Portland and Vancouver International and Domestic Trade Capacity Analysis

2006

METRO
Oregon Department of Transportation
Portland Development Commission
Port of Portland
Port of Vancouver

Executive Summary

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Introduction

The rapidly growing Asian economies will have significant impact on the demand for trade access into and out of the United States. The Portland/Vancouver region is one of four primary international trade gateways on the US West Coast (Southern California, Bay Area, Columbia River, and Puget Sound). Many of the trade facilities (marine terminals and air cargo facilities) are already operating near or at capacity. At the same time, the ability of the highway and rail system to handle the additional freight volume and the supply of industrial land to accommodate support services is strained. It is likely that there will be implications for the Portland/Vancouver region.

The region is currently beginning a large-scale planning process called the "New Look", assessing growth patterns through 2035. They are creating a regional freight plan as a part of the overall regional transportation plan, also under development this year. To better inform Port business planning and provide input into the regional planning processes, a consortium of agencies has commissioned the study of trade patterns affecting the Portland/ Vancouver region. The information from the analyses will provide input into the planning efforts.

Purpose

Determine the impact of increased international and domestic trade on the region's supply of and demand for trade support infrastructure (i.e., surface transportation and industrial land). Provide regional decision makers with technical information to support decisions regarding the management of the region's land supply and the identification transportation priorities, particularly as it relates to international and domestic trade.

Scope

Task 1. Quantify overall growth rate for the region's freight volumes to 2035.

Task 2. Assess global market dynamics that may affect trade volumes through Portland/Vancouver gateways.

Task 3. Identify challenges and opportunities trade volume growth presents to Portland/Vancouver region.

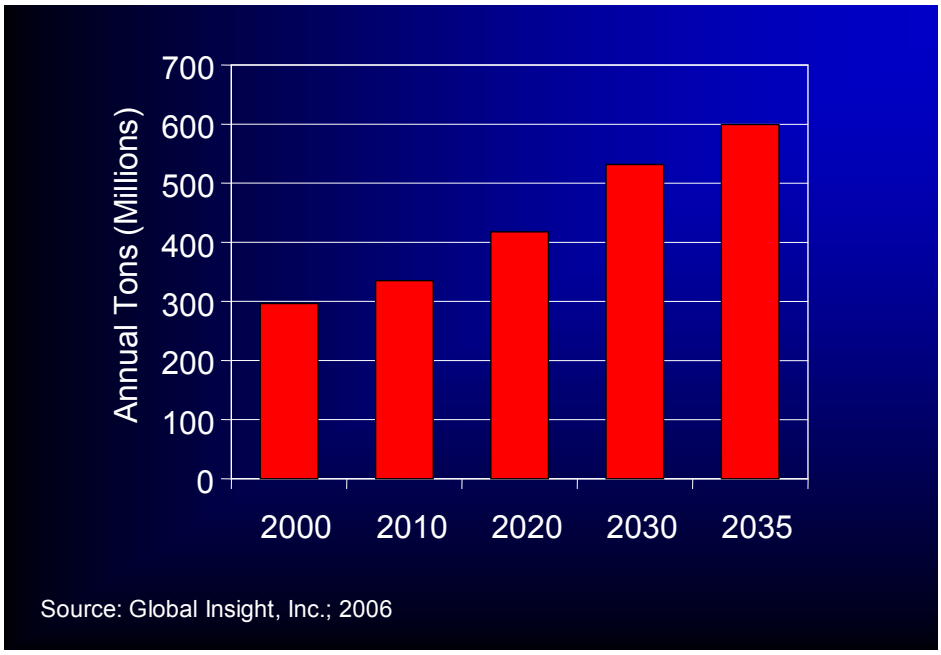
Task 4. Assess of adequacy of land supply and transportation infrastructure to meet forecasted trade volume.

Task 5. Validate results by review of national expert on trade, transportation, and related land use issues.

Key Findings

Trade Growth

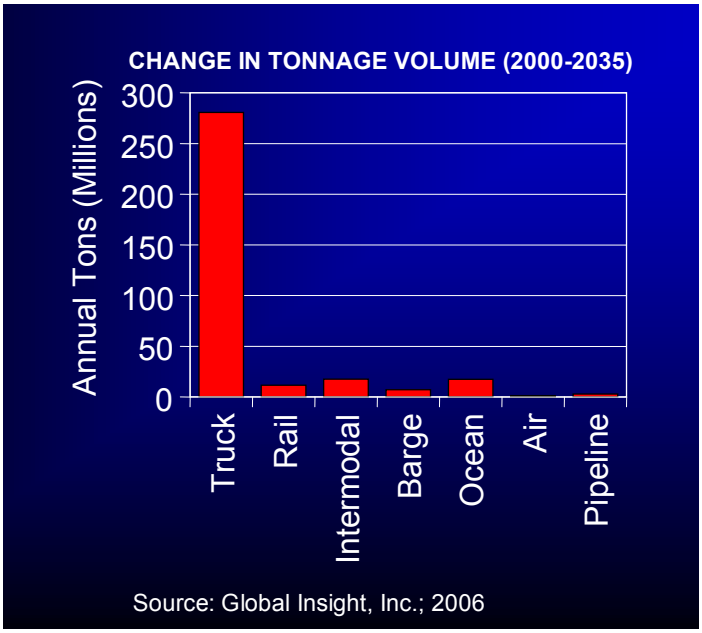
The study forecasts a doubling of trade volume by 2035 in the Portland region, consistent with the last forecast in 1997. The project growth in trade, at approximately 2% per year, is also consistent with the region's projected population growth over the same time period.



Growth is likely to alternate between periods of slow to moderate growth and rapid growth, because our relatively small market size is more impacted by external forces in the national and international economies than in larger domestic markets.

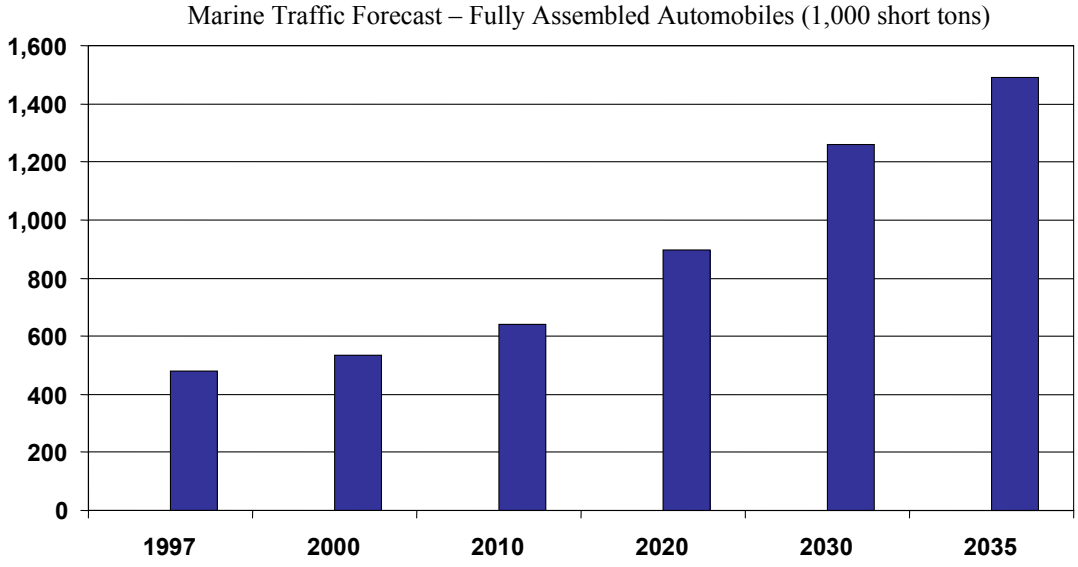
Trade growth is also influenced by a market area that extends well beyond the metropolitan region. Because Portland is at the nexus of an excellent transportation network, it serves as a gateway to domestic and international markets for businesses located throughout Oregon, Southwest Washington, Idaho and even further east. As business and population grow in the market area, trade volumes will increase, which in turn will stimulate more growth.

By mode, trucking will continue to be the dominant mode of freight transport, as shown in the table below. The dominance of trucking is related to its flexibility and integration with all other modes of freight movement. In addition, the study suggests there will be an increasing shift in the commodity mix to high value goods requiring high frequency, smaller shipments that will promote greater truck use.



Maritime Trade

The current forecast projects an increase of 67% more tons of marine cargo by 2035 with substantial increases projected for autos, bulks and containerized freight. As the graph below shows, auto volumes are forecast to triple by 2035 and bulk minerals are forecast to double by 2035. Containerized freight is the wildcard in this scenario.



These opportunities are dependent, however, on the availability of adequate infrastructure, including the Columbia River navigation channel, the Columbia-Snake River barge system, the rail and road networks and the availability of marine industrial land.

The navigation channel of the Columbia River, currently being deepened to 43 feet, is predicted to be adequate to handle a substantial portion of today's larger cargo ship fleet.

The Columbia-Snake River barge system, unique to marine trade on the US west coast, currently provides the lowest cost and most energy efficient mode to transport agricultural and other commodities from as far up-river as Lewiston, Idaho. The study warns that if barging is eliminated, the railroads may not carry displaced barge volumes, given their shift from short haul to long haul operations and increasing demands on mainline capacity.

The road system provides key access to markets for certain types of marine cargo such as containers and regional market autos. The rail system provides a key linkage to bring all types of marine cargo to and from market including containers, autos, bulks and break-bulks. Both of these systems need to be enhanced in order to meet the volumes forecast.

Marine Industrial land is a scarce commodity in the region, due to very specific location and size requirements and competition from other general industrial and non-industrial land uses. Land currently designated for marine industrial use has a long lead time to bring it into productive use due to permitting processes, making it difficult to respond to market demands in a timely fashion.

The Rail System

Portland benefits from good rail service relative to other West Coast ports from two of the major Class I railroads (Union Pacific and BNSF Railways) and several short line railroads.

However, Class I railroads are facing local, regional and national capacity and congestion issues. As a result, Class I railroads are changing their business model to focus on long haul unit trains (intermodal containers and bulk commodities) to maximize revenues & minimize costs. Consequently, they have placed less focus on serving individual local boxcar (carload) shippers.

As the Class I railroads focus less on local carload business, short line railroads may be able to assume more of this important role for local shippers. However, providing national market access for carload shippers will still require system capacity and the cooperation of the Class I railroads. In addition, the short lines are likely to need additional land for new facilities in order to perform this transloading function.

Air Cargo

Local and regional businesses depend on air cargo to provide national and international market access for high value and time sensitive products, such as computer components, specialized equipment and instruments, apparel and footwear and perishable foodstuffs.

While air transport may account for a relatively small share of these companies' total traffic weight, air cargo access is a critical competitive factor in driving their location and expansion decisions.

However, good air cargo service is only as good as the local road access to the airport. Efficient ground access also expands the areas where industries can locate and be close to a cargo airport and where airports can compete in the regional hinterland. Investment in the road network will be critical in maintaining access in the future.

Land for Logistics

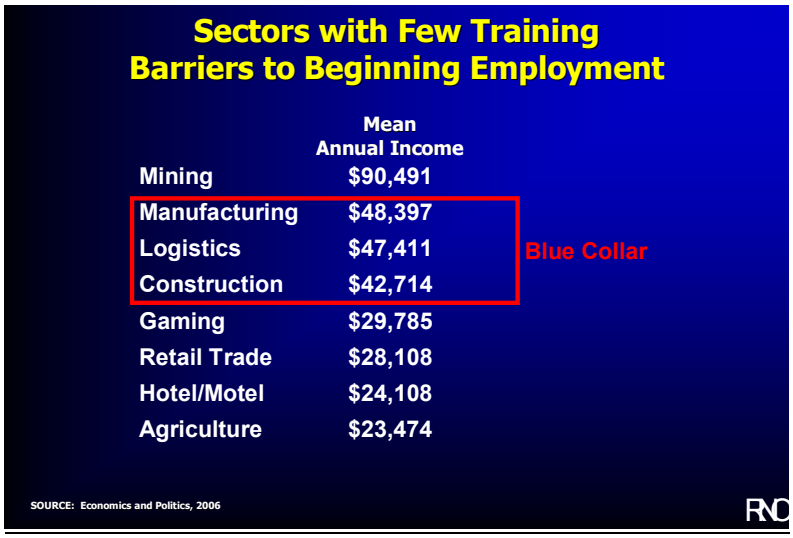
Moving from a just in-time to just-in case logistics business model suggests expansion to regional distribution hubs serving both the Portland and Seattle markets, created by a push for redundancy and flexibility to withstand shocks to the supply chain.

Logistics companies interested in regional warehouse/distribution sites primarily require access to the I-5 corridor in order to provide the flexibility described above.

In addition, each of the modes has their own specialized land need with very specific requirements related to shape, size and access to transportation facilities. Preserving land for this purpose is challenging given competition from general industrial and non-industrial (such as residential) land uses.

Jobs in Logistics

Logistics provides living wage jobs and a career path for workers without a college education. Traditionally, manufacturing provided the career path for workers fitting this profile. As that sector has declined and is projected to decline relative to other sectors of the economy, the logistics sector is increasingly able to provide career opportunities for blue collar workers.



Commodity Flow Validation

Portland/Vancouver International and Domestic Trade Capacity Analysis

Task 1

PORT OF PORTLAND

by:

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July 28, 2006

THE POWER OF PERSPECTIVE

OVERVIEW

Global Insight, Inc. was tasked with providing a validation of the 2002 commodity flow forecast for the Portland/Vancouver Regions. Global Insight also was asked to provide an assessment of trade and economic dynamics for the Portland/Vancouver international and domestic trade capacity analysis. Global Insight has conducted this work as two tasks, of which this is the report on the first task, validation of the commodity flow forecast. This effort has broadly validated the earlier forecasts with total growth still being expected to see a doubling of commodity volume between 1997 and 2030. The composition of the share of modal growth and commodity share exhibits some differences from before, though the relative growth of the various modes is much the same with those modes carrying high value goods, air, truck and rail intermodal growing faster than modes that carry primarily slower growing bulk commodities such as pipeline and barge.

METHODOLOGY AND APPROACH

The work of the commodity flow forecast validation was to review the growth rate assumptions used in the commodity flow forecast completed in 2002. Using the 1997 baseline from that forecast, Global Insight has validated that forecast. There were two specific subtasks associated with this. The first was to assess the overall growth rate for freight volumes. The forecast completed in 2002 was that freight volumes for the Portland/Vancouver region will double between 1997 and 2030. The question addressed here is whether this continues to be the case or have developments accelerated or decelerated from the earlier projection? The second task was to examine the growth rates for each of the 41 individual commodity categories and update the forecasts for these commodities using current Global Insight trade and freight demand models and underlying macroeconomic and industry forecasts. This was done and the results and findings are documented in this report.

The new forecasts, as were the forecasts completed in 2002, were developed in the context of national models both driven by forecasts at the macroeconomic, regional, producing sector, and purchasing sector levels.

The commodity flow forecasts project the demand for freight flows for 2010, 2020, 2030, and 2035 for domestic and international freight flows, by origin, destination, and commodity category. The forecast was developed using industry sector classified activity, which were then mapped to the study's SCTG commodity categories. The general methodology involved taking the base year values for 1997, and growing these values based on appropriate growth rates. The results represent the demand for transportation of desired goods either as shipments or purchases of a commodity in a particular region of the country. The shipments growth rate was determined based on the growth rate in output in a particular region of the country and commodity group, from Global Insight's Business Demographic Model (BDM). The purchases growth rate was determined based

on Global Insight's Business Transactions Matrix (BTM), which measures the purchases of a product made in one industry by industries in all other industry sectors, as well as the retail sector, in a particular region of the country. Finally, the forecasts of commodity shipments were controlled to purchases by commodity group and region.

FINDINGS AND CONCLUSIONS

The analysis and new projections have validated the 2002 forecasts by the newly estimated freight volumes also expecting to double from 1997 to 2030. In the new projections out to 2035, total freight tonnage for the Portland/Vancouver region increases at a compound average annual growth rate of 2.2%. Comparing the forecast completed in 2002 to the new validation, the new projection is for slightly faster growth over the 1997 to 2030 period, with a compound average annual growth rate of 2.18% compared with the 2.12% rate in the forecast completed in 2002. By 2030, the difference in total tonnage, for the entire metro area (including both the Oregon and Washington portions of the metro area) is 9.96 million tons additional compared with the forecast completed in 2002. The growth rates for the individual mode total freight volumes are shown in Table 1.1, below. The compound average annual growth rates have been calculated for the period 1997 to 2030 for comparison with the forecast completed in 2002 which extended only to 2030.

Table 1.1 Total Portland/Vancouver Freight Tonnage 1997-2035
(1000s of Short Tons)

Period	Truck	Rail	Intermodal	Barge	Ocean	Air	Pipeline	Total
1997	166,574	14,636	11,778	14,082	25,265	313	28,131	260,779
2000	197,236	17,316	15,634	15,065	28,406	449	22,236	296,342
2010	224,526	20,137	17,222	15,068	33,025	521	24,448	334,947
2020	294,356	21,661	21,267	17,126	36,527	754	25,760	417,451
2030	390,498	24,082	26,809	19,783	40,344	1,257	28,810	531,582
2035	447,157	26,243	29,318	21,280	42,629	1,658	31,055	599,340
CAGR % (1997-2030)	**2.62%**	**1.52%**	**2.52%**	**1.04%**	**1.43%**	**4.3%**	**0.72%**	**2.18%**

Note: CAGR is Compound Average annual Growth Rate (percent)
Source: Global Insight, Inc.

The difference between the forecasts completed in 2002 and the validation projections are more substantial when compared at an individual modal basis. The most significant difference is in rail carload traffic, which is now projected to grow at a compound average annual rate of 1.6% rather than the 2.7% rate of the forecast completed in 2002. The difference in growth rates results in almost 11 million few tons being shipped in rail carload traffic in the metro region by 2030, reflecting significantly slower rail carload growth in base chemicals, gas, fuel, petroleum products, milled grain and bakery products, foodstuffs, alcoholic beverages, and other categories. Some of this is from loss of mode share to rail intermodal or truck, but some, such as basic chemicals, is due to lower overall growth in tonnage volume projected for that commodity category. Intermodal rail is forecast to grow slightly faster by 2030 than in the forecast completed

in 2002, now carrying more tonnage than carload rail through the region by the year 2030. There is some reduction in growth forecast for the petroleum products moved by pipeline by 2030, somewhat offset by a shift to more by truck and inbound ocean transport. Air cargo and barge volumes are also now expected to see slightly faster growth in tonnage by 2030 than in the forecast completed in 2002. Barge will capture some agriculture tonnage lost by rail carload as well as handle a greater volume of gravel and stone by 2030 than forecast before. The largest increase in 2030 tonnage compared with the forecast completed in 2002 is for truck, but is off a very large base so that the increase in compound average annual growth from 1997 to 2030 is just 0.085%. The differences in total tonnage by mode between the forecast completed in 2002 and the validated forecast are summarized in Table 2.

Table 1.2 Differences in Total Portland/Vancouver 2030 Freight Tonnage Validated Forecast vs. Forecast Completed in 2002 (1000s of Short Tons)

Difference in Validated - Original Forecast, 2035	Truck	Rail	Intermodal	Barge	Ocean	Air	Pipeline	Total
Tonnage (1000s)	10,526	-10,912	2,645	4,282	5,578	196	-2,352	9,964
CAGR % (1997-2030)	0.085	-1.156	0.322	0.744	0.456	0.535	-0.238	0.059

Note: CAGR % here is the difference in the Compound Average Annual percentage growth rates.
Source: Global Insight, Inc.

Looking at the growth in the Standard Classification of Transported Goods categories used in the forecasts, gas, fuel and petroleum products remains the category with the greatest total Portland / Vancouver commodity tonnage. The majority of this product category tonnage is inbound to the region, especially via the Olympic pipeline from Puget Sound. There is also significant movement inbound via the ocean. Outbound movements by barge and truck, as well as substantial metro area distribution by truck make up most of the rest of this category tonnage. The next largest tonnage commodity category in the region is the non-metallic mineral products category that includes cement, concrete, glass and ceramic products primarily used in construction. These are mostly very heavy unit-weight commodities that travel relatively short distances by truck. This category has the greatest internal tonnage movement of any category, almost all by truck. Foodstuffs and alcoholic beverages is the third largest category, a catch all category including a wide variety of grocery food products and beverages. This is another category with substantial internal movements as well as inbound and outbound shipments, almost all by truck. Cereal grains, gravel & crushed stone, logs and wood products are the next largest tonnage categories. The validated 2030 total tonnage forecast by commodity category and by mode, the last year that can be compared with the forecast completed in 2002, is in Table 1.3 below.

