13	13

For assumptions see notes to Route 1

ROUTE:	4	Shanghai-Anchorage-Shanghai			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		4,173	4,173	4,173	4,173
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		14.2	14.2	14.2	14.2
Additional sea time for other ports		3.6	0.5	4.3	4.3
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	21	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		590,966	903,719	1,163,818	1,409,257
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		187,817	270,895	692,659	821,551
Ship costs per voyage (both legs)		**778,783**	**1,174,615**	**1,856,477**	**2,230,808**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	324,895	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000

TOTAL Ship and Container costs p.a.		1,033,231	1,683,510	2,782,268	3,465,195
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**397**	**324**	**357**	**333**
Handling costs ($/TEU)					
THC Anchorage		121	121	121	121
THC Shanghai		45	45	45	45
TOTAL COST, $ PER TEU		**563**	**490**	**523**	**499**
Transit time to USWC (days)		9	10	12	12

For assumptions see notes to Route 1

ROUTE:	**5**	**Kobe- Prince Rupert- Kobe**			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		4,101	4,101	4,101	4,101
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		13.9	13.9	13.9	13.9
Additional sea time for other ports		3.9	0.7	4.5	4.6
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	21	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		580,770	888,127	1,143,738	1,384,942
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		194,575	280,642	704,945	836,124
Ship costs per voyage (both legs)		**775,345**	**1,168,769**	**1,848,683**	**2,221,066**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	324,895	649,791	866,388

Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		1,029,792	1,677,665	2,774,474	3,455,453
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**396**	**323**	**356**	**332**
Handling costs ($/TEU)					
THC Kobe		132	132	132	132
THC Prince Rupert		121	121	121	121
TOTAL COST, $ PER TEU		**649**	**576**	**609**	**585**
Transit time to USWC (days)		9	10	12	12

For assumptions see notes to Route 1

ROUTE:	**6**	**Yokohama- Prince Rupert- Yokahama**			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		3,825	3,825	3,825	3,825
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		13.0	13.0	13.0	13.0
Additional sea time for other ports		4.8	1.6	5.5	5.5
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	21	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		541,684	828,355	1,066,764	1,291,734
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		220,481	318,007	752,044	891,987
Ship costs per voyage (both legs)		**762,164**	**1,146,363**	**1,818,808**	**2,183,721**

Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	324,895	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		1,016,612	1,655,258	2,744,598	3,418,109
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**391**	**318**	**352**	**329**
Handling costs ($/TEU)					
THC Yokohama		132	132	132	132
THC Prince Rupert		121	121	121	121
TOTAL COST, $ PER TEU		**644**	**571**	**605**	**582**
Transit time to USWC (days)		8	10	11	11

For assumptions see notes to Route 1

ROUTE:	**7**	**HK- Prince Rupert- HK**			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		5,355	5,355	5,355	5,355
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		18.2	18.2	18.2	18.2
Additional sea time for other ports		6.6	3.4	0.3	0.3
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		28	28	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		758,357	1,159,698	1,493,469	1,808,428
Cost of transit time for Canal		0	0	0	0

Cost of ship time in port	270,040	389,488	490,953	582,311
Ship costs per voyage (both legs)	**1,028,397**	**1,549,185**	**1,984,422**	**2,390,740**
Container cost per ship day	7,736	15,471	23,207	30,942
Container costs per voyage	216,597	433,194	649,791	866,388
Canal transit charges	0	0	0	0
Port entry dues	92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.	1,336,994	2,166,379	2,910,213	3,625,127
Load Factor (including both directions)	65%	65%	65%	65%
SHIPPING COSTS, $ per TEU	**514**	**417**	**373**	**349**
Handling costs ($/TEU)				
THC Hong Kong	185	185	185	185
THC Prince Rupert	121	206	206	206
TOTAL COST, $ PER TEU	**821**	**808**	**764**	**740**