Table 1.3 Total Portland/Vancouver 2030 Freight Tonnage Validated Forecast by Commodity Category and Mode (1000s of Short Tons)

YEAR 2030 (1000s of short tons)		TOTAL							
SCTG	Description	Truck	Rail	Intermodal	Barge	Ocean	Air	Pipeline	Totals
1	Live animals and live fish	340.8	20.0	-	-	6.9	0.1	-	367.8
2	Cereal grains	4,828.8	9,240.5	-	8,607.5	16,322.2	-	-	38,999.0
3	Agricultural products, except live animals, cereal grains and forage products	5,243.0	148.2	75.3	25.3	307.5	25.5	-	5,824.8
4	Animal feed and feed ingredients, cereal, straw, and eggs and other products of animal origin, n.e.c.	1,168.7	22.0	7.9	21.1	674.8	0.2	-	1,894.8
5	Meat, fish, seafood, and preparations	1,483.1	11.2	74.0	-	54.8	9.2	-	1,632.3
6	Milled grain products and preparations and bakery products	11,777.8	797.9	93.1	8.1	130.8	0.0	-	12,807.8
7.8	Foodstuffs and alcoholic beverages	46,388.0	2,265.1	260.1	-	246.2	16.4	-	49,175.8
9	Tobacco products	441.7	1.9	-	-	0.1	-	-	443.8
10	Monumental or building stone	222.6	415.6	-	-	-	-	-	638.2
11	Natural sands	-	-	-	-	-	-	-	-
12	Gravel and crushed stone	25,131.1	-	-	5,407.1	10.7	-	-	30,548.9
13	Nonmetallic minerals, n.e.c.	2,068.3	-	-	1.2	2,669.7	-	-	4,739.2
14	Metallic ores	0.1	414.9	-	-	1,391.7	-	-	1,806.6
15	Coal	9.8	-	-	-	-	-	-	9.8
16	Crude Petroleum Oil and Oil from Bituminous Materials	0.5	-	-	94.6	436.8	-	-	531.9
17.18.19	Gas, fuel, petroleum/coal products	29,163.5	923.6	-	4,268.2	6,508.4	0.9	28,810.0	69,674.6
20	Base chemical	13,526.4	4,334.7	679.6	27.8	3,508.8	17.1	-	22,094.5
21	Pharmaceutical products	1,233.0	-	-	-	-	5.6	-	1,238.5
22	Fertilizer and fertilizer materials	466.6	2,173.2	-	103.9	2,279.9	-	-	5,023.5
23	Chemical products and preparations, n.e.c.	6,754.9	-	-	-	130.2	19.8	-	6,904.9
24	Plastics and rubber	4,111.3	98.2	11.2	-	320.3	11.1	-	4,552.1
25	Logs and other wood in the rough	33,484.0	-	-	24.8	85.4	-	-	33,594.2
26	Wood products	33,280.9	72.6	6,012.4	106.1	221.0	13.1	-	39,706.0
27	Pulp, newsprint, paper, and paperboard	7,222.6	66.5	3,914.3	50.5	48.8	7.1	-	11,309.8
28	Paper or paperboard articles	5,801.0	-	-	102.7	39.1	8.4	-	5,951.2
29	Printed products	1,668.6	34.1	2.3	-	-	17.0	-	1,722.0
30	Textiles, leather, and articles	5,030.6	20.3	1.2	-	48.2	17.7	-	5,118.0
31	Nonmetallic mineral products	65,026.4	342.4	438.5	-	1,593.1	5.2	-	67,405.6
32	Base metal in primary or semifinished forms and in finished basic shapes	7,819.8	1,048.1	484.0	-	709.7	0.5	-	10,062.0
33	Articles of base metal	10,417.8	0.4	67.7	60.2	287.4	9.6	-	10,843.2
34	Machinery	3,031.2	182.7	44.6	-	78.4	276.8	-	3,613.8
35	Electronic and other electrical equipment and components, and office equipment	2,584.1	47.0	-	-	381.8	259.6	-	3,272.4
36	Vehicles	12,275.6	494.3	692.0	-	1,257.9	29.0	-	14,748.8
37	Transportation equipment, n.e.c.	3,604.4	-	-	-	-	0.6	-	3,605.0
38	Precision instruments and apparatus	1,325.8	-	-	-	-	99.1	-	1,424.9
39	Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	2,141.6	71.2	5.4	-	58.3	4.0	-	2,280.5
40	Miscellaneous manufactured products	6,517.5	3.7	270.3	-	272.1	16.6	-	7,080.2
41	Waste and scrap	16,298.5	433.6	426.6	76.5	243.0	0.1	-	17,478.4
43	Mixed freight	17,590.9	-	12,825.9	-	19.5	87.1	-	30,523.4
44	Mail and Express Traffic	367.8	397.9	-	-	-	299.8	-	1,065.5
60	Empty Containers, etc	648.6	-	422.6	797.2	-	-	-	1,868.4
	Totals	390,497.6	24,081.7	26,809.3	19,783.0	40,343.7	1,257.1	28,810.0	531,582.3

Source: Global Insight, Inc.

Comparing the results of the forecast completed in 2002 with the validated forecast shows the changes in outlook are not uniform. The logs and wood products categories are projected to grow slower than before, due to more difficulties in producing in the U.S. and more competition from foreign producers with more open access to the U.S. market (including Canada.) In the other direction, mixed freight, often consolidated shipments used by retailers and third party logistics firms is forecast to increase more than in the forecast completed in 2002, as changes in logistics practices have accelerated, partly as a reflection of national consolidation in the retail sector, and partly as a reflection of the increase in use of intermodal rail service. The forecast tonnage volume for gas, fuel and petroleum products is also projected to grow faster, with the growth in truck and ocean volume coming at the expense of slower growth in rail and pipeline. The differences in the two forecasts in 2010, 2020 and 2030 are in Table 1.4 below.

Difference: Validated Minus Original (1000s of short tons)

SCTG	Description	2010	2020	2030
1	Live animals and live fish	41.4	65.0	88.5
2	Cereal grains	3,337.5	2,977.0	4,470.0
3	Agricultural products, except live animals, cereal grains and forage products	448.6	678.7	1,730.3
4	Animal feed and feed ingredients, cereal, straw, and eggs and other products of animal origin, n.e.c.	(162.3)	(248.0)	(199.2)
5	Meat, fish, seafood, and preparations	73.0	(174.1)	(248.9)
6	Milled grain products and preparations and bakery products	119.7	(2,665.5)	(3,367.2)
7.8	Foodstuffs and alcoholic beverages	1,759.9	(8,495.8)	(10,816.3)
9	Tobacco products	72.4	87.6	47.3
10	Monumental or building stone	36.8	66.8	113.7
11	Natural sands	-	-	-
12	Gravel and crushed stone	(6,833.7)	(5,638.8)	3,551.3
13	Nonmetallic minerals, n.e.c.	936.6	1,790.8	3,046.4
14	Metallic ores	349.5	473.5	525.1
15	Coal	1.8	2.9	8.0
16	Crude Petroleum Oil and Oil from Bituminous Materials	(44.8)	(75.1)	(115.0)
17.18.19	Gas, fuel, petroleum/coal products	(1,515.1)	3,391.5	13,156.0
20	Base chemical	763.4	(1,854.0)	(2,643.9)
21	Pharmaceutical products	72.4	322.3	876.2
22	Fertilizer and fertilizer materials	292.0	(37.6)	(290.1)
23	Chemical products and preparations, n.e.c.	357.6	1,098.3	3,333.3
24	Plastics and rubber	359.8	376.6	862.1
25	Logs and other wood in the rough	(3,946.7)	(10,652.8)	(14,512.0)
26	Wood products	(4,151.5)	(11,789.8)	(16,825.5)
27	Pulp, newsprint, paper, and paperboard	130.7	(797.3)	(1,524.2)
28	Paper or paperboard articles	86.1	(261.4)	(77.5)
29	Printed products	(26.4)	(715.9)	(1,181.5)
30	Textiles, leather, and articles	(261.6)	(1,544.8)	(2,523.7)
31	Nonmetallic mineral products	(995.1)	(10,671.4)	(14,123.7)
32	Base metal in primary or semifinished forms and in finished basic shapes	1,243.3	1,334.5	2,655.2
33	Articles of base metal	1,080.9	1,213.0	2,778.9
34	Machinery	(358.6)	(860.1)	(397.0)
35	Electronic and other electrical equipment and components, and office equipment	(341.7)	(800.7)	(398.6)
36	Vehicles	714.9	2,405.4	7,385.4
37	Transportation equipment, n.e.c.	285.8	471.6	1,744.7
38	Precision instruments and apparatus	(26.6)	(178.3)	144.1
39	Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	108.4	127.4	385.7
40	Miscellaneous manufactured products	200.7	741.5	3,290.4
41	Waste and scrap	1,732.2	2,667.1	7,194.2
43	Mixed freight	8,048.7	12,502.1	22,315.6
44	Mail and Express Traffic	63.4	(471.9)	(737.5)
60	Empty Containers, etc	129.9	106.4	243.3
	Totals	4,183.4	(25,033.3)	9,963.8

Source: Global Insight, Inc.

ASSUMPTIONS USED TO VALIDATE THE FORECASTS

As a summary of the assumptions in the economic and trade forecasts used to validate the commodity flow forecast, we present the following comparison of forecasts completed in 2002 and the new validation of those forecasts prepared in 2006.

Table 1.4 Comparison of Underlying Economic and Trade Assumptions Behind Forecast Prepared in 2002 and Validation Forecast Completed in 2006

Assumption	Forecast Completed in 2002	Validation Completed in 2006
1. U.S. GDP	Rebound in 2002 with GDP growth increasing to 4.5% by 2004 then slowing to 3.6% in 2005 and staying above 3% annually over longer term.	Growth in rebound peaked at 4.2% in 2004 now slowing to 2.6% by 2007 before increasing back to over 3% over the long term. Not much change long-term
2. U.S. Interest Rates	Federal Reserve will continue to focus on inflation fighting as #1 goal by raising interest rates through 2005, and then adjust rates for steady low inflation.	Much the same except rate hikes in short-run continue into 2006. No change in long term anti-inflation policy assumptions, so the CPI averages near 2.4% long-term.
3. Fiscal Policy	Federal government runs a long-term deficit, especially as entitlement programs grow and tax increases are minimized. State and local spending limited by ability to increase tax revenues.	Mostly the same: growth of real federal spending averages 1.8% per year; real growth in federal transfers average 5.8% per year. Average growth in state and local purchases is 1.5% per year.
4. Energy Prices	Crude oil prices expected to rise gradually from $20/bbl to near $30/bbl by 2010 and continue moderate real growth thereafter. Coal, natural gas and other energy prices also see moderate growth. Limited conservation / alternative fuels adoption within U.S.	Crude oil falls from near $80/bbl in 2006 (after quick run up in last few years) to $50/bbl by 2010 and then moderate long term increases from that level to $79/bbl by 2030. Other energy prices higher as well. Accelerated adoption of alternative fuels and energy conservation steps.
5. Commodity Prices	Non-energy commodity prices expected to show moderate inflation over the long-term as demand and investment for production expected to track fairly closely, moderated by business cycle demand and productivity growth.	Non-energy commodity prices increased through rapid demand increases, especially from China, as world in recovery. Longer-term price increases still expected to moderate as production expands following recent price increases.
6. U.S. Dollar Exchange Rate	Dollar to fall gradually over long-term starting in 2002 against most trade partners. U.S. export competitiveness improves starting in 2002.	Dollar fell against Euro but held value against some Asian currencies until 2005. China appreciates its currency slowly against the dollar. U.S. export competitiveness improves after 2005.

Table 1.4 Comparison of Underlying Economic and Trade Assumptions Behind Forecast Prepared in 2002 and Validation Forecast Completed in 2006 (Continued)

7. Japanese economy	Recession and deflation keep Japan growing slowly through 2004-2005, then growth increases to near 2% growth in GDP annually over medium term before falling again with shrinking population and workforce after 2010	Much the same except growth recovered about one year faster and will slow again sooner. No change to declining demographic outlook. Goods trade with China continues to increase.
8. China's Economy	Rapid growth in exports and internal development assumed, including more trade with U.S. Chinese infrastructure spending and employment growth expected to decelerate by 2007 following WTO entry. Average 8% GDP growth 2002- 2007.	Chinese Export growth, foreign investment, Chinese government infrastructure spending and new job creation all at higher rates than previously forecast through 2007. Long term trade growth rate slows with maturation of China export markets, after 2010. Average 9% GDP growth 2002-2007.
9. Other Asian Economies	Strong GDP growth, driven by export trade and much of it linked to development in China, with strong growth in intra-Asia trade. Assumed other Asia grows an average of over 4% per year over the long-term, India at 5.5% growth sustained into the long-term..	Similar, though Korea and Taiwanese trade growth has moved quickly up the value chain ahead of lower cost manufacturing moved to China. Commodity price boom helps some Asian country exporters. India remains protectionist for many goods manufacturing industries while booming in service sector development, averaging 6.5% growth.
10. U.S. Population and Work Force	Long-term, population projections use the U.S. Census Bureau's latest projections, which are based on specific Census Bureau assumptions about immigration, fertility, and mortality rates. Retirements of the baby-boomers and the aging of the population affects the availability of labor and consumption patterns, including such results as slower growth of the housing stock.	Mostly the same, though with updated projections from the U.S. Census Bureau. Retirement ages are not increasing despite policy to encourage it to do so. Availability of labor includes continuation of recent immigration and migration patterns and no change to law or enforcement that restricts immigrant labor availability. The U.S. population will average 0.8% growth per year through 2030.

Table 1.4 Comparison of Underlying Economic and Trade Assumptions Behind Forecast Prepared in 2002 and Validation Forecast Completed in 2006 (Continued)

11. Oregon Employment	After decline to -1.5% in 2002, the average annual 1997-2030 growth in employment was forecast between 1.1% and 1.4%, but with slower growth in the last 20 years of the forecast period to 2030 of 0.2% to 0.3%.	After strong recovery through 2005, growth in employment is forecast to average 1.1% over the study period, though growth slows to an average of 0.8% between 2010 and 2030. Higher growth in services drives employment.
12. Oregon Gross State Product	Real Gross State Product was forecast at 2.5% to 3.0% out to the 2030 study horizon with weaker growth in services in the early years after the 2001 recession.	Real Gross State Product is now forecast at 3.2% over the comparable period due to stronger growth in the services sectors and manufacturing in the state.
13. Portland / Vancouver Employment	Metro area employment growth forecast to be 0.6% in 2003–2010, with few sectors reaching 1.0% growth due to aftermath of 2001 recession.	Metro area employment growth rebounded faster than forecast in 2003-2005, with near term 2005-2007 employment growth now projected to be 2.2%, longer term growth
14. Portland / Vancouver Real Output	Real output in the metro area was forecast between 2.7% to 3.0% over the forecast horizon, 2010-2030, following the 2004-2010 rebound from the 2001 recession.	About the same though short term performance has been better, averaging 5.6% over 2005-2007, increasing the long-term average growth towards the top end of the earlier range.
15. Industry Sector Growth	Service sectors will be the source of short-term and long-term economic growth. Specialty manufacturing will remain though increased outsourcing of commodity goods production is the long-term forecast.	Mostly the same, though some capital goods manufacturing has rebounded faster than projected out of the 2001 recession. Services lead growth while resource sectors such as wood products now slow more due to restricted output and freer trade. Retailing industry consolidation faster than in previous forecast.

Trade & Economic Dynamics

Portland/Vancouver International and Domestic Trade Capacity Analysis

Task 2
Assessment of Trade and Economic Dynamics

PORT OF PORTLAND

by:

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September 22, 2006

THE POWER OF PERSPECTIVE

OVERVIEW

For the Portland/Vancouver International and Domestic Trade Capacity Analysis, Global Insight, Inc. was tasked with providing a validation of the 2002 commodity flow forecast for the Portland/Vancouver Regions and an assessment of trade and economic dynamics. Global Insight has conducted this work as two tasks, of which this is the report on the second task, the assessment of trade and economic dynamics. The commodity forecasts completed in 2002 and the validation effort are both dependent on a large number of assumptions about the underlying dynamics of the economy and trade over the forecast horizon. This report discusses the key factors that might influence the forecast.

TRADE AND ECONOMIC DYNAMICS

The demand for commodity transportation depends on many factors that determine the demand for and supply of goods and the geography of their production and consumption. These factors are usually quantified as economic and demographic indicators, though the changes in these indicators can be in turn be influenced by sociological, geopolitical and environmental developments that can more difficult to quantify (or predict). This discussion will focus on the developments we observe in industry and the economy that affect commodity shipments in the Portland / Vancouver region. Among these developments are those in the areas of the purchasing patterns of consumers, the sourcing patterns of businesses, industry logistics practices, and macroeconomic developments within the United States and abroad.

POPULATION

There are many important characteristics of the population that influence future commodity flow activity. The demographics of the population are expected to show a continued increase in average age, with low birth rates and increasing life expectancy leading to an ever-smaller proportion of the total population of working age, and an increase in the elderly population. This is a population that is expected to shift their consumption increasingly towards services (e.g. healthcare) compared with spending on goods for consumption as a proportion of their total income. This trend is already at work in the economy and how this will affect future commodity transportation demand is somewhat complex, because the composition of goods purchased is changing as well. It is likely that the future population will be spending a greater percentage of their income on high value goods such as pharmaceuticals and a smaller percentage of their income on higher cubic volume goods such as furniture. Longer lives mean more years of consumption however, so the bottom line impact is an increase in demand. Obviously anything that would slow population growth or reduce the population in the region would have the opposite effect, reducing total transportation demand, though it is difficult to imagine what might cause population trends to reverse in the region. In the validated commodity forecasts the demographic influence on purchasing patterns is captured from consumer purchases of goods and services by category. The underlying shift in

population is modeled as seven individual age cohorts as well as labor force size and labor force participation by age group. Regional geographic shifts in population are captured through net migration and work force estimates at the state and metropolitan area level for the United States.

WORKFORCE AND MIGRATION

Related to the population are the characteristics of the workforce, and the influences of migration and immigration. Reflecting the aging of the population, the workforce will see slower growth than the population as a whole, with the average age of employees increasing. Employers will have incentive to invest in more technology and equipment for production that remains in the country, increasing labor productivity through advances in automation. This continues to put pressure on workers to obtain more education. If the challenge from availability of the skilled labor workforce becomes severe enough, it may promote the movement of even more manufacturing off-shore. At the national level, manufacturing employment trends of the past decade are forecast to continue with long-term absolute declines in manufacturing jobs through the end of the forecast period. How this will turn out for the Portland/Vancouver region is not yet clear, as further net migration from other parts of the country is quite possible, as the quality of life available in the region proves attractive to those living in more crowded and expensive parts of the country. Immigration, legal or not, is another factor affecting the workforce, though the outlook for this in the region is unclear, given the uncertainty with respect to federal immigration policy and enforcement. In the Portland / Vancouver region, some of the affects of immigration are indirect through their greater influence on other regions of the country. This forecast assumes no significant affect from potential changes in immigration law or enforcement from the practices of the last decade which means that that workforce availability is not significantly changed from recent historical trends by immigration.

U.S. REGIONAL GROWTH

Differences in regional growth in the country can also have an effect on goods transportation demand in the Portland / Vancouver region. The more rapid growth in the southern and western regions of the country is likely to continue though the more recent pattern in the West has been a shift towards faster growth in the 'Mountain'[1] states than along the West Coast itself. The upper Midwest and the Northeastern portions of the country are expected to continue to be slower growing, which has implications for growth in demand for freight transportation serving those regions. The influence of these geographic shifts are captured through the faster relative growth in goods demand from the faster growing regions drawing more strongly on source supply regions and gateways than the slower growing regions. While the Portland / Vancouver region has an international gateway function for both the near-hinterland of the Mountain states and more distant population centers of the Mid-West and Eastern regions, it will be closer hinterland that will be the stronger market. This has implications for relative modal

[1] The 'Mountain' states are generally considered to be Idaho, Montana, Wyoming, Colorado, Utah, and Nevada.

demand, such as more truck demand to serve the closer hinterland where rail has less of an advantage due to the shorter distances.

TRADE PARTNER GROWTH

Difference in growth among the country's trading partners will also affect goods transportation demand in the Portland / Vancouver region. After the strong growth in U.S. trade with Japan during the 1970s-1980s, commodity trade with Japan has become increasingly less important to the region. The shift that first followed growth in trade with Japan was a shift towards faster growth in trade with the 'newly industrialized economies' of Asia, including Hong Kong, South Korea, Taiwan and Singapore. In the last ten years, trade with these economies has been overtaken by trade with China, which will soon overtake even Mexico to become the country's second largest trade partner after Canada. The continued rapid growth in China, and more moderate growth in the rest of Asia (and slow growth in Japan) has transformed the composition of U.S. trade with Asia trade as well as the composition of all U.S. trade. With the exception of large energy commodity imports into the U.S. from other regions of the world, Pacific Rim trade has justifiably commanded the greatest attention from trade specialists. While there is real political risk associated with the ability of China to continue to grow at near double-digit rates on a sustained basis, it is likely that Asian trade will continue to be the center of attention for both U.S. importers and exporters over the long-term. This forecast is for continued growth in trade with China, exceeding the volume of any other trade partner throughout the forecast period. By the end of the long-term forecast period, Vietnam trade with through the Pacific Northwest, including Portland / Vancouver, is forecast to grow at a faster annual rate than trade with China, but off a much smaller base of traffic. Japan suffers from continued slow trade growth with the Pacific Northwest throughout the forecast period yet remains the number two Asian trade partner for the region, while losing 2/3 of its market share, in percentage terms to China.

INTERNATIONAL GATEWAYS

Critical to sustained growth in trade are the gateways through which these goods move in and out of the country. Though far from the largest, the Portland / Vancouver region is one of these international gateways, and importantly serves primarily the fast-growing U.S. - Asian trade. How this growth in trade will impact the region depends in part on how desirable this region is in comparison with other international gateways. Therefore, among the factors affecting demand for commodity transportation through the Portland /Vancouver region are the conditions of the alternative international trade gateways serving the country.

This is an important factor in the future international commodity demand in the region because there are signs of strains in the system of international trade gateways. In the last four years, the West Coast has seen a U.S. West Coast-wide port shut down in 2002, severe containerized cargo congestion in Southern California in 2004 and a port-trucker strike in Vancouver, BC in 2005. Since 2001, the airline industry has suffered with poor

financial performance that has resulted in a restructuring of routes, services and aircraft fleets which has affected the air cargo service network, including the U.S. – Asia routes.

While these recent events captured headlines and attracted attention to the performance and capacity of international gateways serving the West Coast, more fundamental issues such as the environmental and long-term congestion impacts of port activity have become increasingly the focus of the communities and states of which the ports are a part. Congestion and port traffic-related environmental impacts are especially acute in the Los Angeles metropolitan area which consequently faces steep costs to mitigate the environmental impacts of even existing traffic volume. Key international air cargo gateway airports such as Los Angeles International and Seattle-Tacoma also face limitations on growth.

Consequently it is possible that there will be more serious congestion at these gateways ahead, because the pace of investment has not been keeping up with the growth in traffic volume. This could change if the government takes steps to promote expansion of transportation infrastructure capacity again. There are some moves at the state and federal level to tackle infrastructure needs, but the competition for government budgets makes fully funding transportation needs with public dollars unlikely. With more private investment in transportation infrastructure, such as the recent moves elsewhere in the country to privatize toll roads, it is possible that the total investment in capacity could accelerate, though this isn't seen in the public port or airport sector yet. With respect to congestion in Southern California or elsewhere outside the Portland / Vancouver region, this represents an upside risk to the Portland / Vancouver forecast. However the ability of the Portland / Vancouver region to benefit from external-region congestion could most likely happen in conjunction with a concerted effort to attract the business from the other regions. Even capturing only a small share of the "excess" demand for congested gateway regions could be a sizable increase for Portland / Vancouver and help advance initiatives for improved services locally, such as improved rail service.

In the port and airport sector, there has also been a substantial diversion of resources towards security and environmental considerations and away from capacity-building. While these other issues are of critical importance, the consequences have been to stretch available resources for capacity-building even further. Obviously much of the infrastructure investment needed is not within the harbors, port terminals or airports themselves but in the inland system needed to make the physical gateway facilities function, and neither the road or rail system capacity are being expanded as fast as cargo has been increasing, or is expected to increase, either. Therefore the existing patterns of international gateway traffic may shift away from the current concentration at key hub gateways. This may be an opportunity for more rapid growth in the use of the gateway facilities in the Portland / Vancouver region.

The pressures on the existing system are already producing changes that can help alleviate future congestion. There are several developments that may significantly add new port capacity, at least. One potential contribution to adding capacity is the development of new port gateways in new locations (e.g. Prince Rupert in British

Columbia, Punta Colonet in Baja California, Jasper County in South Carolina) to serve the U.S. market. These port proposals seem to be attracting private investment capital that can add North American capacity without facing the obstacles that further major expansion of existing container ports face. The hinterland to be served by these proposed ports overlaps with that served by Portland / Vancouver only in the upper Mid-west, and it is not certain that each of these will be developed as proposed.

Another contribution towards alleviating congestion is the continued evolution of port operating practices and employment of technology. The expansion of operating hours, reductions in "free time", adoption of chassis pools, use of virtual container yards, the addition of more cranes and more labor, can all help extract higher throughput from existing port terminal space. Technology may also help add capacity to the aviation system through more efficient use of available airspace and expanded all-weather operations. Over the long-term what is unknown is whether there can be a new revolutionary technology, like the ocean container was 50 years ago, that can further transform goods transport.

For the near-term, the pressures from trade growth are substantial and require shorter-term solutions. One important solution, as we've seen in the Asian response to rapid trade growth, is the expansion of use of currently under-utilized facilities. Direct ocean and air cargo services to cities not previously served directly have been added as the volumes of trade have grown large enough to justify it. Some signs exist that this is already happening on the West Coast with the recent increase in the number of container services calling at the Port of Portland. Due to the increases in costs deriving from the congestion at the largest existing ports, importers and exporters with cargo to and from inland points may divert cargo to ports like Portland / Vancouver. And while this practice may affect ports around the coasts of North America, the ports along the West Coast still will have the advantage of the shorter distance for most Asian trade compared with sailing down through the Panama Canal or east through the Suez Canal[2]. This practice also becomes more likely over time as the long-term growth in traffic becomes large enough for vessels operators to offer more regular vessel service at ports. The distance upriver from the ocean and the Columbia River channel depth still limit the ability of Port/and Vancouver to compete for all larger-port discretionary (non-local) cargo, because many of the new large container ships can not call Portland when fully loaded. Similar developments exist in the air cargo business, especially as aviation agreements open up more opportunities for new city-pair services on the transpacific routes.

The commodity flow forecasts are relatively unconstrained demand forecasts that assume necessary investments and policies will be available to provide total system capacity for the expected demand, as has happened in the past. These forecasts have not been limited by infrastructure constraints specific to any particular geographic region or transportation

[2] Container vessels of any size can use the Suez Canal today, which means the greater economies of scale possible with larger ships can at least partially offset the longer sailing distance and time. Most East coast ports also have channel dimension limitations that constrain loaded vessel size as well, reducing the advantage of the Suez Route. The Panama Canal is still limited to 'Panamax' size vessels today.

mode. This means that aggregate capacity of international gateways serving the region is assumed to be provided, at a price, and consequently demand at these levels will not be reduced by inadequate total international gateway capacity.

ENERGY

Since the commodity forecasts completed in 2002 were made, the world energy markets have seen significant changes in prices and market dynamics. Oil prices and natural gas prices have increased due to the influence of world politics, natural disasters such as hurricanes Katrina and Rita, and the growth of demand from Asia, increasing substantially faster than forecast earlier. There has also been an additional price pressure from the entry of financial firms such as hedge funds into the energy commodity markets. Consequently, it is expected that energy prices will continue to be volatile over the long-term, as many of the world's key producing regions remain in political turmoil and the U.S. remains dependent on imported energy. Higher energy prices add pressure on shippers that currently use more energy-intensive modes of transport (air and truck) which may benefit the modal competitiveness of those modes that are relatively less energy-intensive such as maritime and rail transport. The potential for modal diversion from energy prices alone is somewhat limited, however, to those goods whose value and time sensitivity makes use of slower modes of transport a possibility. Much more common will be increased efforts for efficiency in use of the existing modes of transport, through marginal reductions in shipments made without full capacity utilization, that up until now were made in order to keep to a schedule. There may also be some further consolidation of shipments to gain further economy-of-scale efficiencies. As the airlines have done in recent years, equipment will increasingly be "right-sized" to match market volume demanded to the capacity used to carry it. Accelerated investments in information technology to optimize use of equipment will also be a consequence of living with higher energy prices. Substantially higher energy costs would affect the economy more broadly over the long-term, "crowding-out" consumption of other products and encouraging greater substitution of other factors of production for energy and energy-intensive service inputs such as transport. Nevertheless, given the fundamentals of supply response (with a lag) resulting from the recent high energy prices, real energy prices are forecast to fall back from recent high levels, though not back down to the levels of the 1990s. A substantially higher energy cost scenario and the consequences for trade and transportation are a lower probability than the likelihood of the more moderate future energy price condition. There is also a chance that energy prices could fall further than expected, with further reductions in pressures for industry practices to change.

INDUSTRY LOGISTICS AND PERFORMANCE

Examining the validated commodity flow forecast estimates, Global Insight has identified several changes in patterns of industry logistics and the economic performance of certain industries that have contributed to the observed differences between the validated forecasts and the forecasts completed in 2002.

LOGISTICS

The pace of adoption of higher-technology logistics practices throughout industry has accelerated in recent years. Some of this is due to the acceleration in off-shore manufacturing which has lengthened supply chains and required advanced communications systems to manage more complex supplier relationships. More generally across industry, businesses have accelerated implementation of advanced logistics practices to minimize warehousing and shorten the time it takes to bring goods to market. The result has been a faster shift towards more frequent, smaller shipments, with a focus on increasing the 'velocity' of product shipments. Benefits from the shift include less unsold merchandise and a supply chain that can be global yet responsive to changes in the marketplace. Coordinated shipments from multiple suppliers include practices where traditional physical warehouses are replaced with electronic databases of production and shipment information. Centralized warehousing is used less and less and only adopted when the volume of goods and the economics of value-added services performed at these facilities make it efficient for shippers. This does not mean that production is localized or that distribution-related industries no longer require physical space. On the contrary, domestic markets are shifting to be international, and regional markets are shifting to being national markets. There are now retail import shipments that are moving directly to the store from overseas through the international gateways without moving through a distribution center. There is also a move to spread distribution geographically around the country to serve regional instead of national distribution needs, thereby minimizing risk from potential gateway bottlenecks and improving flexibility, at least where total shipment volume can still take advantage of economies of scale on multiple routes. Another logistics practice that is increasing in use is the shift of some new value-added services to distribution centers rather than at factories, including such functions as product labeling, tagging, sequencing, and/or consolidation.

The consequences of the faster adoption of advanced logistics is more rapid growth in truck shipments and slower growth in carload rail, the rail service that is not the intermodal rail movement of containers or truck trailers. Railroads are focusing on two business lines that have the greatest potential for them to earn profits: long-distance movements of complete trains filled with intermodal containers and 'unit' trains of bulk commodities such as grain or coal that are moved very long distances. Railroads are most efficient when they haul long distances without having to stop, so with limited capacity on their networks, that is where their primary focus will remain.

In a significantly higher-energy price world, the use of advanced logistics practices would shift back towards relatively higher inventories and greater consolidation of freight transport into fewer, denser shipments for those commodities whose transportation costs are, or become, a significant share of the total delivered cost. Such a situation would benefit maritime and rail transport compared with truck and air transport at the margins where the service requirements / cost trade-off between modes is competitive.

INDUSTRY PERFORMANCE

The outlook for several individual industries has changed since the commodity flow forecasts completed in 2002 as well, resulting in higher or lower projected commodity shipments in the validated forecasts. Among the commodity categories with the greatest differences in outlook are logs and other wood in the rough, wood products, foodstuffs (e.g. oils, fats, dairy, sugar, processed foods, juices, etc.) and alcoholic beverages, non-metallic mineral products (e.g. clay, building stone, bricks, articles of cement/concrete, glass, gypsum wallboard, asphalt products, etc.), motor vehicles, and "mixed" freight. The reasons for the differences are primarily due to changes in these industries affecting the quantity produced (and shipped) and/or the geography of sourcing and/or consumption. Upside and downside risks remain in the outlooks for most industries due to competitiveness factors at work within each sector, and affecting their freight demand.

For example, Global Insight is projecting slower growth than previously for the logging and lumber industry in Oregon and Washington, which results in a reduction in the compound average annual growth rate (1997 to 2030) for the logs and other wood in the rough and wood products category tonnage volume. This is a reduction from 2.6%-2.9% in the forecast completed in 2002 to 1.5%-1.8% in the validated forecast. The forecast is still for growth in this category, but at a slower rate due to greater long-term environmental constraints on this industry as well as increased production and competitiveness of foreign (and substitute product) producers.

The compound average annual growth rate for tonnage forecast for the non-metallic minerals category is also less in the validated forecast (3.1%) than in the forecast completed in 2002 (2.5%). This primarily is a result of a less robust forecast for long-term construction activity with most of this tonnage moved internally in the region by truck.

The tonnage volume of the foodstuffs and alcoholic beverages category remains as one of the top three categories in terms of total tons shipped in 2030, however the rate of growth is now lower. The compound average annual growth rate (1997 to 2030) is reduced from 3.5% in the forecast completed in 2002 to 2.9% in the validated forecast. This moderate reduction in growth rate reflects some of the broader trends in this industry to have products serve a national market, which comes at the expense of facilities, such as distribution centers and warehouses, within the Portland / Vancouver region.

Looking forward, this could well begin to change, as high prices of oil and natural gas have sent ripples throughout the chemicals sector in North America, and critical raw materials costs (ethane, propane, and naphtha) have escalated in tandem with the rise in oil and gas prices. The prospects for a return to low 1990s energy price levels seems remote at the present time despite the long-term forecasts for a decline in real energy prices from recent levels. Even moderated energy prices still present a challenge to the future of the chemical industry in North America as the underlying fundamentals of feed stock supply and foreign competition will continue to work against the domestic chemicals industry.

There will continue to be a variety of industry-sector specific factors that will affect the potential demand and supply conditions that determine freight volumes in the region. Consequently we can expect further dynamic change to affect freight volumes at an industry-specific level over the long-term, which warrants the continued attention of planners as conditions change. For freight planning, continuous change will compel updating these projections again in the future.

FINDINGS AND CONCLUSIONS

There are many developments that will have influence on the path of commodity flow growth eventually seen in the Portland / Vancouver region. These factors may accelerate the demand compared with the validated forecast levels or work to dampen expected growth. These factors can affect the geographic distribution, the modal distribution, and the overall level of Portland / Vancouver commodity flows such than any of these dimensions of freight transportation in the region may turn out to be higher or lower than projected. Some of these factors, such as global geopolitics, are beyond the ability of the region to influence. Other factors, such as highway network capacity and the preservation of land for transportation/logistics industry use are well within the capacity of the region to influence positively over the long-term. Developments in trade and the economy outside the region are likely to provide opportunity for Portland / Vancouver to take advantage of its location as a key international gateway in attracting desirable services into the region. However competitive threats and external economic challenges will remain meaning proactive decision-making in the region will be required to meet the challenges and benefit from the opportunities that exist.

Opportunities & Challenges
Marine

TRADE CAPACITY STUDY

GROWTH OPPORTUNITIES AND CHALLENGES ASSESSMENT

RELATED TO MARITIME TRADE

For:

PORT OF PORTLAND

METRO

OREGON DEPARTMENT OF TRANSPORTATION

PORT OF VANCOUVER

REGIONAL TRANSPORTATION COUNCIL

PORTLAND DEVELOPMENT COMMISSION

Submitted by:

BST Associates

August, 2006

Trade Capacity Study
Growth Opportunities Assessment
Related to Maritime Trade
Task 3 – Marine and Barge Modes

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EXECUTIVE SUMMARY

BST Associates was retained by the Port of Portland to:

- Evaluate market opportunities for maritime trade based upon the updated forecasts by Global Insight,
- Assess the required level of service to meet these opportunities, and,
- Describe the infrastructure requirements to capitalize on these opportunities.

The report is presented in three sections. The first section presents a summary of findings and conclusions while the second section evaluates the opportunities for marine cargo and the third section evaluates the opportunities for the Columbia-Snake River barge system.

FINDINGS & CONCLUSIONS

Cargo Opportunities

The updated cargo forecast for both marine and barge cargo is significantly higher than the previous forecast. In the year 2030, there is expected to be 5.5 million more tons of marine cargo and 4.2 million more tons of barged cargo than under the previous forecast.

Most cargo handling groups (fully assembled autos, grain, dry bulks and liquid bulks) are expected to be higher under the forecast update. General cargo (breakbulk and containers) is expected to be at the same level as the previous forecast in 2030. However, Global Insight notes that there is a need for additional gateway ports to handle container volumes and that there appears to be an opportunity for the Portland-Vancouver region to serve this function.

Infrastructure and Service Requirements

In order to meet these potential opportunities, the Ports and their partners will need to continue to improve the transportation systems that serve these shippers and carriers.

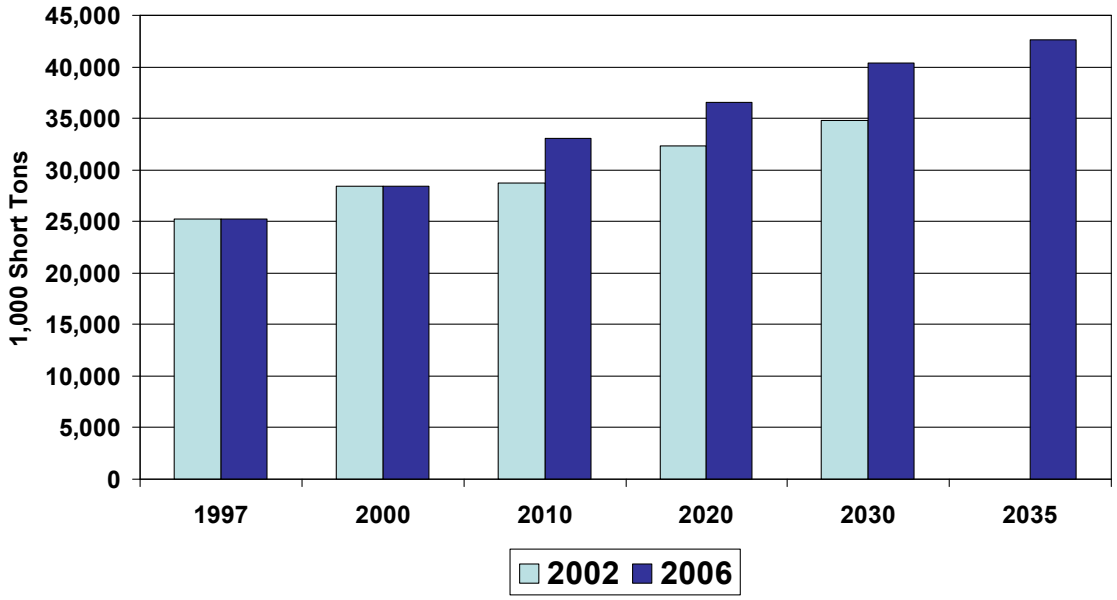
The following improvements are required:

- The continued deepening of the Columbia River Channel is very important to meet shipper's needs. In addition, funds need to be available to maintain and repair the channel system including the jetties, the channel, anchorages and port terminal berths.
- The Ports have recently prepared plans to upgrade and expand marine terminals to meet market conditions. These projects may be adequate to meet the updated baseline forecasts. However, there are additional opportunities beyond the baseline forecasts. This may require the Ports to acquire and develop additional land for terminal development.
- Inland transportation systems also need to be enhanced to meet expected cargo volumes. Truck and rail improvements are addressed in other companion reports.
- Barge transportation is also very important to shippers and upriver communities from the Columbia River into the Lower Snake River. It is important that these systems are properly dredged and improvements undertaken to lock systems and upriver ports as needed.

MARINE CARGO SYSTEMS

A comparison of the unconstrained marine forecasts for all inbound and outbound cargoes that were prepared in 2002 and 2006 are presented in Figure 1. As can be seen, the 2006 cargo forecast anticipates more opportunities for growth, with approximately 5.5 million short tons more cargo than the previous forecast by the year 2030. Inbound and outbound cargoes could contribute approximately 4 million and 1.5 million additional tons respectively.