For assumptions see notes to Route 1

ROUTE:	**8**	**Shanghai-Prince Rupert-Shanghai**			
Total number of ports on route		**8**			
Via (canal/direct**)**		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		4,678	4,678	4,678	4,678
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		15.9	15.9	15.9	15.9
Additional sea time for other ports		1.9	5.7	2.6	2.6
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	28	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		662,483	1,013,084	1,304,659	1,579,800
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		140,417	481,140	606,481	719,338
Ship costs per voyage (both legs)		**802,899**	**1,494,224**	**1,911,140**	**2,299,137**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	433,194	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		1,057,347	2,111,418	2,836,931	3,533,525
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**407**	**406**	**364**	**340**
Handling costs ($/TEU)					
THC Shanghai		45	45	45	45
THC Prince Rupert		121	121	121	121
TOTAL COST, $ PER TEU		**572**	**572**	**530**	**506**

For assumptions see notes to Route 1

ROUTE:	9	Kobe- Vancouver- Kobe			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		4,554	4,554	4,554	4,554
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		15.5	15.5	15.5	15.5
Additional sea time for other ports		2.3	6.2	3.0	3.0
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	28	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		644,922	986,230	1,270,076	1,537,924
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		152,056	497,927	627,642	744,435
Ship costs per voyage (both legs)		**796,978**	**1,484,157**	**1,897,718**	**2,282,359**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	433,194	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		1,051,425	2,101,351	2,823,509	3,516,747
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**404**	**404**	**362**	**338**
Handling costs ($/TEU)					
THC Kobe		132	132	132	132
THC Vancouver		200	200	200	200
TOTAL COST, $ PER TEU		**736**	**736**	**694**	**670**
Transit time to USWC (days)		9	11	13	12

For assumptions see notes to Route 1

ROUTE:	10	**Yokohama-Vancouver- Yokohama**			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		4,264	4,264	4,264	4,264
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		14.5	14.5	14.5	14.5
Additional sea time for other ports		3.3	0.1	4.0	4.0
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	21	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		603,853	923,427	1,189,198	1,439,988
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		179,276	258,575	677,130	803,132
Ship costs per voyage (both legs)		**783,129**	**1,182,002**	**1,866,327**	**2,243,121**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	324,895	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		1,037,576	1,690,898	2,792,118	3,477,508
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**399**	**325**	**358**	**334**
Handling costs ($/TEU)					
THC Yokohama=		132	132	132	132
THC Vancouver		200	200	200	200
TOTAL COST, $ PER TEU		**731**	**657**	**690**	**666**

For assumptions see notes to Route 1

ROUTE:	11	Hong Kong-Vancouver- Hong Kong			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		5,760	5,760	5,760	5,760
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		19.6	19.6	19.6	19.6
Additional sea time for other ports		5.2	2.1	5.9	5.9
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		28	28	35	35
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		815,712	1,378,499	2,088,905	2,534,492
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		232,026	252,709	477,813	563,696
Ship costs per voyage (both legs)		**1,047,737**	**1,631,208**	**2,566,718**	**3,098,188**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		216,597	433,194	812,238	1,082,985
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		1,356,334	2,248,402	3,654,956	4,549,172
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**522**	**432**	**469**	**437**
Handling costs ($/TEU)					
THC Hong Kong		182	182	182	182
THC Vancouver		200	200	200	200

TOTAL COST, $ PER TEU	**903**	**814**	**850**	**819**
Transit time to USWC (days)	11	13	15	15

For assumptions see notes to Route 1

ROUTE:	**12**	**Shanghai-Vancouver-Shanghai**			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		5,114	5,114	5,114	5,114
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		17.4	17.4	17.4	17.4
Additional sea time for other ports		0.4	4.3	1.1	1.1
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	28	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		724,227	1,107,506	1,426,256	1,727,041
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		99,493	422,114	532,079	631,090
Ship costs per voyage (both legs)		**823,721**	**1,529,620**	**1,958,335**	**2,358,131**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	433,194	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		1,078,168	2,146,814	2,884,126	3,592,518
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**415**	**413**	**370**	**345**
Handling costs ($/TEU)					
THC Shanghai		45	45	45	45

THC Vancouver		200	200	200	200
TOTAL COST, $ PER TEU		**659**	**657**	**614**	**590**
Transit time to USWC (days)		10	12	13	13

For assumptions see notes to Route 1

ROUTE:	**13**	**Kobe-LA/LB- Kobe**			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		5,137	5,137	5,137	5,137
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		17.5	17.5	17.5	17.5
Additional sea time for other ports		0.4	4.2	1.0	1.1
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	28	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		727,485	1,112,487	1,432,671	1,734,808
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		97,334	419,001	528,154	626,435
Ship costs per voyage (both legs)		**824,819**	**1,531,487**	**1,960,825**	**2,361,243**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	433,194	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		1,079,267	2,148,681	2,886,616	3,595,630
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**415**	**413**	**370**	**346**

Handling costs ($/TEU)					
THC Kobe		132	132	132	132
THC Long Beach		200	200	200	200
TOTAL COST, $ PER TEU		**747**	**745**	**702**	**678**
Transit time to USWC (days)		10	12	13	13

For assumptions see notes to Route 1

ROUTE:	**14**	**Yokohama-LA/LB- Yokohama**			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		4,842	4,842	4,842	4,842
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		16.5	16.5	16.5	16.5
Additional sea time for other ports		1.4	5.2	2.0	2.1
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		21	28	28	28
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		685,708	1,048,600	1,350,397	1,635,184
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		125,024	458,938	578,495	686,144
Ship costs per voyage (both legs)		**810,731**	**1,507,538**	**1,928,893**	**2,321,327**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		162,448	433,194	649,791	866,388
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		1,065,179	2,124,732	2,854,683	3,555,715
Load Factor (including both directions)		65%	65%	65%	65%

SHIPPING COSTS, $ per TEU		**410**	**409**	**366**	**342**
Handling costs ($/TEU)					
THC Yokohama		132	132	132	132
THC Long Beach		200	200	200	200
TOTAL COST, $ PER TEU		**742**	**740**	**698**	**674**
Transit time to USWC (days)		10	11	13	13

For assumptions see notes to Route 1

ROUTE:	**15**	**Hong Kong-LA/LB- Hong Kong**			
Total number of ports on route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		6,363	6,363	6,363	6,363
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		21.6	21.6	21.6	21.6
Additional sea time for other ports		3.2	0.0	3.8	3.9
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		28	28	35	35
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		901,107	1,377,994	1,774,593	2,148,838
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		175,427	253,025	670,133	794,834
Ship costs per voyage (both legs)		**1,076,534**	**1,631,018**	**2,444,726**	**2,943,672**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		216,597	433,194	812,238	1,082,985
Canal transit charges		0	0	0	0
Port entry dues		92,000	184,000	276,000	368,000

TOTAL Ship and Container costs p.a		1,385,131	2,248,212	3,532,964	4,394,656
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**533**	**432**	**453**	**423**
Handling costs ($/TEU)					
THC Hong Kong		182	182	182	182
THC Long Beach		200	200	200	200
TOTAL COST, $ PER TEU		**915**	**814**	**835**	**804**
Transit time to USWC (days)		12	14	16	16

For assumptions see notes to Route 1

ROUTE:	**16**	**Shanghai-LA/LB- Shanghai**			
Total Number of Ports on Route		**8**			
Via (canal/direct)		**(direct)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		5,708	5,708	5,708	5,708
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		19.4	19.4	19.4	19.4
Additional sea time for other ports		5.4	2.2	6.1	6.1
Transit time for Canal		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		28	28	35	35
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		808,348	1,236,144	1,591,918	1,927,639
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		236,906	341,699	781,907	927,407
Ship costs per voyage (both legs)		**1,045,254**	**1,577,843**	**2,373,825**	**2,855,046**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		216,597	433,194	812,238	1,082,985

Canal transit charges	0	0	0	0
Port entry dues	92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.	1,353,851	2,195,037	3,462,064	4,306,031
Load Factor (including both directions)	65%	65%	65%	65%
SHIPPING COSTS, $ per TEU	**521**	**422**	**444**	**414**
Handling costs ($/TEU)				
THC Shanghai	45	45	45	45
THC Long Beach	200	200	200	200
TOTAL COST, $ PER TEU	**765**	**667**	**688**	**659**
Transit time to USWC (days)	11	13	14	14