Figure 1 – Marine Traffic Forecast – Inbound & Outbound (1,000 short tons)



Virtually all of the marine trade moving through the Portland-Vancouver region is with international trading partners, most of whom are located along the Pacific Rim.

MARINE CARGO HANDLING MODE

In order to fully appreciate the trade opportunities and potential infrastructure challenges, it is necessary to evaluate specific cargo handling groups.

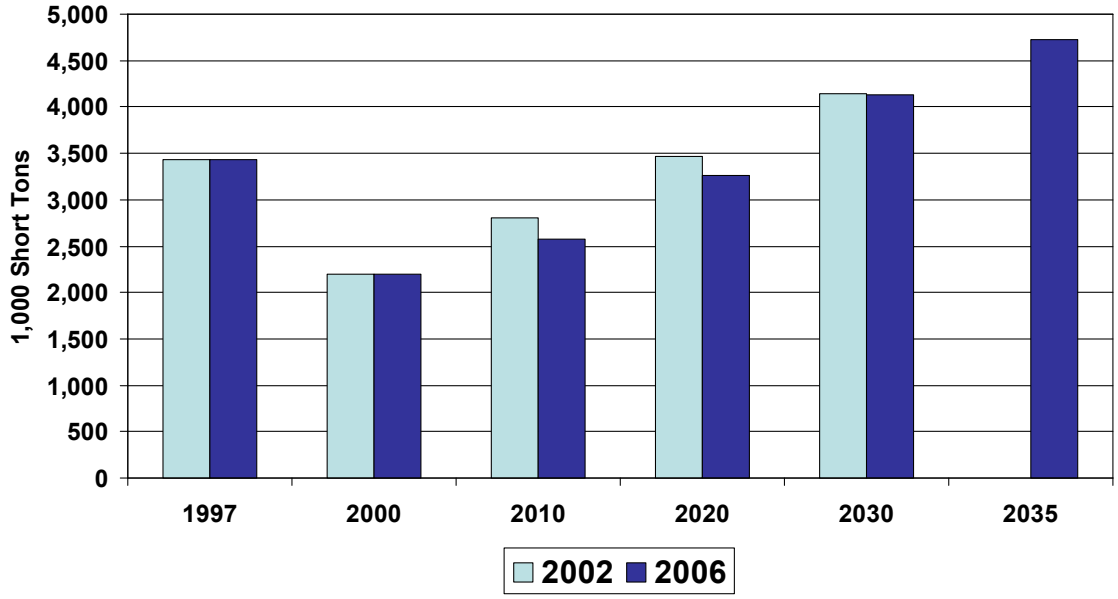
General Cargo

The unconstrained forecast is based upon the standard classification of transported goods (SCTG). As a result, it is difficult to identify the precise split between breakbulk and containerized commodities[1]. We have aggregated those commodities that are considered general cargo in a single group. The forecast assumes lower growth in the general cargo category in 2006 than in 2002 through 2010 and 2020 but the forecasts reach parity in 2030. Upon investigation of specific SCTG categories, the biggest difference between the 2002

[1] This is particularly true for swing commodities such as lumber, pulp, metals and like products that may move in breakbulk or container form.

and 2006 forecasts are in two commodities (agricultural products and animal feeds[2]), in which lower growth is now expected. However, offsetting these downward trends, the 2006 forecast expects much more rapid growth in inbound container volumes than expected in 2002.

Figure 2 – Marine Traffic Forecast – General Cargo (1,000 short tons)



The important factors for attracting breakbulk and container traffic are assessed in this section, focusing on navigational requirements, marine terminals and inland transportation systems.

Breakbulk Cargo

In the Portland-Vancouver area, breakbulk cargo is primarily composed of forest products (pulp and lumber among other products) and metal products (primarily steel and aluminum products) as well as project cargo (turbines for wind power projects, domestic and overseas construction projects et al). Some of these products originate or terminate at local firms but some also move forward to inland destinations by barge and/or rail. As declining production has occurred in some local firms (particularly at pulp and lumber mills and aluminum smelters et al), it has created an opportunity for imports of these products.

Breakbulk vessels are generally Panamax or Handymax types, which are able to navigate the Columbia River channel without constraint.

The regional competition for breakbulk cargo is very intense, particularly for gateway traffic. Success in attracting these cargoes requires provision of cost effective and efficient general purpose terminals as well as efficient rail and barge connections.

Both Ports have efficient terminal facilities available at the present time. In addition, both Ports have entered into effective operating agreements that help attract and retain the cargo.

[2] Animal feeds may move in either a bulk (beet pulp pellets) or container form (hay cubes and baled hay et al).

The Port of Portland entered into an agreement with Oregon Steel to bring steel products into T6 in an area very close to the mill, which minimized transportation costs. The Port of Vancouver has entered into an agreement with its stevedore to operate the general cargo terminal. Additional breakbulk terminals are not likely to be needed through the study period.

Efficient inland connections for gateway traffic are also required to support breakbulk operations.

Rail service is critical for steel coils and other products moving from the Ports to manufacturing centers located in the Midwest and elsewhere. This requires cost effective access to the rail system by small and large volume shippers. The performance of the rail system is addressed in another section of this report.

Barge service has been used to transport imported wind turbines from the Ports upriver to the construction site. As an example, turbines and other products were barged from the Ports to the Stateline Wind Energy Center located in Walla Walla. Other similar projects are expected to occur in the future. Because these projects could not occur without it, these projects underscore the need for full barge access to Columbia-Snake River system. The performance of the barge system is addressed in greater detail in a later section.

Containers

The region's local container market consists of an area including the state of Oregon, southern Idaho, and the barge system serving southeast Washington and northern Idaho. Products in this market area can either move via Columbia River ports (primarily the Port of Portland) or container ports in Puget Sound (primarily Seattle and Tacoma). The region's share of the local market depends on a number of factors, including the number of containers moving to and from each country/region, the relative frequency of service provided by ocean carriers and relative inland transport costs, among other factors.

The 2006 forecast update extends baseline conditions, in which the region would continue to experience modest growth in container volumes. However, container volumes on the US West Coast are expected to continue to grow rapidly throughout the study period. A direct result will likely be the absorption of container terminal space in the existing major gateways, increased costs of service and congestion on the mainline rail systems. A search for new gateways is currently underway and the Portland-Vancouver region could potentially play a greater role serving this need but there are challenges to meeting this opportunity.

Container vessels are getting larger and deeper. As shown in Table 1, the fully laden draft of Panamax and Post-Panamax vessels up to 6,000 TEUs can be accommodated in the improved Columbia River channel with minimal underkeel clearance. However, as vessel size increases beyond this point, the vessel would have to call the Portland-Vancouver region with a partial load. It should be noted that import containers are relatively light and the vessels do not typically achieve their design draft.

A recent study by the Port of Long Beach finds that "The projected fleet calling San Pedro Bay ports reflects a continuing growth in average ship size from approximately 3,700 TEUs in 2004 to 5,800 TEUs by year 2020. Fully 22 new weekly services are expected with

vessels ranging in size from 8,000-12,000 TEUs[3]." Throughout the study period, there will be vessels calling on the West Coast that can utilize the improved Columbia River channel.

Table 1 – Container Vessel Dimensions

Type	TEUs	Length	Draft	Beam
Existing Vessels				
Panamax	3,000	722	39	106
Panamax	4,000	919	37	106
Post-Panamax	4,500	961	40	106
Post-Panamax	5,000	919	41	131
Post-Panamax	6,000	1,001	41	141
Post-Panamax	8,000	1,099	45	141
Future Vessels				
Suezmax	12,000	1,312	48	172
Post-Suezmax	18,000	1,542	52	197

Source: Propulsion Trends in Container Vessels, Man B&W A/S

More significantly, the major US West Coast port gateways are nearing capacity. As this occurs, ports and terminal operators are focusing on maximizing terminal velocity. There are several programs underway that attempt to improve productivity, including:

- Smoothing of the peak seasonal volumes,
- Shifting from wheeled to grounded operations,
- Increase in use of night gates,
- Increase in the use of off-dock transfer areas, and
- Financial incentives to improve throughput, among others.

These efforts will improve throughput but they will also likely increase terminal-related costs. These trends are forcing shippers and carriers to identify new gateways. The Portland-Vancouver region has available waterfront industrial land. In addition, the Columbia Gorge route is less congested than other west coast corridors. This issue is addressed in more detail in another section.

The opportunities for achieving growth in container throughput beyond the baseline forecast appear guardedly optimistic.

Fully Assembled Automobiles

The Portland-Vancouver region has established itself as one of the leading US gateways for automobile traffic. The 2006 forecast calls for much more rapid growth in automobile traffic than the 2002 forecast. In 2030, there are expected to be 615,000 tons (approximately 410,000 additional units) more than previously forecast. This level of growth would double the throughput of automobiles through the region.

[3] Source: Forecast of Container Vessel Specifications and Port Calls Within San Pedro Bay Final Report, Mercator Group, February 22, 2005, Page 3.

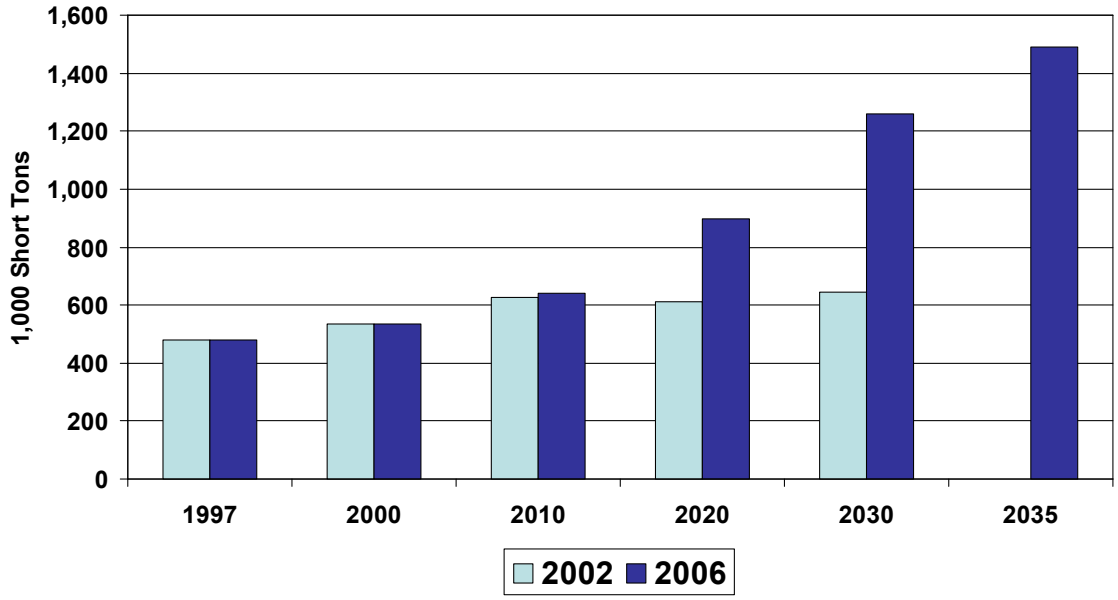
In addition to carrying autos, these ships also occasionally carry project cargo.

Auto carriers are increasing in size but are not expected to have any vessel draft limitations given the Columbia River channel improvements.

The infrastructure challenges for meeting the forecast opportunities are terminal development and inland transportation. Portland and Vancouver both have existing terminals for autos. New terminals are required to serve the additional expected volumes and should be in place prior to 2020.

Approximately 75% of the auto imports are transported by rail to inland destinations. The cumulative impact of this additional carload volume would need to be accommodated.

Figure 3 – Marine Traffic Forecast – Fully Assembled Automobiles (1,000 short tons)



Grain Exports

The Portland-Vancouver region is a major gateway for grain exports, primarily serving wheat exporters as well as other commodities (barley, corn, soybeans, sorghum et al). The 2006 forecast anticipates between 1 and 2 million additional tons of grain more than the 2002 forecast during the forecast period[4].

By leaving at the right time and speed, grain shippers have been able to take advantage of tidal conditions and achieve vessel loadings exceeding 40 feet. The channel deepening (to 43 feet) will make deeper draft loading more accessible for these shippers.

Some of the grain elevators in the region are old and less efficient. There are plans to improve and expand the elevator system in the region. With these improvements, existing facilities should be able to accommodate the forecasted volumes.

[4] In addition to grain exports, the Port of Vancouver has recently entered into plans to develop an ethanol terminal, which will increase receipts of grain by rail.

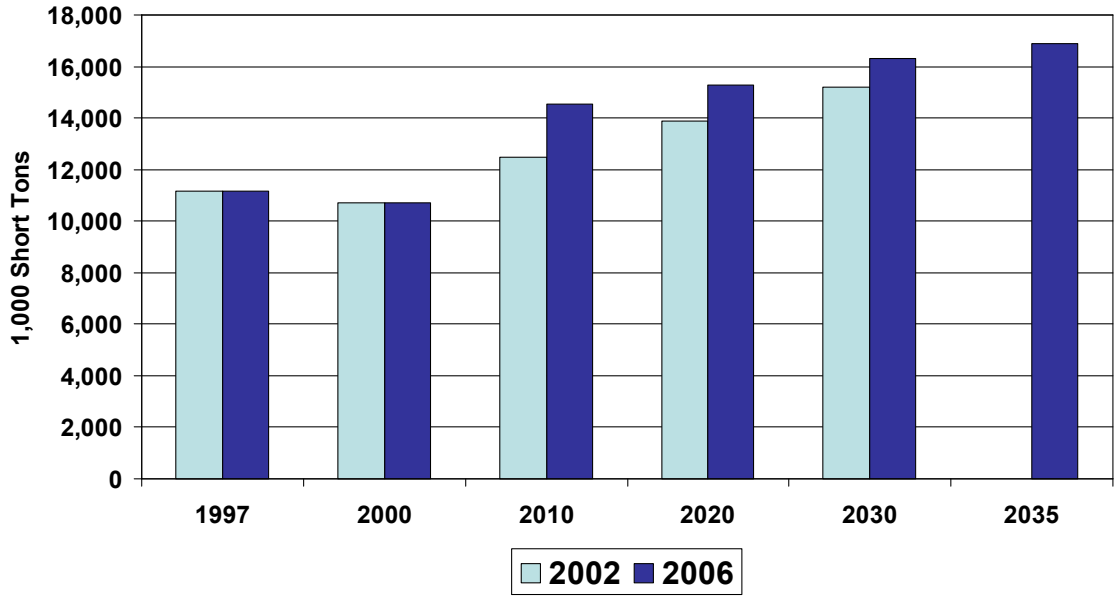
Grain arrives at the elevators by barge (around 40-45%) and rail (around 55-60%).

Of the barged grain, more than half arrives from elevators located along the Lower Snake River and the remainder comes from elevators located along the Columbia River. Continued access to the barge system is required to meet the forecast volumes.

Grain moving by rail comes from areas that are more distant from the river system, stretching from Washington, Oregon and Idaho into Montana, North and South Dakota and beyond. The railroads have initiated pricing systems that provide an incentive for rapid loading and unloading of unit trains of grain. This has required improvements to the elevators in the Portland-Vancouver region to accommodate the unit trains. These improvements have largely occurred or are underway.

However, as the mainline rail system begins to reach capacity, the railroads have begun to focus more on transcontinental traffic. This could negatively impact short haul grain shipments. The conventional wisdom is that if the barge system is compromised, the displaced volumes would shift to rail. However, there continues to be uncertainty about whether the railroads would accommodate this traffic.

Figure 4 – Marine Traffic Forecast – Grain Exports (1,000 short tons)



Dry Bulks

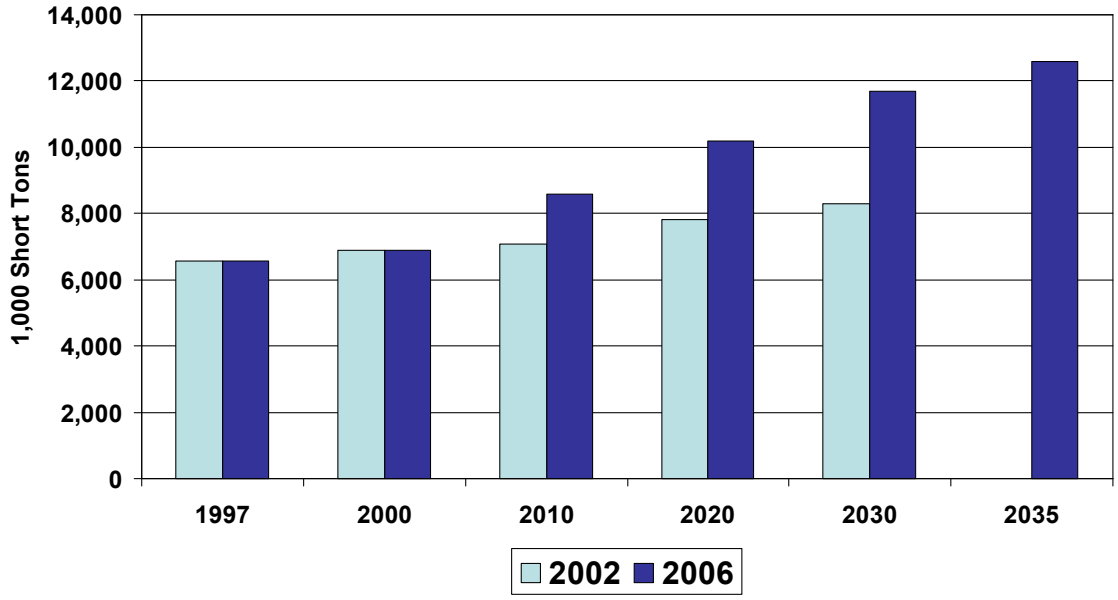
The Portland-Vancouver region is also a major gateway for dry bulk imports and exports, including exports of potash, soda ash, bentonite clay and ores and imports of ores, fertilizer, minerals and mineral products (cement and limestone) among other products. The 2006 forecast anticipates more than 3 million additional tons of dry bulks than projected in the 2002 forecast in the year 2030.

Dry bulk commodities are typically moved in Panamax or Handymax vessels. Given improvements to the channel, these vessels are not expected to experience constraints.

The increased volumes will likely require additional terminal capacity. The Ports are currently planning expanding existing facilities and possible building new terminals as market conditions warrant.

Virtually all of the outbound dry bulks arrive at the Port by rail in units trains. The ability of the rail system to accommodate these flows will require numerous improvements, which are covered in the rail section of this report.

Figure 5 – Marine Traffic Forecast – Dry Bulks (1,000 short tons)



Liquid Bulks

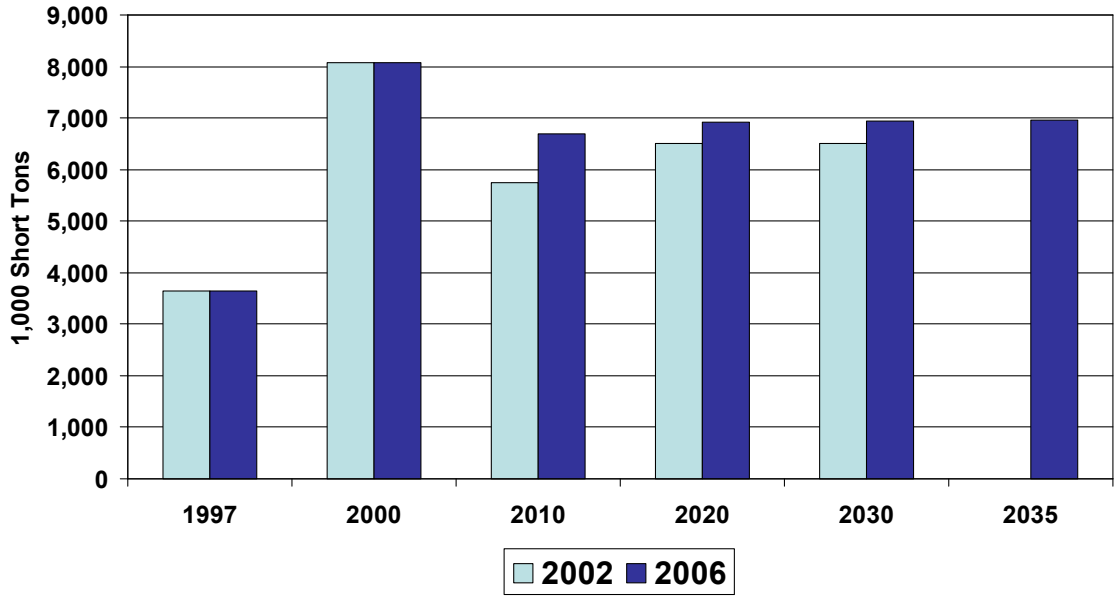
Liquid bulks flowing through the region include:

- Petroleum products for local consumption as well as barged volumes to upriver communities along the Columbia and Lower Snake Rivers,
- Crude oil used for asphalt plants supporting the local construction market and
- Chemicals used by local industry.