For assumptions see notes to Route 1

ROUTE:	**17**	**Kobe-New York-Kobe**			
Total number of ports on route		**8**	8		
Via (canal/direct)		**(canal)**			
Ship Capacity (TEU)		2000	4000	6000	8,000
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		10,867	10,867	10,867	10,867
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		37.0	37.0	37.0	37.0
Additional sea time for other ports		1.9	5.7	2.5	2.6
Transit time for Canal**		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		42	49	49	49
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		1,538,948	2,353,396	3,030,725	3,669,877
Cost of transit time for Canal (included in additional sea time for other ports above)	**	0	0	0	0

Cost of ship time in port		139,009	479,109	603,922	716,302
Ship costs per voyage (both legs)		1,677,957	2,832,505	3,634,646	4,386,178
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		324,895	758,089	1,137,134	1,516,178
Canal transit charges		200,000	400,000	600,000	800,000
Port entry dues		46,000	92,000	138,000	368,000
TOTAL Ship and Container costs p.a.		2,248,852	4,082,594	5,509,780	7,070,357
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		865	785	706	680
Handling costs ($/TEU)					
THC New York		150	150	150	150
THC Kobe		132	132	132	132
TOTAL COST, $ PER TEU		1,147	1,067	988	962
Transit time to USWC (days)		20	22	23	23

**Transit time could have been shown, as one day, but the costs remain the same because the canal time would not be additional to the total voyage time, but taken out of the slack time (i.e. "additional time for other ports") i.e. ,if there were 5 slack days on a route to New York, one of those days would be used for the canal, leaving only four slack days.

ROUTE:	**18**	**Yokahama-New York-Yokahama**			
Total number of ports on route		**8**			
Via (canal/direct)		**(canal)**			
Ship Capacity (TEU)		2000	4000	6000	8,000
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		10,587	10,587	10,587	10,587
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		36.0	36.0	36.0	36.0
Additional sea time for other ports		2.8	6.6	3.5	3.5
Transit time for Canal**		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		42	49	49	49

Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		1,499,295	2,292,758	2,952,635	3,575,318
Cost of transit time for Canal (included in additional sea time for other ports above)		0	0	0	0
Cost of ship time in port		165,290	517,016	651,703	772,974
Ship costs per voyage (both legs)		1,664,585	2,809,773	3,604,338	4,348,293
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		324,895	758,089	1,137,134	1,516,178
Canal transit charges		200,000	400,000	600,000	800,000
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a		2,281,481	4,151,863	5,617,472	7,032,471
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		877	798	720	676
Handling costs ($/TEU)					
THC N York		150	150	150	150
THC Yokahama		132	132	132	132
TOTAL COST, $ PER TEU		1,159	1,080	1,002	958
Transit time to USWC (days)		20	21	23	23

**Transit time could have been shown, as one day, but the costs remain the same because the canal time would not be additional to the total voyage time, but taken out of the slack time (i.e. “additional time for other ports”) i.e. ,if there were 5 slack days on a route to New York, one of those days would be used for the canal, leaving only four slack days.

ROUTE:	19	Hong Kong-New York-Hong Kong		
Total number of ports on route	**8**			
Via (canal/direct)	**(canal)**			
Ship Capacity (TEU)	**2000**	**4000**	**6000**	**8,000**
GRT	23,000	46,000	69,000	92,000
Route Distance (n miles)	11,587	11,587	11,587	11,587
Ship speed (knots)	24.5	24.5	24.5	24.5
Sea Time to link main ports (days)	39.4	39.4	39.4	39.4
Additional sea time for other ports	6.4	3.2	0.1	0.1
Transit time for Canal**	0	0	0	0
Time in port (days)	1.3	2.6	3.9	3.4
	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)	49	49	49	49
Ship cost per day in port	13,886	16,952	19,557	21,903
Ship cost per day at sea	27,926	40,820	51,381	61,683
Cost of ship time at sea	1,100,596	1,608,795	2,025,020	2,431,018
Cost of transit time for Canal*	0	0	0	0
Cost of ship time in port	133,142	162,547	187,525	210,014
Ship costs per voyage (both legs)	**1,233,738**	**1,771,342**	**2,212,544**	**2,641,032**
Container cost per ship day	7,736	15,471	23,207	30,942
Container costs per voyage	379,045	758,089	1,137,134	1,516,178
Canal transit charges	200,000	400,000	600,000	800,000
Port entry dues	92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.	1,904,783	3,113,431	4,225,678	5,325,210
Load Factor (including both directions)	65%	65%	65%	65%
SHIPPING COSTS, $ per TEU	**733**	**599**	**542**	**512**
Handling costs ($/TEU)				
THC New York	150	150	150	150
THC Hong Kong	185	185	185	185
TOTAL COST, $ PER TEU	**1,068**	**934**	**877**	**847**
Transit time to USWC (days)	21	23	24	24

**Transit time could have been shown, as one day, but the costs remain the same because the canal time would not be additional to the total voyage time, but taken out of the slack time (i.e. “additional time for other ports”) i.e. ,if there were 5 slack days on a route to New York, one of those days would be used for the canal, leaving only four slack days.

ROUTE:	20	Shanghai-New York-Shanghai			
Total number of ports on route		**8**			
Via (canal)		**(canal)**			
Ship Capacity (TEU)		**2000**	**4000**	**6000**	**8,000**
GRT		23,000	46,000	69,000	92,000
Route Distance (n miles)		11,471	11,471	11,471	11,471
Ship speed (knots)		24.5	24.5	24.5	24.5
Sea Time to link main ports (days)		39.0	39.0	39.0	39.0
Additional sea time for other ports		6.8	3.6	0.5	0.5
Transit time for Canal**		0	0	0	0
Time in port (days)	Origin	1.3	2.6	3.9	3.4
	Destination	1.9	3.7	5.6	6.1
Total round voyage time (days) (a)		49	49	49	49
Ship cost per day in port		27,595	39,802	50,170	59,506
Ship cost per day at sea		41,635	63,670	81,994	99,286
Cost of ship time at sea		1,624,484	2,484,200	3,199,176	3,873,853
Cost of transit time for Canal		0	0	0	0
Cost of ship time in port		275,484	397,340	500,851	594,051
Ship costs per voyage (both legs)		**1,899,968**	**2,881,540**	**3,700,026**	**4,467,903**
Container cost per ship day		7,736	15,471	23,207	30,942
Container costs per voyage		379,045	758,089	1,137,134	1,516,178
Canal transit charges		200,000	400,000	600,000	800,000
Port entry dues		92,000	184,000	276,000	368,000
TOTAL Ship and Container costs p.a.		2,571,012	4,223,629	5,713,160	7,152,082
Load Factor (including both directions)		65%	65%	65%	65%
SHIPPING COSTS, $ per TEU		**989**	**812**	**732**	**688**
Handling costs ($/TEU)					
THC New York		150	150	150	150
THC Shanghai		45	45	45	45
TOTAL COST, $ PER TEU		**1,183**	**1,007**	**927**	**882**
Transit time to USWC (days)		21	23	24	24

**Transit time could have been shown, as one day, but the costs remain the same because the canal time would not be additional to the total voyage time, but taken out of the slack time (i.e. “additional time for other ports”) i.e. ,if there were 5 slack days on a route to New York, one of those days would be used for the canal, leaving only four slack days.

ADDITIONAL ASSUMPTIONS FOR SHIPPING COSTS

- Container costs. As a working rule ships have three sets of containers - one on the ship and one set on land at each end of the route.
- Terminal handling charges vary widely. Current THCs are as follows:

($/TEU, based on half of the charge per FEU)

LA/LB	200
Vancouver	200
Kobe	132
Yokohama	132
Shanghai	45
Hong Kong	185
Anchorage	121 (assumed 60% of LA/LB)
Prince Rupert	121 (assumed 60% of LA/LB)

- Fuel consumption is at 0.13 kg. per brake horsepower per hour. The BHP required for a given speed has to increase by 60% of an increase in vessel size. (To increase speed, however, the engine size has to increase by the square of the speed increase: e.g. a increase of 20% in speed requires an increase in brake horse power of 1.44 (1.2 x 1.2).
- Vessel handling speeds are dependent on ship length, as more cranes are normally deployed on a longer ship.