The 2006 forecast is slightly higher than the 2002 forecast. The forecast anticipates that more of the petroleum products will arrive in the region by truck and pipeline than by ocean vessels.

Vessels carrying these products are typically parcel tankers or barges and do not have draft constraints in the channel. The products flow through private terminals that are expected to be able to accommodate the anticipated flow of the product. Most of the product is consumed locally and is transported by truck. However, a portion of the petroleum products moves upriver by barge. Continued access to the barge system is required to meet these needs.

Figure 6 – Marine Traffic Forecast – Liquid Bulks (1,000 short tons)



BARGE CARGO SYSTEMS

The Columbia/Snake River waterway is an extension of the Columbia River navigation channel, which allows for commercial navigation between the Pacific Ocean and Lewiston, Idaho. Most of the commodities moved via barge move to the deep-water ports on the lower Columbia River.

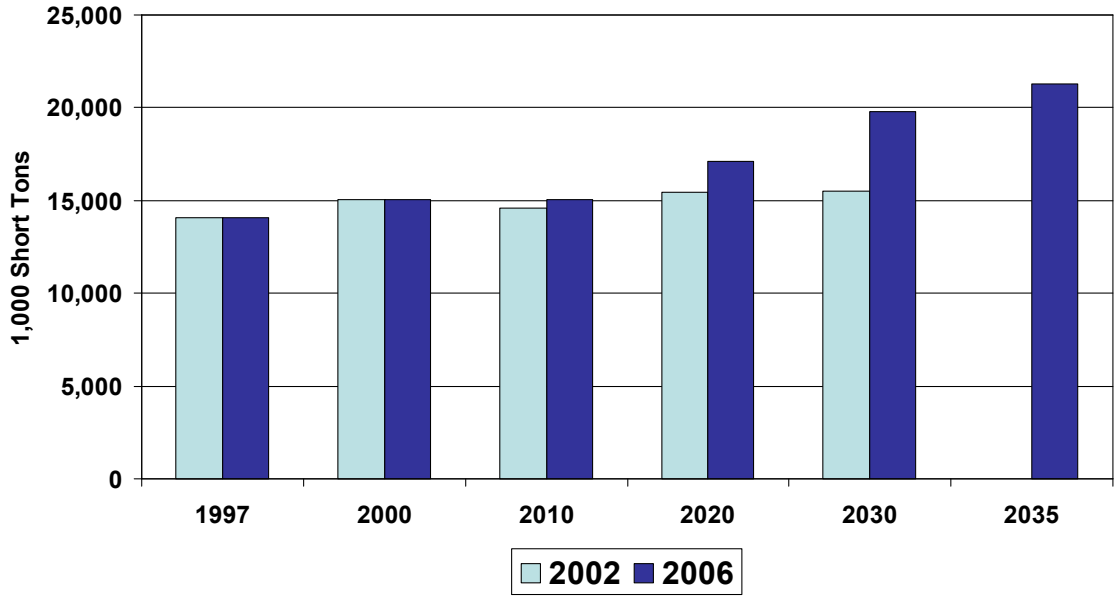
The 2006 forecast projects that significantly more cargo will be transported by barge (more than 4.2 million tons in 2030).

Downbound cargo is largely comprised of grain as well as containerized products (animal feeds, peas and lentils, and forest products) and forest products (wood chips and logs) among others. Upriver cargoes mainly include upriver shipments of petroleum products, fertilizer and returning empty containers. In addition, there are shipments and receipts of gravel and other construction materials.

Most of the increased growth is expected to come from grain shipments and to a lesser extent from construction materials (particularly aggregates).

Existing barge terminals are generally capable of handling these projected volumes. In addition, the barge system has been sized to meet the additional volumes

Figure 7 - Barge Traffic Forecast – Inbound, Outbound & Internal (1,000 short tons)



Most of the constraints on the barge system result from efforts to breach the Lower Snake River dams and to delay or eliminate improvements such as dredging the channels or improving the lock systems.

The barge system functions effectively for shippers from both economic and transportation perspectives, meaning that system capacity is available at a competitive cost for all system components, including: access roads, river elevators, navigation channel capacity, barge availability/capacity and down river elevator capacity for unloading barges. However, the need for improved dredging is required in the navigation channels and at the entrance to some terminals. Annual dredging in the Lower Snake river is expected to cost approximately $4 to $6 million every three years. Lock maintenance is expected to cost approximately $1.5 million per year in the mid-Columbia and $1.9 million per year in the Lower Snake river[5].

In the near future, improvements will also be required for the lock systems to improve fish flows and replace aging systems. In the near term (within five years), this will include:

- Mid Columbia River navigation lock repair & retrofit – approximately $33,300,000 and
- Snake River navigation locks repair & retrofit – approximately $18,100,000.

In the longer run (10+ years), there is a need to replace the BNSF rail bridge navigation lift span in order to make barge transit more efficient. This is expected to cost approximately $56.5 million.

[5] Source: Pacific Northwest Waterways Association.

If barging were no longer available, wheat would necessarily move to another, more expensive mode of transport, which would affect the selling price of the grain, because barge is the lowest-cost means of transporting downriver. Given the intense competition in the world wheat market even a small increase in the price of Pacific Northwest wheat could have a substantial negative effect on exports. In addition, as noted previously, the railroads have shifted their focus from short haul to long haul operations. As a consequence, it is unclear whether the displaced barge volumes could move to rail.

Portland/Vancouver
International and Domestic Trade Capacity Analysis

Task 3

Growth Opportunities and Challenges Assessment

Outlook on Rail

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August 23, 2006

Freight Demand

The United States economy will grow at an average compound annual growth rate between 2.6 percent and 3 percent between now and 2035. At these rates, the tonnage of freight moved in the U.S. will double by the end of the period. However, rail's share of total tonnage is forecast to drop because of the continuing structural shift in the economy toward industries and trade that generate toward lighter, higher-value freight shipments. Nevertheless, rail tonnage will increase 60 percent and rail ton-miles by 70 percent.

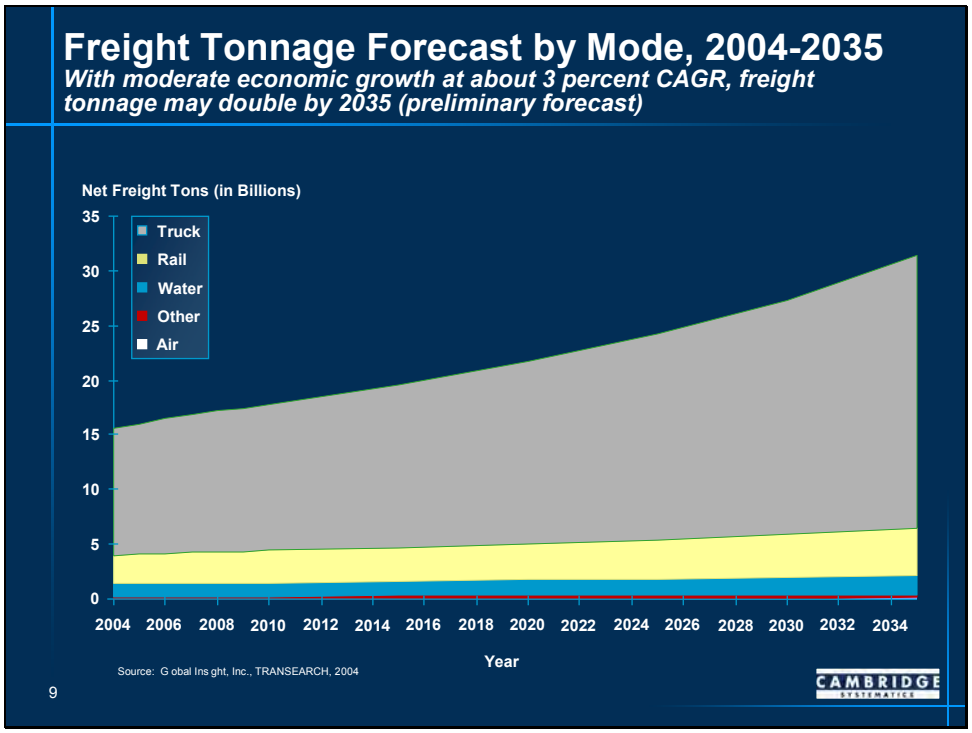

Figure 1

The Pacific Northwest (Washington and Oregon) will grow faster than the national average. The gross regional product is expected to grow at an average compound annual growth rate of about 3.5 percent. This means that the PNW will see a doubling or more of freight demand. As with the national forecasts, rail's share of total freight tonnage is expected to decline, with trucking absorbing more of the growth in freight demand in the PNW. However, just to handle its share, rail will need to carry about two-thirds more tonnage through the PNW than it does today.

In the Portland/Vancouver region, total freight tonnage is expected to grow from about 300 million tons today to 600 million tons in 2035. As in the nation and the PNW, demand for rail will grow more slowly than for truck, but rail will carry about 50 percent more tonnage than it does today. The Portland/Vancouver region generates about 35 million tons for rail today; this will grow to over 56 million tons by 2035.

We expect to see 1.52 percent growth in rail carload tonnage coupled with the 2.52 percent growth in intermodal traffic tonnage (see Task 1). The growth in carload tonnage from 19,000 tons to 26,000 tons translates into an additional six to eight trains per day. The growth in intermodal tonnage from 16.5 million to 30 million tons also translates to an additional six to eight trains per day (TPD). Accounting for empty returns, the Portland/Vancouver region will need to accommodate between 24 and 32 additional TPD to handle the rail share of freight demand by 2035. Splitting this growth between the two Class I carriers suggests that the BNSF and UPRR each must handle 12 to 16 additional trains per day. Additional rail infrastructure will be required in the Portland/Vancouver area to keep up with this growth.

Railroad Business Practices

Nationally as well as in the PNW and the Portland/Vancouver region, the railroads are straining to meet the growing freight demand. The rail industry today is stable, productive, and competitive with enough business and profit to operate. But despite the recent increase in prices and revenue, the industry is not yet attracting capital fast enough to replenish its infrastructure quickly nor keep pace with demand and public expectations. The rail industry spends three to five times as much on infrastructure as other major industries. As a consequence, both lenders and railroads tend to be very cautious about over-investing in infrastructure. The mismatch between demand and rail supply has led to increasing rail congestion and deteriorating service levels in many rail corridors.

The Class I railroads are responding by increasing "velocity" to gain greater throughput capacity and shifting further toward "wholesale" railroading, looking for economies of scale by focusing on long-distance, high-volume, "hook-'n-haul" operations. Specific strategies include the following.

Railroads are using pricing to turn aside lower-profit carload freight in favor of intermodal and coal traffic, which can be handled cost-effectively and profitably in bulk unit trains. In some markets and corridors, international intermodal traffic is squeezing out industrial-carload traffic, and even domestic-intermodal traffic. Shippers, who are used to being price setters, and now price takers. This is painful change for all shippers, especially captive shippers, who are being forced to rethink their supply chains and markets. This shift is having a noticeable effect in the PNW and the Portland/Vancouver region. The Ports of Seattle and Tacoma are major gateways for intermodal traffic moving to and from the Pacific Rim. The strong growth in intermodal traffic is slowly eroding the railroads' capacity to serve local Oregon and Washington State industrial and agricultural carload traffic.

The railroads are rerouting traffic. As oil prices have increased, the demand for coal from the Powder River Basin has surged. The Class I railroads have been under strong pressure from electric utilities and politicians to ensure the reliable rail service. The high volume of coal trains moving east out of the Powder River Basin (PRB) has made it virtually impossible to route time-sensitive intermodal trains moving from PNW ports to central and southeast gateways such as Kansas City and Memphis through the near

continuous flow of slow-moving coal trains. Adjusting to this, BNSF has shifted all intermodal traffic destined to locations south of Chicago to the Ports of Los Angeles and Long Beach. All intermodal traffic landing at PNW ports must now move through Chicago. Because of continuing delays in implementing much needed physical plant and infrastructure improvements in the Chicago area rail network, many trains routed through Chicago are penalized up to one to two days as this traffic attempts to move through Chicago. The UPRR faces a similar problem. The UPRR's only east-west corridor connecting the PNW with Midwest and Eastern destinations passes directly through the 120-140 TPD central-Nebraska coal corridor. To avoid conflict with the coal trains, UPRR now routes their time-sensitive intermodal traffic over their Sunset Corridor, bypassing the large volume of coal trains of the Central Corridor. These routing changes make it more difficult for the Ports of Seattle, Tacoma, Portland, and Vancouver to compete with the Ports of Los Angeles and Long Beach for intermodal traffic destined for central and south-central U.S. and East Coast markets.

Figure 2:

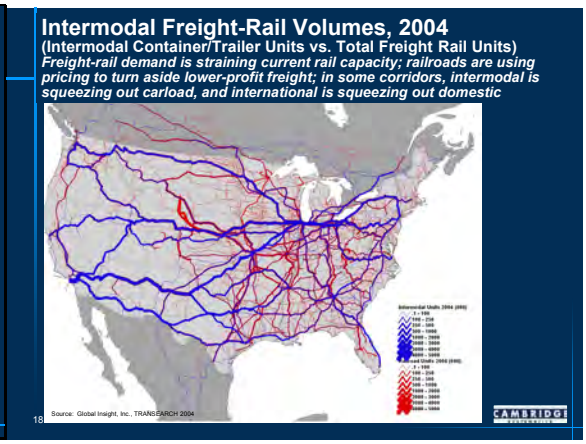

Figure 3:

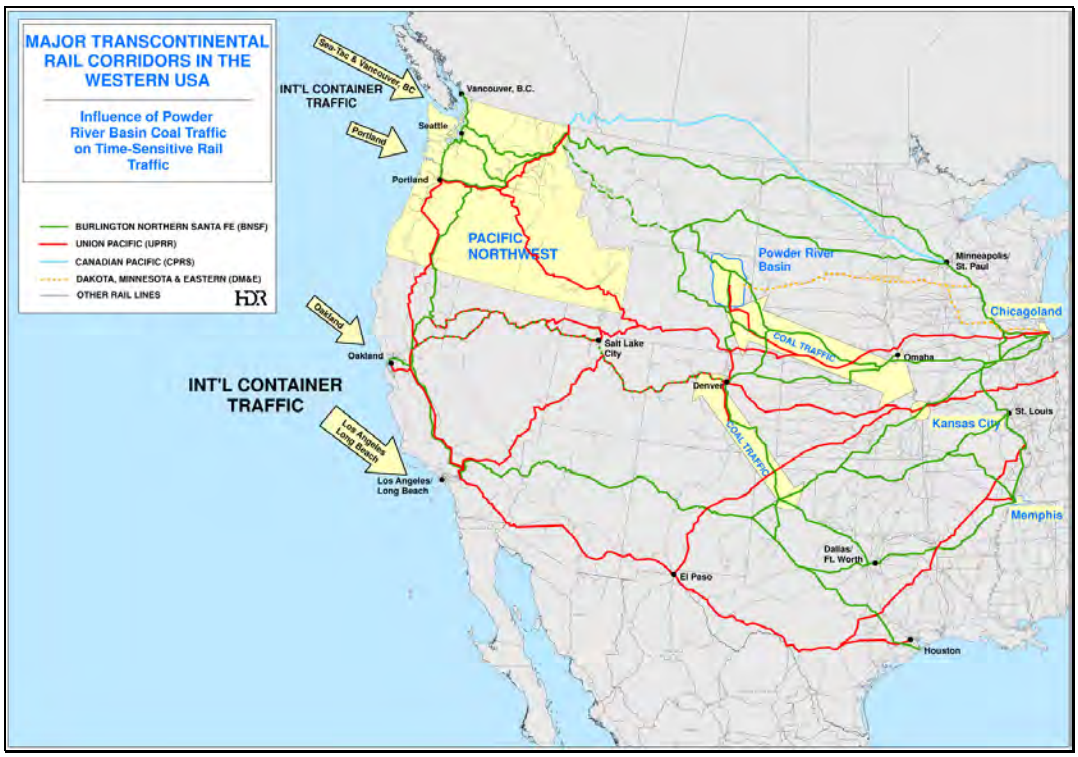

Figure 4: High Volume of Powder Rive Basin (PRB) Coal Traffic on Key UPRR and BNSF could discourage their agreeing to time-sensitive, guaranteed delivery intermodal service.

Figure 5: Recent depiction of BNSF's revamping of their PNW Intermodal Traffic Flow. Note that the Time-Sensitive Service Lanes all avoid BNSF's primary PRB Coal Routes.

The railroads are using longer trains. For example, the BNSF has mandated that all their international intermodal shipments will be handled in 40-foot well cars and all their intermodal trains will be 8,000 feet in length. These changes will allow the BNSF to increase the amount of freight that can be handled over its mainlines without increasing the number of trains. However, the longer trains cannot be handled without lengthening sidings to permit trains to meet and pass; and without providing the corresponding yard capacity to assemble and hold the longer trains. Adding sidings and expanding terminals is a major challenge in a densely developed area such as the Portland/Vancouver region.

Railroads are encouraging the rationalization of the carload network and the development of consolidation terminals for carload and domestic intermodal shipments. To provide rail service that is cost competitive with trucking—at least for long-haul movement of heavy or bulky commodities—the Class I railroads have restructured themselves as wholesale carriers. They specialize in moving large quantities over great distances where economies of scale (such as gained by the use of unit coal, grain, and intermodal trains) can be used to keep the cost of individual shipments down. To do this, the railroads have focused on mainline, "hook-'n-haul" service, relying on short lines and truckers to collect and distribute traffic to individual shippers. And to feed these mainline, "hook-'n-haul" services, the Class I railroads are pushing shippers, short lines, and truckers to consolidate shipments in ever larger terminals and "industrial villages." They are accelerating the process by declining to stop trains on the mainline to pick up and put out small lots of carload and intermodal traffic (e.g., 2, 5, 10 cars at a time). These small "work events" cost the railroads more in mainline delays than they generate in revenue. Should a potential shipper insists on locating their facility adjacent to a Class 1 mainline, the railroads are countering with the stipulation that all work events necessary to serve the facility must be on siding tracks clear of the mainline and that trains must enter and leave these siding tracks at relatively high speeds (in the 30 MPH range). In the Portland/Vancouver region, this will likely play out as pressure to relocate and consolidate small local terminals and provide trackage rights to short lines so they can access these new consolidation terminals. There will be a tendency to locate these terminals further outside the urban area because of the high cost of urban land and because railroading is a heavy, 24/7 industry. Development of consolidation terminals will benefit the Portland/Vancouver region by sustaining rail service and therefore industries and jobs, but rebound to the public sector in the form of higher highway and bridge maintenance costs to accommodate increased and longer-distance truck traffic to and from the rail centers.

Union Pacific and BNSF differ in the markets that service. The two figures below indicate these differences.