11 APPENDIX E: COMPARATIVE THROUGH COSTS – ANCHORAGE VERSUS NEW YORK TO CHICAGO

Shipping, Port and Rail Costs to Chicago from Shanghai and Hong Kong

	COSTS per TEU……………………………………………….			**TRANSIT TIME DAYS)…….**		
	Cost in most likely ship (a)	***Rail to Chicago***	***Total Cost $/TEU***	**Sea**	**Rail (b)**	***Total***
Shanghai to Chicago, via:						
Anchorage	***490***	***1,367***	***1,856***	**10**	**7**	***17***
NY via Panama	***1,013***	***384***	***1,397***	**23**	**3**	***26***
NY via Suez	***1,095***	***384***	***1,479***	**26**	**3**	***29***
Vancouver, direct	***614***	***804***	***1,419***	**13**	**5**	***18***
LA/LB, direct	***659***	***750***	***1,409***	**14**	**5**	***19***
Hong Kong to Chicago, via:						
Anchorage	***592***	***1,367***	***1,959***	**11**	**7**	***18***
NY via Panama	***1,156***	***384***	***1,539***	**23**	**3**	***26***
NY via Suez	***1,150***	***384***	***1,533***	**23**	**3**	***26***
Vancouver, direct	***854***	***804***	***1,658***	**13**	**5**	***18***
LA/LB, direct	***808***	***750***	***1,558***	**16**	**5**	***20***

(a) See Table 2 for most likely ship size, in red
(b) Average speed, miles per hour: 35
Days at each end 1

Table 2 Shipping and Ports Costs
(most likely ship size in red)

	2000	**4000**	**6000**	**8000**
Shanghai to Chicago, via				
Anchorage	563	490	523	499
NY via Panama	1,190	1,013	999	949
NY via Suez	1,200	1,095	1,005	955
Vancouver, direct	659	657	614	590
LA/LB, direct	765	667	688	659
Hong Kong to Chicago, via				
Anchorage	605	592	563	547
NY via Panama	1,333	1,156	1,076	1,031
NY via Suez	1,326	1,150	1,135	1,086
Vancouver, direct	907	818	854	823
LA/LB, direct	918	818	838	808

Distances by Rail : Western Ports to Chicago

	to Chicago (miles)
Anchorage	4,125
LA/LB	2,227
Prince Rupert	2,587
Vancouver	2,394
New York	1,100

US Dollars per FEU

To:	**NY**	**Chicago**
From:		
LA	2100	1500
NY		1160

US$ Per TEU

	NY	**Chicago**
LA	1050	750
NY		580

Distances (miles)

To:	**NY**	**Chicago**
From:		
LA	3,327	2,227

Implied charges: per FEU

Fixed/terminal cost	52
Distance related, $/mile	0.65
Distance related LA-Chicago	1448

Implied charges: per TEU

Fixed/terminal cost	26
Distance related, $/mile	0.33
Distance related LA-Chicago	724

12 APPENDIX F: BULK VERSUS CONTAINER CARRIAGE FOR COAL

Coal Transport from Alaska to China($)

	Bulk Carrier, 75,000 DWT	**Container Vessel 4000 TEU**
Sea Freight rate ($/t)	8.5	33
Loading cost ($/t)	2	7
Unloading Cost ($/t)	2	5
Total ($/t)	12.5	45
COSTS BY BULK CARRIER		
Distance	4500 N Miles	
Days at Sea, laden	12.5	
Days at Sea, returning empty	12.5	
Days in port Alaska	3	
Days in Port, China	3	
Ship Cost at Sea ($/day)	22,500	
Ship Cost in Port ($/day)	12500	
Cost of ship time at Sea ($)	562,500	
Cost of Ship Time in Port ($)	75,000	
Cost of Ship Time, Total ($)	637,500	
Cost per Tonne ($)	8.5	
Handling cost loading port ($)	2.0	
Handling cost unloading port ($)	2.0	
TOTAL cost per tonne	$12.5	
COST BY CONTAINER VESSEL		
Cost per 40' Container,		
Transpacific Westbound ($)	1000	
Tonnes per 40' box	30	
Shipping cost per tonne	33	
Loading cost ($200/30 tonnes)	7	
Unloading cost ($150/30 tonnes)	5	
Total Cost, $ per tonne	$45	