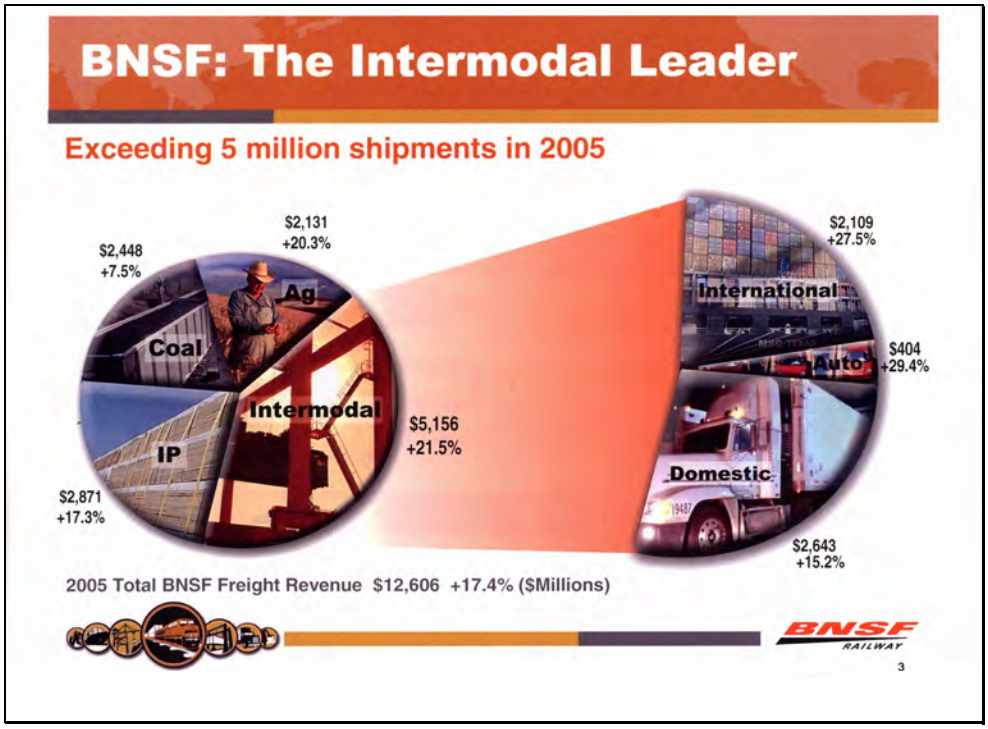

Figure 6: Depiction of BNSF's 2005 Market Distribution

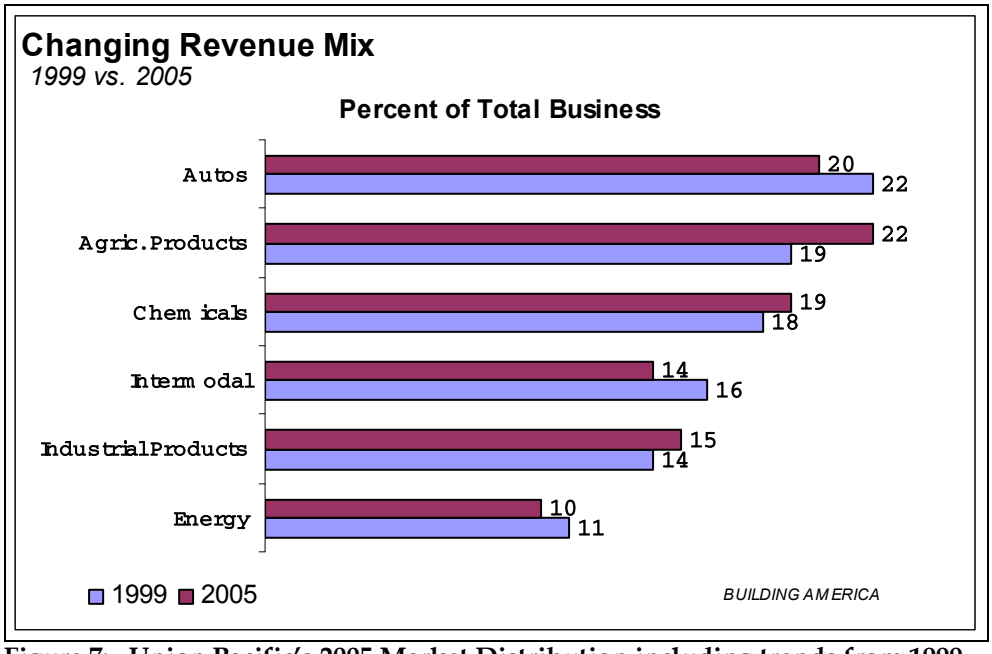

Figure 7: Union Pacific's 2005 Market Distribution including trends from 1999

Rail Capacity Issues

The Portland/Vancouver region has a number of capacity and service constraints that must be addressed to accommodate the growth in rail demand and deal with the changing business models of the Class I and short line railroads. The constraints center around the Portland/Vancouver Triangle, the I-5 Corridor between Portland/Vancouver and Seattle, and the East-West Corridors (Stevens, Stampede, and Gorge lines)

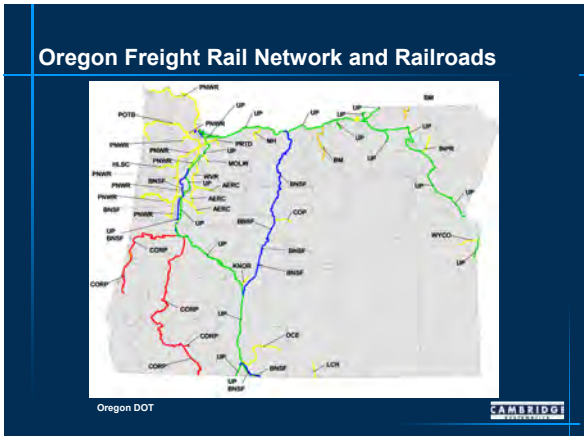

Figure 8

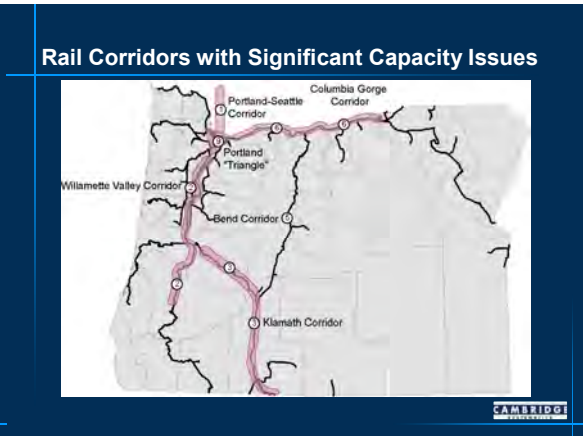

Figure 9

Portland/Vancouver Triangle

The Portland Triangle is the complex of rail lines, switches, sidings, yards, and terminals – including the BNSF rail bridge crossing the Columbia River – that serves freight- and passenger-rail traffic moving into, out of, and through the Portland-Vancouver metropolitan area. The Triangle is the linchpin of the Oregon and the Pacific Northwest rail systems. It serves north-south and east-west through-traffic, freight trains moving to and from Portland and Vancouver's marine terminals, the railroads' four major freight yards, and the state's largest collection of industrial shippers. Portland's juxtaposition at the west end of the Columbia River Gorge allows rail shippers direct access to the only water-level route through the Cascades. Rail traffic must travel through the Triangle because the two-track rail bridge across the Columbia is the only rail crossing in the region. The next major rail crossing of the Columbia River is 92 miles upstream near The Dalles, Oregon.

Following their merger with Southern Pacific, UPRR greatly altered the flow of freight rail traffic in and around Portland area. Due to restrictions near East Portland (near and underneath the intersection of I-5 and I-84), all freight moving between the Willamette Valley (primarily forest products) and California (freight of all kinds) and eastern destinations (such as Hinkle, Salt Lake City, the Midwest and the East Coast) must pass through Albina Yard, turn the corner at Penn. Junction and proceed east on the Kenton Mainline. This is due to the fact that an eastbound connection at East Portland does not

currently exist. This infrastructure improvement would greatly ease congestion in the Portland area by routing the Hinkle-Eugene and Hinkle Roseville, California trains away from the congested Kenton Mainline corridor.

UPRR trains passing through the Portland Triangle enroute to Kalama, Longview, Centralia, Tacoma and Seattle must also pass through the Kenton Mainline. These trains stop on the Kenton Main to change crews. This procedure takes 20 to 30 minutes and, because the Kenton Main is primarily a single track railroad, no other train can move. Changing crews affects the movement of trains as described in the paragraph above as well as hampers UPRR trains moving south on the BNSF Mainline through Vancouver which must oftentimes wait for the Hinkle-Eugene and/or the Hinkle Roseville trains plus the trains that are changing crews to move out of the way before these trains can be advanced. In this manner, congestion south of the Columbia in Oregon has a great impact on BNSF's ability to move passenger and freight trains north of the river in Washington. Double tracking the Kenton Main as well as improving the velocity through the North Portland Interlocker (controlled by BNSF) would greatly help the throughput and the capacity of the Portland Triangle.

Union Pacific operates two intermodal yards in the Portland area, one yard is in Albina and one in Brooklyn. While their plans are not finalized, they intend to consolidate these two yards into one using Brooklyn Yard as UPRR's only intermodal yard in the Portland area. This modification, which will likely occur when the existing load-limited MLK Blvd viaduct is replaced, will free up much needed space in Albina Yard for manifest traffic.

Union Pacific was disappointed with their inability to sequester *Connect*Oregon funds for projects that would free up capacity in the Portland Triangle. They also attempted to secure project funds to improve their mainline capacity on the Portland to Eugene segment of their network, a corridor that is badly over-capacity. In late 2004, UPRR invested $10M into a new mainline through Albina Yard in hopes of improving system velocity through Albina Yard. They have $4.7M remaining to construct a second mainline through Eugene, a project that is estimated to cost in the neighborhood of $6-6.5M.

I-5 North-South Corridor

The Portland/Vancouver-Seattle corridor serves freight-rail traffic moving north from Portland to Seattle and traffic moving south from Seattle, Tacoma and British Columbia to Portland, California and the Midwest.

BNSF is moving more and more of their intermodal business south from the Ports of Seattle and Tacoma along the I-5 corridor to Vancouver, east to Pasco, northeasterly to Spokane, and then east on the BNSF mainline to Chicago and East Coast markets. The reverse movement of these intermodal trains is also occurring along this route through the Gorge. To accommodate this shift in freight rail traffic flow, BNSF is expanding capacity on their Fallbridge and Pasco Subdivisions (the segment between Vancouver and Pasco) by lengthening the siding at Lyle. This modification of their train movements has been precipitated by the following events:

- BNSF's Mainline between Seattle to Everett then east over Stevens Pass to Wenatchee and Spokane is "at capacity" due to the physical restrictions imposed by the ventilations operations of the 7.78-mile long Cascade Tunnel. Approximately 24-28 trains per day (TPD) are moving through this tunnel daily; the tunnel's rated capacity is 28-30 TPD.
- The BNSF Stampede Pass mainline between Auburn and Pasco cannot accommodate high-cube, double-stack equipment because there is insufficient clearance in the two-mile long Stampede Tunnel. Consequently, BNSF cannot use this corridor to handle any of their intermodal traffic growth.
- BNSF, under the auspices of Sound Transit, has been adding capacity to the segment between Seattle and Tacoma by constructing a third and fourth mainline. When this project is completed, the construction to add capacity between Seattle and Everett will begin. The additional trains generated by both the Port of Seattle and the Port of Tacoma have been routed south through Vancouver then east through the Columbia Gorge to avoid this construction interference and because there isn't sufficient capacity through Stevens Pass.

The combination of the UPRR's inability to move through the Portland Triangle coupled with the influx of BNSF intermodal business has created a tremendous bottleneck along the I-5 corridor between Vancouver and Kelso, WA. What commonly occurs is that the UPRR trains depart Portland with very little time left to work and consequently tie up on the BNSF Mainline in the vicinity of Longview. In part this occurs because both UPRR and BNSF freight trains stop daily on the BNSF mainline between Vancouver and Kelso at Woodland, Kalama, Kalama Export, and Longview, picking up and setting out cars to serve the major industries at these locations. Into this congestion are injected the ten scheduled passenger trains operated daily by Amtrak and WSDOT's passenger rail program.

BNSF has been working with WSDOT to develop capacity projects in the Vancouver area (Vancouver Bypass and the West Vancouver Rail Access Project) and the Kelso to Martin's Bluff Third Mainline (see Figures 10 & 11 below). However, these projects have cost higher than expected and have not yet been funded.

According to UPRR, in terms of volume, they move as much business north and south as BNSF moves east and west from PNW locations. This volume of train movement is reaching capacity on UPRR's North/South corridors including: (1) their corridor north of Portland where they operate on a trackage rights basis on the BNSF Mainline between Portland and Tacoma and (2) their corridor south of Portland (between Portland and Eugene) that is often at capacity. Indeed, the on-time percentage of the six daily passenger trains is roughly in the 37-39 percent range. This low on-time percentage is indicative of the congested experienced by both passenger and freight trains.

East-West Corridors (Stevens, Stampede, and Columbia Gorge Lines)

The Columbia Gorge corridor is the major east-west corridor connecting the Portland, Oregon, and the Pacific Northwest with the national rail system. UPRR owns and

operates the rail line through the Gorge on the south (Oregon) side of the Columbia River. BNSF owns and operates a parallel rail line through the Gorge on the north (Washington State) side of the Columbia.

The Gorge corridor is the preferred route for heavy and transcontinental trains. Although the BNSF and the UPRR lines are single tracked for much of the route, the corridor rail lines run at river-grade through the Cascade Mountains. By contrast, the BNSF's more northerly routes, which run directly east from Seattle, must climb over the Cascades. The BNSF's Steven's Pass line travels through a nearly eight-mile long, single-track tunnel at the height of the pass. The number of trains using the tunnel is limited to allow for venting of exhaust gases from the tunnel. The parallel Stampede Pass line located roughly 70-90 miles south of the Stevens Pass route also must negotiate a two-mile long, single track tunnel and is not cleared for double-stack container trains.

Union Pacific's East/West Mainline between Portland and Hinkle is reaching capacity. This is due to the fact that UPRR's strategic alliance with CP Rail is reaching their expected goals. Approximately 12 trains daily now operate between Eastport, Idaho (the location in northern Idaho where UPRR interchanges with CP Rail) and Hinkle. Add these 12 trains to the 20-24 trains per day that move between Hinkle and Idaho over the Blue Mountains indicates that 32-36 trains are now moving between Portland and Hinkle. While not at capacity, there are days when capacity is exceeded and then all trains are delayed. *Connect*Oregon awarded UPRR $3.7M to construct additional tracks in Hinkle adjacent to their mainline. These tracks will serve as "near port storage capacity" tracks for the Port of Portland.

The BNSF mainline through the Gorge is also approaching capacity. It handles approximately 35 trains per day (TPD). With the increased level of intermodal traffic, BNSF is now operating 35 and occasionally 40 TPD over this route. Extending sidings will help, but with sustained growth forecasted for the PNW, BNSF must consider opening up Stampede Pass for intermodal traffic as well as planning for expansion to add capacity in the Gorge.

BNSF's north/south route through Oregon connects with their Gorge route at Wishram. As a result of the Union Pacific/Southern Pacific merger, BNSF obtained a continuous route between the PNW and the Pacific Southwest. Rail traffic blossomed and BNSF now operates 12 TPD through this corridor, its rated capacity. BNSF has considered several siding expansions as well as clearing several tunnels on this route that passes through Bend to improve their capacity on their north/south corridor.

Shortline Serving the Portland Triangle

Portland & Western Railroad (PNWR) provides shortline service to the Portland area via two connections. From the south, PNWR delivers carload business to the UPRR at Brooklyn Yard over their rail connection that crosses over the Willamette River at Lake Oswego. This same railroad delivers BNSF cars to their interchange yard located at the west end of Willbridge (Willamette River Bridge located near the St. John's Bridge). Discussions are underway for the PNWR, working with the Central Oregon & Pacific Railroad, to deliver

trainload business directly from the Rogue Valley and other Oregon locations. Union Pacific has apparently approved "intrastate" shipments that would move to Portland area destinations on this PNWR/CORP routing such as the Rogue Valley. This movement is a combination of UPRR and BNSF franchise arrangements. Normally, whenever one railroad handles the business of another carrier, a reciprocal switching fee is assessed. This move would duplicate the current inter-railroad move of logs from Rainier and forest products manufacturing sites in Southern Oregon. Also underway is the implementation of a passenger commuter rail service between Beaverton and Wilsonville on the PNWR. This project is being managed by TriMet which is seeking a Full-Funding Grant Agreement in October, 2006 from the FTA. The proposed service would operate three morning and three evening bi-directional passenger trains in what will be the first suburb to suburb commuter service in the country.

In other developments that may ultimately impact the Port of Portland is the Portland & Western's assuming of the handling of BNSF's 663/664 freight train service between Vancouver, WA and Albany, OR. This movement will allow PNWR trains crews to operate BNSF trains between Brooklyn Yard over the Steel Bridge to the Lake Yard area then into Vancouver.

Both BNSF and UPRR are in the process of handing over the traditional yard switching assignments over to shortlines. This conversion is occurring in Tacoma with UPRR and BNSF having Tacoma Rail handle the switching assignments in Fife and Main Yards respectively. Still in the talking stages is the allocation of switching in the Centralia area to the Puget Sound and Pacific RR. Also, both railroads are considering third party switching in the Portland area and UPRR is considering having a Eugene-area shortline handle all switching assignments in the Eugene area.

One of the primary reasons for implementing these third party switching arrangements is to free up experienced personnel to protect their mainline train schedules. Both railroads are finding it difficult to hire qualified employees. They routinely interview over 100 candidates only to offer employment to 3-5 individuals. Many times, several of these new hires quit once the realization of 24/7 all weather, all hours, mandatory drug testing, on-call life style faces them. Consequently both BNSF and UPRR are resorting to somewhat draconian measures to obtain qualified personnel to operate their trains.

Mitigation Efforts to Relieve Rail Congestion

Portland Triangle Area

Rail congestion in the Portland/Vancouver Triangle negatively impacts the flow of rail traffic in the I-5 north/south as well as the East/West rail corridors. Many of the service failures highlighted above could be rectified if investment in the rail infrastructure within the Portland Triangle could be developed. Until such time as these bottlenecks are mitigated or eliminated, then the rail velocity through the North/South I-5 corridor will continued to be compromised affecting reliable deliveries to rail-served customers as well as the on-time performance Amtrak's and WSDOT's passenger rail program. Figure 10

displays many of the projects identified during the I-5 Rail Feasibility Analysis conducted in 2002. Some of these projects have been completed with the community and the railroad the recipient of the intended results. Other projects are desperately needed as discussed above. BNSF failed to see the benefits to their railroad of improving the speed of UPRR trains entering and leaving their mainline at North Portland Jct. (Project No. 3 in Figure 10). Therefore they choose not to contribute their portion (roughly $800K) of the 20% match for the *Connect*Oregon grant that would have provided approximately $10M to improve the diverging speed through this interlocker. Unfortunately, southbound UPRR trains oftentimes do not have sufficient time to crossover from the BNSF mainline in Vancouver to the UPRR tracks at North Portland Jct. When this occurs, the BNSF train dispatcher holds the UPRR trains on the mainline until such time the UPRR train can be advanced. During the I-5 feasibility analysis, it was determined that this wait can exceed 4-5 hours!

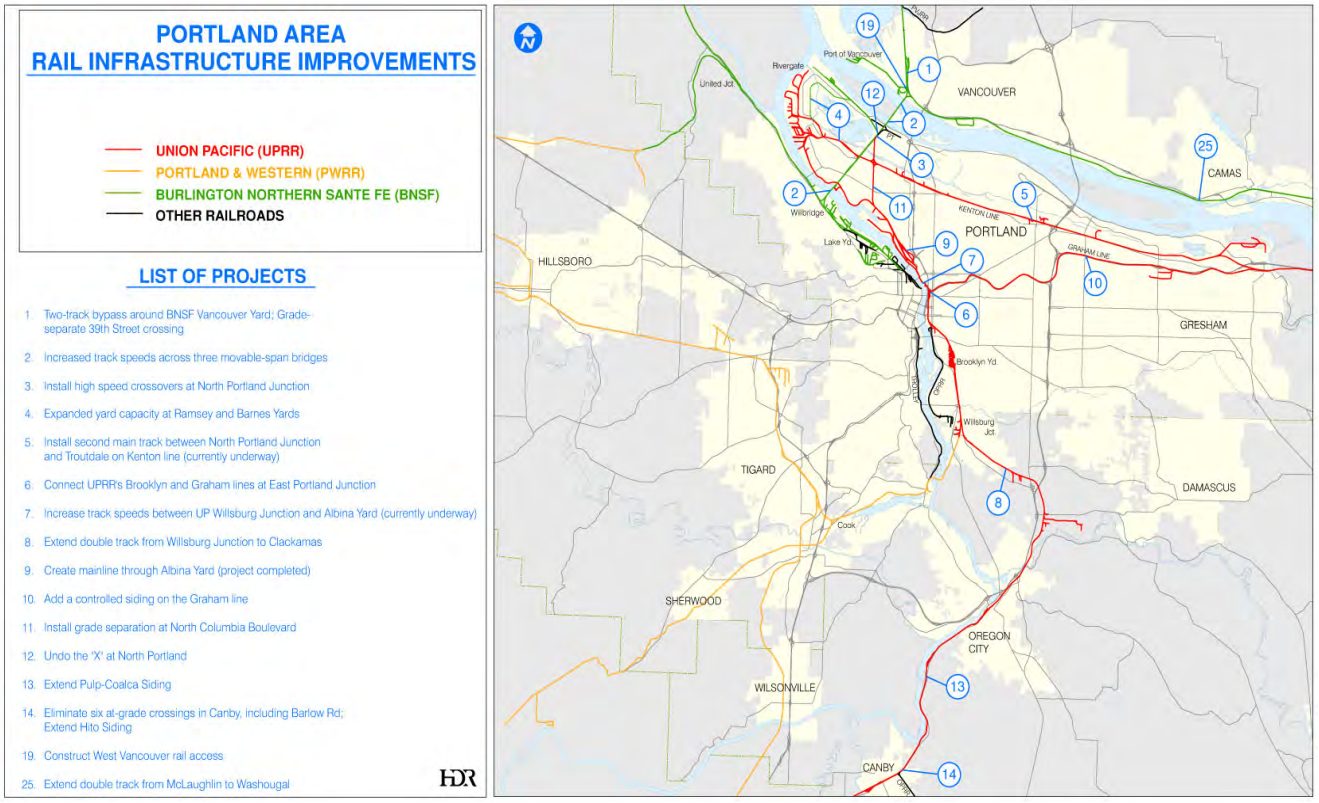

Figure 10: Portland/Vancouver Area Projects that, if implemented, would greatly improve rail velocity and reliability for both passenger and freight trains.