13 APPENDIX G ALASKA SEAFOOD AND FISH PRODUCTION, TRANSPORT AND EXPORT

Alaska is a major producer and exporter of fish and seafood, almost all of it harvested from the wild. The state's total catch of all types of seafood approached 3 million tons in 2005, almost all of which is exported from the state to other US states or internationally. A recent State of Alaska press release states that in 2006 the value of Alaska's seafood exports has exceeded $2 billion for the first time.

Harvest and Export Levels

The table below provides a summary of 2005 harvest levels for various types of fish and seafood in Alaska waters. Federal management applies to all ground fish stocks from 3 to 200 nautical miles offshore while the state manages the inshore ground fish fishery.

Table 1 Alaska Seafood Harvest Levels 2005

Species	Tons
Ground fish, federally managed	2,386,950
Shellfish	31,900
Ground fish, state managed	17,750
Halibut (2004 harvest)	28,700
Salmon	-
Chinook	5,300
Sockeye	133,450
Coho	18,850
Pink	278,050
Chum	48,000
Herring	41,450
TOTAL	**2,990,400**

The table below summarizes international export levels of Alaska's fish and seafood broken out by geographic area and country for 2005 and 2006 .

Table 2 International Exports of Alaskan Seafood, 2005 and 2006

	2005 Tons	2006 Tons

China	154,311	187,920
Japan	310,875	261,907
S. Korea	124,448	140,974
Taiwan	5,780	4,972
Asia Total	595,414	595,773
	-	-
Europe	225,485	228,979
Russia	4,135	3,880
Australia/New Zealand	8,498	9,793
Mexico	1,997	2,211
Canada	61,760	73,831
Other Countries	31,066	27,991
TOTAL	**1,523,768**	**1,538,231**

Alaska has been actively working to diversify its export markets away from an overdependence on Asia and particularly the Japanese market. According the State of Alaska:

> "Alaska's 10-year trend toward diversification of international seafood markets continues. In 2006, Asian markets accounted for $1.5 billion of Alaska's seafood export value and Europe accounted for $461 million. Ten years ago, Asia accounted for almost all of the state's seafood exports. The high increases in seafood exports to China are attributable primarily to China's reprocessing activity for re-export; Alaska seafood is also available on a retail basis in a growing number of Chinese cities. Korea plays an important role in brokering Alaska seafood to other international markets. Germany's increased use of Alaska seafood is linked to the value the market places on health, food traceability, and fisheries management."

Transportation

As with any commodity or product, Alaska's seafood must be transported to its markets, whether nationally or as international exports. According to the Alaska Seafood Marketing Institute, most of Alaska's seafood is frozen before being shipped out of the state. A small amount is processed and packaged but most is shipped in whole form. The most common frozen seafood shipping containers used are either cardboard boxes with a capacity of 100 pounds or less or large (750-1,000 pound capacity) cardboard totes. The totes or palletized smaller containers can be readily moved by forklift and shipped in reefer containers or loaded directly into the holds of specialized reefer ships if needed.

There are currently five major means of transporting Alaska's seafood to market:

1. freezer ships;
2. freighters (either specialized reefer ships or regular container ships);
3. barges;
4. truck; and,
5. air.

As can be seen in Table 1 above, the off-shore ground fish fishery makes up nearly 80% of Alaska's total seafood harvest. Most of this harvest is processed, in whole or in part, on board ship and then taken directly to market — either in the US or internationally — by freezer ship. Thus a large proportion of the harvest does not enter Alaska's transportation system at all.