Greater Portland Area Including I-5 North/South & East/West Solutions

By implementing the projects described in Figure 10 would reduce train delay for all classes of trains, there are projects just outside the immediate Portland/Vancouver area that would also be required once congestion in the Portland Triangle is reduced. These projects range from those critically now (Martins Bluff to Kalama and through Longview Jct. Projects No.

22 & No. 23 in Figure 11) to those that the planning effort should be initiated as soon as possible due to long lead time will be long (Double tracking through Albany, Project No. 18 or the Directional Running Scenario Project No. 28 in Figure 11).

Figure 11: A list of Potential Rail Capacity Projects just outside the Portland/Vancouver Area that will be required once congestion in the Portland Triangle is reduced.

Co-Production

Co-Production is the term that indicates segments of trackage whereby BNSF and UPRR allow each other to operate their trains on each other's track. The terms of these agreements are spelled out fairly rigidly so that a shipper who might see a UPRR train operating on a BNSF track might be tempted to contact UPRR to obtain a more favorable rate than the

shipper might have with BNSF. Usually, these co-production agreements strictly prohibit this from occurring. There are many locations throughout their respective systems where both BNSF and UPRR determine that it would be mutually advantageous for them to share their tracks with each other. While their "gameboard" is large, they try to isolate these potential co-production segments to fairly discrete locations where it is clear that if BNSF receives the right to say operate from Reservation to Black River Jct on the Union Pacific, then in return, UPRR would obtain the right to operate from Lake Yard to Vancouver on BNSF's mainline. In this manner, they can determine that the exchange is "equal" and that one railroad doesn't benefit more than the other.

Co-Production on a grand scale could greatly increase east/west capacity through the Gorge. If BNSF and UPRR were to operate all their eastbound trains on UPRR trackage east from Portland through the Gorge and both railroads were to operate all their westbound trains on the BNSF mainline north of the Columbia, then the carrying capacity of these corridors would immediately double. This concept (Project No. 28 in Figure 11) is diagrammed in Figure 12.

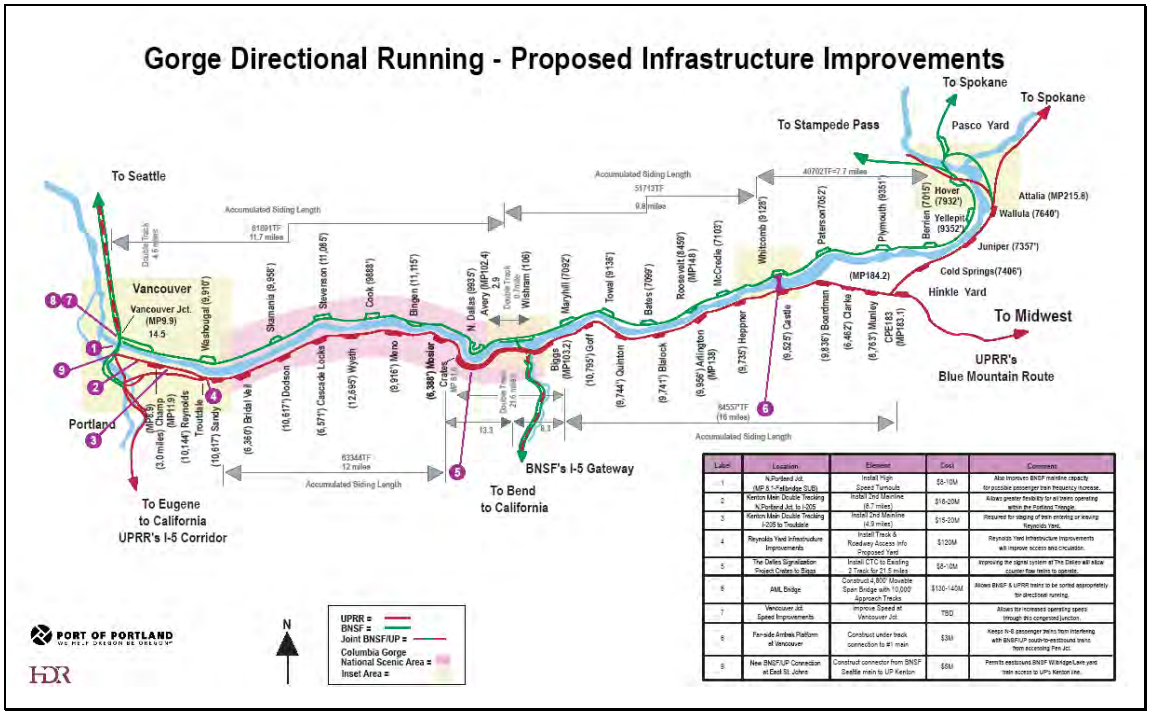

Figure 12: Proposal to Implement Directional Running through the Columbia River Gorge.

UPRR has implemented directional running between the San Antonio area and the St. Louis/Memphis region. BNSF has been granted trackage rights on these paired tracks. Both CP Rail and CN operate together in a co-production agreement between Vancouver BC and Kamloops through the environmentally fragile Thompson River Canyon.

Implications for Portland/Vancouver Freight

Bulk Port Traffic

Congestion in the Portland/Vancouver Triangle impacts almost all of the region's major marine-terminal customers: grain and bulk mineral exporters; lumber, paper, wood, and processed food manufacturers looking to expand their export markets; automobile and wholesale merchandise importers bringing goods in from the Pacific Rim for distribution to the Midwest, etc. Over time, congestion at the core of the Portland rail network will erode the marine terminals' major asset – the perception among shippers, brokers, and carriers that freight transportation through the Portland/Vancouver gateway is relatively less congested and more manageable than other West Coast port cities. The short-term outlook for rail service along the Gorge corridor is good, but long-term service levels are less certain. Much of the Portland marine terminals' business in grain and mineral bulk exports, as well as their business in automobile and containerized merchandise imports, are at risk if east-west rail service along the Gorge corridor is not reliable.

Rail Infrastructure that permits the unrestricted flow of bulk-commodity unit trains includes long storage tracks in the 7000-8000' range that are ideally located near their ultimate terminal for disposition. These storage tracks allow these trains to be "chambered" close enough to the terminal that they can be delivered to the terminal for unloading when it's convenient for the shipper. Also needed are the loop tracks or long working tracks that allow for the positioning of the loads to be unloaded at a dumper pit and then for the empties to be shuttled to a location where they can ultimately be reassembled, air-tested and readied for departure when road locomotives are deployed for the movement back east. Ideally, in today's realm of 110-car unit trains composed of 62' covered hoppers, the working tracks plus trackage through the dumper pit area equates to a narrow parcel of land roughly 3 miles in length without any at-grade road crossings. Both BNSF and UPRR discourage the design of industrial loop track any tighter than 9 degree 30 minute curves. With a radius of 606 feet, this criterion results in a loop track requiring a parcel of land roughly 1.0 mile long and over a quarter mile wide.

Within the Portland Triangle, industrial sites meeting these criteria are few and far between. Loop track arrangements are possible in the Terminal 4 area but these may exceed the minimum curve restriction criteria. Terminal 4 can accommodate relatively long staging or working tracks but much shorter than the nearly 7,000' required to prevent these trains from being doubled or tripled over into multiple tracks. The Port of Vancouver may have parcels of land still able to meet the bulk train infrastructure criteria. Bulk train layouts have been incorporated in the Hayden Island rail planning effort. Except for the proposed mainline trackage over the Slough Bridge, the proposed improvements in the Ramsey Yard and South Rivergate area will be too short to serve to hold a bulk unit train intact (in one unbroken train). However, these tracks will easily accommodate the staging of a bulk unit train by doubling over into the requisite number of track. The addition of a third loop track at Portland Bulk Terminal's facility at Terminal 5 will allow this shipper to handle the

expected volume. UPRR's new 10,000' siding at Hemlock and the recently completed double siding at Champ on the Kenton Main will allow trains to be temporarily stored for disposition at the Port. The Vancouver Bypass will allow BNSF's bulk unit trains enroute to Kalama and Tacoma to be routed through Vancouver without impacting the mainline as the crews are changed on these trains or if these trains are temporarily held for staging. The Port of Vancouver's West Rail Access will allow unimpeded flow of bulk trains to and from BNSF's East/West corridor directly into the Port area without impacting the already congested North/South corridor. This infrastructure improvement will greatly improve rail capacity within the Portland/Vancouver area. Ethanol facilities are currently being contemplated for the Port Westward area near Clatskanie which would necessitate a through-train move from BNSF's east/west corridor over the Columbia River Bridge and Willbridge enroute to the PNWR's Astoria line. Other that taking up mainline capacity, this move shouldn't require any facilities in the Portland/Vancouver area unless surge capacity is needed.

Industrial Carload Traffic

The loss of rail service in the Willamette Valley corridor and related shortages of specialized railcars and containers, which has shifted much of Oregon's local industrial, food products, and chemical traffic from rail to truck over the last decades. Although the volume of international intermodal traffic and the railroads' need to maximize throughput on the mainlines threatens to squeeze out industrial carload traffic, carload traffic is still a major source of revenue for the Class I railroads, especially for the UPRR. The major challenge for the Portland/Vancouver region will be balance the railroads' demand for more railroad-efficient consolidation centers with business and industry's need for tailored door-to-door services and the region's urban growth and land use program.

Rail Infrastructure devoted to Industrial Carload traffic includes, for UPRR, a limited area at Brooklyn Yard, a major classification yard at Albina Yard and at Barnes Yard. BNSF uses Vancouver Yard and both railroads use the Portland Terminal facility at Lake Yard to handle carload business. Both railroads are requiring additional trackage in order to accommodate continued growth in handling carload shipments. The proposed Ramsey Yard is ideal for handling industrial carload business. The propose improvements at South Rivergate will greatly alleviate the congestion there as well. UPRR's yard at Eugene is over-capacity and inadequate to handle the surging industrial carload business in Southern Oregon. While this facility isn't within the Portland Triangle, the fact that Eugene is inadequately-sized does affect train flow in the Portland as well as the Hinkle area.

Intermodal Traffic

Portland/Vancouver's remaining container import and export business depends in part on the frequency of national rail service passing through Portland and on the Portland/Vancouver region's historic role as a major distribution center. Because the Portland/Vancouver marine terminals are eight hours steaming time up river from the ocean, Portland is less attractive than Seattle-Tacoma as a port-of-call for the major containership lines and mega-containerships; nevertheless, Portland maintains a business in container traffic because steamship operators, shippers, and brokers understand that Portland has excellent rail

service. This enables Portland to capture container that might otherwise go Seattle and Tacoma. But to accommodate and grow intermodal traffic, the Portland/Vancouver region must generate enough intermodal traffic and provide sufficient yard space to assemble and store the 8,000 foot trains that the railroads will favor under their "hook-'n-haul" strategy.

Rail Infrastructure devoted to Intermodal traffic was discussed earlier in this report. The addition of a third lead track in Terminal 6 will allow both BNSF and UPRR to work simultaneously.

Conclusion

Congestion in the Portland/Vancouver Triangle impacts the flow of nearly all rail traffic in the Pacific Northwest. Indeed, only the two dozen or more trains that navigate daily over Stevens and Stampede Passes escape being delayed within the Portland Triangle. It will continue to be important for both Class 1 railroads along with the region's shortlines to work together with themselves and with the appropriate public agency to obtain the funds necessary to minimize rail congestion. Upcoming legislation introduced by Senator Trent Lott would provide a 25% tax credit for new trackage installed by the Class 1's. Shortlines currently have this type of incentive already in place. *Connect*Oregon was able to assist in only one limited area (Ramsey Yard). The upcoming SAFETEA-LU is reportedly to have a strong emphasis on freight mobility.

The Portland/Vancouver region requires the focus of both BNSF and UPRR working with both ODOT and WSDOT as well as the Port of Portland and the Port of Vancouver to address improving the region's rail infrastructure in order to remain fluid to handle the expected growth.

Opportunities & Challenges
Air

Portland/Vancouver International and Domestic Trade Capacity Analysis

Task 3
Growth Opportunities and Challenges Assessment for Air Cargo Market

PORT OF PORTLAND

By:

THE CAMPBELL-HILL AVIATION GROUP, INC.
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Alexandria, Virginia
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OVERVIEW

This report examines the opportunities and challenges associated with expanding the air cargo system for the Portland/Vancouver region. A description is provided of air cargo systems in general and the existing activity, infrastructure and services at Portland International Airport (PDX). The Task 1 forecast is examined relative to the expected capabilities of the infrastructure, as well as factors that will affect actual demand and service levels in the future. Finally, opportunities and challenges for expansion of air and supporting services, local/regional air cargo demand and the supporting infrastructure are examined.

MARKET BACKGROUND

AIR CARGO BACKGROUND

The transportation of freight and mail by air represents a vital element of regional trade and distribution networks. In recent years, increased demand for fast and time-definite transportation by manufacturers, merchants and consumers has combined with the development of advanced air services to greatly increase the importance of air transport. Air transport is the fastest, most reliable option for shipping commodities between markets, although typically at a higher cost relative to surface transportation (ocean, rail and truck). Accordingly, air cargo shipments are relatively small, light, and of high value. Examples of the types of goods that tend to travel by air include pharmaceuticals, electronics, auto parts, fashions, and high-value perishables. While relatively insignificant in terms of weight volumes, air transport is responsible for more than 40% of the world's trade value. Despite the effects of recession and terrorist attacks, world air cargo traffic averaged 6% annual growth from 1993 to 2003, and both Boeing and Airbus project similar growth over the next twenty years at about 1% more per year than air passenger traffic.

For the most part, air cargo moves on a multi-modal door-to-door basis involving a combination of air transport, ground transport and transfer/handling activities. Air carriers provide the air transport segment of air shipments, and may also provide ground handling or pickup/delivery services. Air carriers are primarily categorized as either "direct airport-to-airport" carriers who are mostly responsible for the air portion of the trip, or "integrated" carriers who maintain single entity responsibility for shipments on a door-to-door basis (including most if not all of the functions of the cargo service providers listed below). Unlike other modes, passenger services account for a significant amount of cargo capacity, particularly for mail and international traffic. While handling cargo, these services are geared towards passenger markets.

Other key participants in the air cargo service market include:

- **airports** provide facilities and support services to air carriers and air cargo shippers, both at origin/destination points and intermediate hub or gateway transfer points

- **freight forwarders and customs brokers** provide ground and other handling services that connect shipments to airport-to-airport services as an agent for the shipper or consignee

- **trucking firms** transfer shipments to/from both the origin and destination airports, often combining a local pickup or delivery with a linehaul transfer between a gateway and local airport

- **specialized services** may be provided independently of forwarders/brokers and integrated carriers including warehousing and airport **ground handlers**. An increasingly important type of service provider is the **third-party logistics** (3PL) or distribution firm that may provide little or no direct transportation, but rather acts as the shippers' or consignees' agent in handling overall distribution systems.

The air cargo service ("supply") sector is designed to accommodate the need for fast and reliable transportation by shippers and consignees ranging from delivery of an online gift purchase to a household, to the transport of donor organs to hospitals, and to managed distribution of manufacturing components and finished product between suppliers, factories and retail outlets.

The use of air services is determined by a shipper or consignee in consideration of trade-offs between service and price relative to the type of shipment. Air cargo demand markets are characterized by:

- **origin/destination** – most air shipments do not originate or terminate at an airport, but are determined by industrial and demographic location patterns. The origin and destination of a shipment determine the range and cost of routing and service options available

- **commodity** – commodity type affects both the desirability of, and requirements for, air shipment. Key characteristics include size, perishability, value, weight, and physical dimensions.

- **desired transit time** – for the most part, the level of air cargo service desired is determined by the shipment's physical characteristics, although other conditions may dictate use of air services (e.g., emergency need for a low-value part)

- **shipment size** – for the most part, air shipments are small and typically must be consolidated into pallets or containers for handling to and from the aircraft. Larger sized shipments may require special handling or aircraft types, but they can also move at a lower cost

- **shipment volume** – while air cargo services are available in some form for almost all conceivable origin-destinations, the volume of traffic for a particular origin or destination dictates the variety and scope of services available.

While there are thousands of distinct commodities that move in trade markets, air cargo traffic can be categorized as follows:

- **Mail** – shipments collected and distributed through national postal systems and shipped to foreign points via airline contracts including intra-government mail (e.g. diplomatic pouches, military mail)

- **Express Freight** – air shipment of envelopes and small packages via the express services of integrated carriers

- **General Freight** – air shipment of mostly larger commodities and packages using more traditional airport-to-airport services (including those provided by integrated carriers). This is also known as "heavy freight".

In 2003, the Boeing Company estimated that mail traffic accounted for 4% of world airline cargo traffic (measured in revenue tonne-kilometres for domestic and international markets combined) with freight accounting for 96%. Express services accounted for 11% of international traffic in 2003, up from 4.1% in 1992, indicating the continued expansion of the integrated carriers' world networks. In contrast, US express carriers account for 60% of the US domestic market.

The dominance of the integrated carriers in the U.S. domestic market results in a significant distinction between the domestic and international service sectors. The integrated carriers provide direct air service between their hubs and most U.S. airports, based on the need to meet overnight express schedules. The remaining domestic traffic moves on passenger flights (as determined by passenger flow patterns) and all-cargo flights on high volume cargo routes. While the integrated carriers collect and distribute international traffic via their U.S. and worldwide networks, international air traffic is more highly dependent on both widebody passenger and freighter flights with the latter geared towards connecting hub networks in the U.S., Asia, Europe and other world regions. The result is that most domestic air cargo is handled via local airports, while international traffic tends to gravitate to major gateways with some increasing diversion to emerging secondary gateways.

The interaction between air cargo demand and supply patterns results in the flow of air commodities via various routings, service types and carriers. Traffic patterns reflect the underlying demand for shipping between various geographic regions, the type of commodities involved, and the way individual providers tailor their services to meet demand.

PORTLAND/VANCOUVER AIR CARGO MARKET

Like all regional economies, the Portland/Vancouver market is highly dependent on air cargo to support industrial and consumer activity. Local manufacturers ship in supplies, components and emergency parts, while shipping out finished products to domestic and international markets. Wholesale, retail and distribution firms use air services to provide the most efficient delivery to their customers, while consumers increasingly use direct air shipment to shop worldwide for products once limited to local store inventories.

The local air cargo infrastructure is critical to attracting and retaining high tech and similar industrial activity that is increasingly dependent on air transport to compete in speed-dependent manufacturing and distribution markets. A region's airports are critical connectors to worldwide air distribution networks and their efficiency and capabilities are essential to attracting and maintaining economic development.

The service market (or "hinterland") for an air cargo airport can extend 500 miles and even further for the top international gateways (e.g., LAX) that have a high share of available cargo flights to overseas points. Except for the major gateways and integrated hub airports, the typical regional airport serves a local metropolitan market and regional market defined by the location, size and capabilities of competing gateways. Optimally, an air shipper would prefer to directly deliver an outbound shipment to the airplane and have the consignee pick it up at the flight's destination airport. In reality, most air shipments require some ground transport and some transfer at an intermediate hub or gateway airport. Shippers seek to minimize ground linkages, but any cost and time savings using a local airport must be compared to cost and service advantages at the major gateways, particularly the breadth of direct air services typically not available at a "secondary" gateway.