For the remainder of the harvest that does go through the state's transportation system, the US Census provides some limited data on what modes of transportation are used. The 2002 Survey shows a total of 519,000 tons of seafood being transported. The Census commodity flow survey data is not ideal in a number of respects. Some data is suppressed to preserve confidentiality while some categories are combinations of transport modes (truck and water for example) that do not specify whether the water mode is shallow-draft or deep-draft vessels. Also, it appears that the survey understates the actual amounts being transported given the data on commercial landings at Alaskan ports.

Air

Of the 519,000 tons shipped in 2002, 15 tons or 2.8% was shipped via air. It is interesting to note that the tonnage of air shipments tripled from 1997 to 2002. Although representing less than 3% of the volume shipped, air freighted seafood represented nearly 10% of the value shipped in 2002. Air freight is increasingly being used as a means of adding value by shipping fresh and specialty seafood directly to customers.

Truck

The 2002 Census data shows approximately 49,000 tons, or 9.4% of the volume shipped, moving by truck transport only. This form of transport obviously implies that the destination be either Canada or the Lower 48 states. Alaska imports most of its food, and much of it is shipped up via reefer trucks. Rather than returning south empty, some of these trucks are transporting seafood south to market.

Barge

Barges carrying refrigerated containers (reefer units) are extensively used within Alaska to transport frozen seafood from more remote fishing ports to larger centres where the product is normally transhipped to other modes of transport. However, some of the state's seafood exports also move by barge to Canadian and US ports down the west coast of BC. Like trucks, barges are used to transport all types of goods (including food) from US west coast ports to Alaska and they can offer backhaul services in their reefer containers for seafood shipments.

The 2002 Census Survey does not include data on barge shipments, but in 1997 9.4% of total seafood shipments went by shallow draft vessels. If that percentage remained unchanged, then barges shipped approximately 49,000 tons of seafood in 2002, the same volume as trucks.

Freighters

For the purposes of this analysis, it will be assumed that all of the remaining seafood shipments made in 2002 — approximately 421,000 tons or 81% — left Alaska via ocean-going deep-draft vessels. (This assumes that the Census survey categories of "truck & water transport" and "other/unknown" end up being freighters).

Implications for Alaska-Canada Rail Link

The proposed Alaska-Canada Rail Link and new container port near Anchorage at its terminus may be in a position to compete for the business of shipping Alaskan seafood both by rail to North American markets and by offering container services to Asian and other world markets. To succeed, the Rail Link and container port would need to displace the existing shipping services.

Critical Factors

The total seafood harvest (nearly 3 million tons in 2005) is not the amount that needs to be shipped from Alaska. As noted above, much of that harvest does not enter Alaska's transportation system at all. It is frozen at sea and shipped directly to markets without coming ashore. In 2004, reported commercial landings of seafood at Alaska's 16 busiest ports totaled 852,650 tons. A reasonable estimate of the potential market for transporting the seafood by rail and by container ship would therefore be no higher than 800,000 tons total.

Of the approximately 800,000 tons of seafood, approximately 160,000 tons (or 20%) would possibly be shipped either by truck or barge to North American markets if the proportions in the 2002 Commodity Flow Survey continue to hold true. A rail line could compete for at least a portion of the 160,000 tons using reefer containers. Both efficiently assembling the tonnage at the nearest railhead and offering efficient delivery at the destination would be challenges.

For a new container port at Anchorage to compete effectively with existing shipping arrangements for the remaining estimated 640,000 tons would require overcoming a different set of challenges. Several Alaskan container ports — including the major fishing ports of Dutch Harbour and Kodiak — already provide the facilities for shipping large volumes of frozen seafood. Both ports have scheduled container ship service and are visited by tramp freighters during the peak fishing seasons. Dutch Harbour, a community of only 5,000 in the Aleutian Islands, is not only the busiest fishing harbour in the United States (443,200 tons landed in 2004) but is also ranked as the 18th busiest container ship harbour in the country, outranking Boston and Anchorage on the top 20 ports list. In 2005 152 container ships totaling 511,000 TEU capacity called at Dutch Harbour. It appears that Dutch Harbour, and other Aleutian Island fishing communities, are well served by container ships picking up their seafood production.