Portland International Airport (PDX) is the primary service airport for the Portland/Vancouver region, providing direct air services to domestic and international origin/destinations, as well as connecting to the hubs and gateways of the major integrated and other cargo carriers. Due to the broad availability of direct integrated and passenger flights to local airports, the domestic cargo market for PDX would be primarily the local metropolitan area (other than some feeder hub activity as described below). In the international sector, PDX's "primary" market hinterland can be defined as points within 100 miles of the airport (a "local" truckhaul) that are closer to PDX than to Seattle's airport. A broader "regional" hinterland encompassing the 5 states of Oregon, Washington, Idaho, Montana and Wyoming can also be competitively served via PDX services. While air shipments can (and do) originate and terminate beyond this hinterland (particularly in international markets), significant penetration of markets beyond 500 miles is mostly limited to the primary gateways (LAX or SFO for the trans-Pacific, JFK for trans-Atlantic, and MIA for Latin America).

Figure 1

PDX's 50- and 100-mile Market Hinterlands

In 2005, the airport handled 276,000 tons of air freight and 12,000 tons of air mail. Domestic traffic accounted for 92% of the air freight with 86% of that total moving on integrated carrier flights with domestic passenger flights handling 9% and freighter flights handling 5%. For domestic integrated traffic, PDX is the service airport for the local market and also serves as a regional air hub connecting the integrated hubs with smaller Oregon communities using feeder flights. The three integrated carriers (FedEx, UPS and DHL/ABX) handled 217,000 on nearly 15,000 freighter flights in 2005 with 11% of the traffic transferred between the small feeder flights and the primary hub flights. Domestic freight and mail also moves on passenger flights to and from major travel destinations and some freighter flights operated in support of large forwarder traffic routes. Other than the feeder traffic, the majority of the domestic traffic can be assumed to originate or terminate within the "primary" market hinterland.

At present, PDX has limited direct service to international points including passenger flights to Japan and Germany, and all-cargo service to China. Up to May 2006, PDX also had direct freighter service to South Korea. The carriers serving these routes not only handle traffic for the destination country, but also distribute cargo to and from the entire region via their flight networks.[1] Total international traffic amounted to 23,000 tons in 2005 with 55% of that moving on the freighter services to China and Korea.

PDX's international services draw traffic from a wider hinterland including the entire state of Oregon and southern Washington. PDX's international services compete with

[1] Both Lufthansa and Korean Air operate major distribution hubs at Frankfurt and Seoul respectively in order to serve "beyond" markets throughout the entire region. Air China is less dependent on beyond traffic due to the geographical size and high volumes of the China market.

Seattle and Vancouver, BC services for traffic originating or terminating in the 5-state Northwest region although both airports have more direct service to the key Asia market. LAX is the dominant West Coast gateway airport for international traffic, particularly to and from Asia. San Francisco is the next largest gateway, while a significant amount of U.S.-Asia traffic is routed via Anchorage due to stage length limitations and increased freighter-based transit cargo.

The State of Oregon accounted for 82,000 tons of international air trade in 2005 with 51% of that estimated to be imported.[2] The total value of air trade originating or terminating in Oregon is estimated at $10 billion or an average of $61 per pound. Oregon is ranked 18th in air trade value compared to other states and 25th in terms of air trade weight. East Asia accounts for 67% of Oregon's trade value and 48% of trade weight with Europe accounting for 24% of air value and 36% of air weight. The effects of 9/11 and a downturn in high tech trade resulted in a 14% decline in the state's air trade value between 2000 and 2005, although air trade weight increased 16%.

The broader 5-state regional hinterland accounted for 253,000 tons of air trade worth nearly $29 billion in 2005. The region was responsible for 5% of total U.S. air trade value and 4% of trade weight. The region's air trade in slightly more weighted towards inbound trade than the State of Oregon. East Asia accounts for 60% of the region's trade value and 46% of trade weight with Europe accounting for about one-third of both. While the local market is smaller than that of Seattle's, it is estimated that the PDX local 50-mile market accounted for 28% of 2005 export weight from the 5-state region with other Oregon points accounting for an additional 11% of the market. Between 2000 and 2005, regional air trade value declined 6% while air trade weight increased 16%.

PDX's Customs District[3] handled over 25,000 tons of international air trade in 2005, equivalent to 10% of the regional origin/destination trade and 31% of Oregon's air trade. The relative size of PDX's international air trade is shown by comparison with competing gateways. PDX's total air weight is 24% of Seattle's total in 2005, 7% of San Francisco's, and 3% of Los Angeles. This provides an indication of PDX's relative disadvantage in terms of direct flight availability as traffic flows closely correlates with flight capacity. The primary competing gateway at LAX was ranked just third in terms of Customs air weight behind New York/New Jersey (JFK and EWR) and Chicago and just before Miami. Portland's District is roughly equivalent in weight volumes to Charlotte, NC, Great Falls, MT and Buffalo, NY. The fact that Washington air trade weight is just 70% higher than that of Oregon (and some of that originates/terminates closer to PDX than Seattle) compared to traffic volumes that are four times higher shows that local origin/destination traffic levels is not the sole determinant for air cargo and flight routings.

[2] These statistics are derived from U.S. Bureau of Census trade statistics using the State of Exports series for outbound traffic and an allocation of Customs District statistics for inbound trade.

[3] PDX is the primary airport in the Columbia-Snake River Customs District and should account for almost all of its air trade. Census statistics differ from the airport's international cargo traffic totals probably due to differences in the timing of reporting and the exclusion of small and in-transit shipments from Census totals.

Despite its relatively small volume of international air trade, PDX has benefited from the long-term growth of air trade in general with air value increasing 344% between 1990 and 2005 and air weight increasing 218%. This growth includes declines from 2000 to 2005 in air value of 21% and in air weight of 6%. PDX's air trade growth substantially exceeded that of both Seattle and San Francisco from 1990 to 2005 (in both value and weight terms), although Seattle did not experience the same decline from 2000 to 2005 as Portland (while San Francisco's decline was less).

The amount of leakage from PDX's market hinterland can be demonstrated by the flow of regional air exports by airport. In 2005, PDX accounted for 33% of Oregon's exports to all world markets (excluding Canada[4]) compared to 26% for Seattle, 8% for Memphis (based on FedEx's hub routings), 7% for LAX, and 7% for SFO. PDX's one-third share is an increase over 1995's share of 18% and 2000's share of 33%, during which periods Seattle's share declined. As might be expected based on its services relative to competing gateway, PDX's share of the Asia market (43%) is higher than its world average with a below average share to Europe (23%) compared to Seattle's 33% share. To indicate both the benefit of direct air service and the power of large gateways, PDX accounts for just 2% of Oregon's air export weight to Latin America, while Miami accounts for 54% followed by LAX with 19%.

The limited reach of current PDX international cargo services is indicated by the heavy reliance on local traffic. Oregon's air exports accounted for 76% of PDX total air export weight (excluding Canada) with most of the rest originating in Washington (15%). PDX accounted for just 4% of Washington's total air export weight and similar shares of the other states in the regional hinterland (that are relatively small origin markets in any case). The only states outside the regional hinterland that accounted for any significant traffic for PDX were California (5% of PDX's total weight) and New York (1%), both of which were probably based on interline connections by air rather than truck.

These patterns differ depending on the overseas market with PDX's penetration of the local and regional hinterland markets significantly higher for regions with direct service. Export markets for which PDX accounts for above average shares of Oregon air export weight include China (69%), France (56%), Japan (52%) and Hong Kong (43%). The ability (and in some cases the desirability) to serve beyond markets is shown by high shares for both France and Hong Kong, as well as average or below average shares for direct service markets Germany (33%) and South Korea (26%). PDX accounts for high shares of Washington- and Idaho-origin traffic for all of the direct service markets (15% and 25% respectively for South Korea and 12% and 23% for Germany). This pattern, indicates that shippers are willing to accept a longer trip on the U.S. side as a trade-off for direct air service on the foreign side (and vice versa for good beyond services).

[4] In analyzing routing statistics, U.S-Canada trade is eliminated as it is handled similarly to the U.S. domestic market, i.e., mostly via integrated carrier networks.

AIR CARGO FORECAST

The Task 1 air cargo forecast corresponds to the total air cargo traffic projected to be routed via PDX and incorporates status quo assumptions concerning service and routing patterns and does not address the effect of infrastructure capacity or efficiency. The forecast predicts total air cargo via PDX will increase from a 1997 baseline of 313,000 tons (derived from PDX statistics) to 521,000 tons in 2010 and 1.3 million tons in 2030. The relevant annual growth rates are 4.0% from 1997 to 2010, 3.8% from 2010 to 2020, and 5.2% from 2020 to 2030 or 4.3% annual growth for the entire period. Inbound traffic is projected to increase slightly faster than outbound traffic, but it projected to remain equal split in each direction.

Based on the current high dependence on domestic air cargo, this forecast is reasonable when compared to industry forecasts. Boeing projects 20-year annul growth from 2003 levels with be 4.2 for the U.S. domestic market, 5.2% for U.S.-Europe, and 7.2-7.3% for U.S. Asia. A weighted average of these growth rates (based on 2005 traffic levels) would be 4.2% annual growth.

The issue of whether the forecasts will be achieved is addressed in the sections below.

CURRENT AND FUTURE STATUS OF AIR CARGO INFRASTRUCTURE

PDX's air cargo system includes both on- and off-airport facilities, equipment and infrastructure, as well as the ground transport access that connects those facilities and the local air cargo industry with local and regional markets. This section briefly describes the existing and planned air cargo system serving the Portland/Vancouver region.

The physical elements of an air cargo system support the transport and handling activities of door-to-door "air" cargo shipments. A typical inbound shipment involves the following elements to reach final origin/destination:

AIRSPACE AND AIRFIELD

PDX has 2 parallel runways and supporting taxiways that are capable of handling all current freighter and passenger aircraft under all conditions. PDX, as well as many other airports, is not currently capable of handling the Airbus A380 for routine traffic. The 2000 Master Plan projected that runway capacity would be adequate through 2020, at which point, a third runway is planned for construction. An airport flight handling capacity is also affected by the efficiency and capacity of the local air traffic control system inclusive of local airspace. (Airports are also obviously affected by regional, national and international airspace issues but those apply systemwide and would not be specific to PDX.) In 2005, PDX had the 5th lowest average departure delay per flight

among the 35 OEP airports. In terms of capacity, there are no problems anticipated regarding the airspace.

A key issue related to air cargo is the heavy reliance on nighttime flights by the integrated carriers. The typical integrated network relies on evening flights from service airports to hub airports where traffic is sorted back to flights returning to the same airports. The hub sort typically occurs in the middle of the night and the returning flights arrive in the early morning in order to meet early morning express delivery guarantees. The ability to continue to operate existing and future night flights is essential to retaining direct integrated carrier service at PDX and maintaining the top level of service essential for local manufacturers and consumers. Local express service levels would be hurt if integrated carrier flights were forced to another airport, necessitating higher costs, earlier cutoff times, and later delivery times. In addition to affecting the overnight delivery systems for local residents, reduced express levels would harm businesses that depend on overnight delivery to ship critical parts and products, as well as the potential to attract logistics/distribution facilities.

The operation of the statewide feeder flights for FedEx and UPS at PDX also is dependent on night flights that link the primary hub flights with small communities throughout the state. These communities currently enjoy comparable levels of express service to Portland and other major metropolitan areas solely based on the ability to operate these flights as trucking times fall outside the integrated carriers' sort schedules. PDX has actively worked to balance the continued operation of these flights with community noise concerns.

The relatively small proportion of flights that are cargo-related (7% of 2005 total flights excluding all North American passenger flights handling cargo) make it unlikely that any additional air cargo growth would severely impact either airspace or runway/taxiway congestion or efficiency. The relatively uncongested nature of the airport could increasingly become a competitive advantage as competing gateways reach their capacities.

AIRCRAFT HANDLING AND CARGO TRANSFER EQUIPMENT

Air cargo is handled to and from the aircraft using loading equipment that transfers pallets, containers, and even loose shipments to ground transfer equipment. Passenger aircraft are typically handled directly at the passenger transfer point which may require a longer on-airport transfer to reach the cargo area. Freighter aircraft are parked close to the cargo terminals in the designated cargo area. The handling of non-integrated aircraft is typically conducted by a third party operator, particularly in smaller airports where an airline may have just a few cargo flights per day.

Smaller freighter and passenger aircraft don't require any specialized equipment, while large freighters generally use a special loading device (e.g., front loaders). The relatively low usage of special loading devices at small gateways often is a competitive disadvantage relative to the major gateways. In the case of PDX, the future attraction of

international freighter flights will require assurance that adequate and cost-competitive loading equipment will be available.

The current cargo area totals 50 acres and is divided between the original cargo terminal area and the south cargo area where the integrated carriers and some of the direct carriers operate. Future plans also anticipate further consolidation and expansion of the cargo areas. The Master Plan estimates the cargo area could be expanded to 138 acres or even more with a third runway. The size and efficiency of the cargo area is not anticipated to have any effect on meeting or exceeding the cargo forecast.

ON-AIRPORT AND OFF-AIRPORT CARGO TERMINALS

Most air cargo shipments move in a palletized or containerized form, but the small average shipment requires "building" and "breaking down" unit load devices for transfer to and from the aircraft. These types of activities are typically conducted in airport terminals, although large forwarders and some integrated carriers use off-airport sites. At PDX, most of the ULD activity is conducted at the airline's cargo terminal or at a similar facility operated by a cargo handling agent. PDX currently has 12 cargo facilities totalling 661,000 sf including 3 facilities owned by the port. There is currently available space on-airport for leasing, particularly at the older cargo terminal on the north side. The availability of and lack of congestion for on-airport cargo facilities should be asset in achieving or exceeding forecast growth.

In addition to cargo handling facilities, PDX also has facilities where Customs and other inspection activities can be conducted. Because of lower volumes, PDX's Customs operations are considered efficient and may be a competitive advantage. Related facilities typically only become an issue when needed terminal space has to be diverted for government use.

Most of the forwarders and custom brokers have off-airport sites where final distribution (or initial acceptance) of shipments are conducted, often in concert with ocean and truck traffic. Because most of these operators handled multiple modes, these facilities may be located some distance from the airport at a centralized location. Most of the large air forwarders are located in local office parks where rental costs are less than on-airport facilities. The cost of warehouse space in PDX is considered low relative to competing airports and may be an advantage in attracting new carriers, forwarders, or air-dependent distribution activities. The availability and suitability of off-airport space would not appear to be issue in the future.

AIRPORT ACCESS

As noted above, most air cargo is transferred by truck between airport and off-airport facilities. Most of the general air traffic uses smaller trucks that shuttle traffic back and forth to the airport prior to flight departure or after flight arrival. Integrated carriers that sort local traffic on-airport may operate larger equipment, while off-airport sorts may transfer cargo using tugs. Airports that attract cargo from a large hinterland may

also have direct airport-to-airport long distance trucks. Large shippers may operate their own equipment or use regional or local trucking firms.

In any case, the ability to efficiently transfer cargo between the airport and either local or long-distance points is essential to the overall efficiency of air cargo services. At the high rates charged for air cargo (relative to other modes), shippers expects the fastest and most reliable transit times possible, and any advantage of a direct flight can easily be dissipated by ground delays having nothing to do with the airport.

The critical elements of the ground access system are:

- Airport Gate – Being a secure area, all ground equipment transferring air cargo must use a airport gate. PDX has several gates used for cargo operations and it does not appear to be an issue, and, in fact, may be an advantage as competing gateways typically have greater congestion. A key issue presently is the impact of new cargo security regulations that will require most personnel involved in airport ground trucking operations must have the same clearances as on-airport employees. In one case, a cargo airline will be moving their gate to better segregate off- and on-airport truck operations and avoid the cost of credentialing all of their truckers.

- Local Roads – While air cargo may travel long distances by road, most general air cargo (i.e., non-integrated) involves a short-haul transfer between the airport and a local facility, typically moving under a tight schedule. While these local truck transfers do not generate significant traffic relative to passenger-related traffic and non-airport local traffic, congestion caused by those other uses may have a significant impact on the efficiency of air cargo services. For example, increased rush-hour congestion may require a off-airport forwarder to cutoff shipments earlier to make a flight. An earlier local cutoff will translate into earlier departures from origin areas, possibly adding a day to the ultimate delivery time and making a service non-competitive.[5] The efficiency of local road access also determines the range where manufacturers and other cargo shippers can locate and still be "close" to the airport. Local road congestion can severely affect the ability to attract and retain air-dependent industries that require such access.

- Highway Access – The importance of local access also pertains to the longer-distance access necessary to connect the airport with final origins and destinations. Air cargo service is regarded as a door-to-door product, as best exemplified by the integrated carriers. The size of regional market hinterlands available for specific cargo services depends on the time and cost efficiency of truck transfer to various points, particularly quick access to interstate highways. PDX and its adjacent cargo facilities has excellent interstate access, and therefore

[5] Air cargo shippers optimally seek to ship out at the end of business day and time a start-of-the-day arrival at destination. Relatively short delays that affect that window can be significant in terms of routing and even modal decisions.

maintaining good access could be a significant selling point in attracting carriers and forwarders, as well as the ability for PDX to be the gateway for emerging high-tech centers in the region (e.g., Boise).

Additional items relating infrastructure to the opportunities and challenges of future air cargo growth are discussed below.

KEY FACTORS AFFECTING FUTURE EXPANSION AND EFFICIENCY OF AIR CARGO SYSTEM

The future level of air cargo activity at PDX ultimately depends on future changes to traffic patterns, air cargo service levels, and the availability and efficiency of air cargo infrastructure. The following describes the various demand and supply factors that might affect long-range airport activity.

LOCAL AND REGIONAL DEMAND

Task 2 discussed general demand market factors that would affect regional traffic levels by mode including population and employment changes, shifts in the local industrial profile or that of trade partners. The Task 1 forecasts assumed that these general patterns would apply across modes including air. Due to the interaction of industrial location/growth patterns and the efficiency of trade and transportation systems, each mode will be affected different by general demand shifts.

Like other modes, future air cargo traffic growth will depend on general economic trends. Population growth will determine the level of consumer products shipped by air, as will relative income growth as many luxury items or discretionary shipments (e.g., overnight lobsters from Maine or high fashion items) tend to be shipped by air. To the extent there is general growth in the demand for products produced in the area, air shipments should rise somewhat similar to other modal shipments by local industries.

In regard to air cargo, an important demand consideration relative to future airport growth is the growth or re-location patterns of air-dependent industries and how that may be affected by current location patterns rather than the future trade and transport environment in the region. While consumer-based shipments by air vary in type similar to surface modes (e.g., air-shipped products available on-line are comparable to what can be found at Target or Wal-mart), the industrial-based shipments tend to be concentrated in certain industries and commodity types, particularly for a local or regional economy. The Portland area ships high tech products such as integrated circuits and computer products, footwear-related commodities, specialized equipments and the parts used to product and support those products. The regional economy produces many of the same air cargo items (particularly computer products) while also produces seafood and other perishables (e.g., cherries) that require air shipment.

Industries make location and expansion decisions based on a variety of factors including labor and other costs and availability of skilled labor and space. Accordingly, future

growth in particular air cargo movements will vary significantly based on other factors that drive those decisions. For example, the decline in PDX's air cargo traffic is recent years is highly related to the decline of the high tech sector in the late 1990s, mostly if not entirely unrelated to the airport used for many of that sector's shipments. The rise or fall of existing or future high tech and other "air-dependent" industries will greatly determine air traffic volumes at the airport, particularly as the location of these time-sensitive shippers drive the service sector. As described above, air transport accounts for a high share of U.S. overseas trade value and an increase or decrease in the efficiency of local air cargo systems could have a significant effect on local production and employment.

A similar set of factors affect the markets that local and regional shippers ship to or from. Recent growth in international trade at PDX and other West Coast airports has been significantly driven by the explosion in U.S.-Asia trade relative to other world regions. Any growth or shift in the overseas markets that trade with the PDX regional market will affect future air cargo growth, again mostly unrelated to the air cargo system. As with local industries, the air-related markets overseas may be highly concentrated in certain sectors and subject to large pattern shifts (e.g., the rise and fall of circuit manufacturing in general and the constant shift of facilities between countries).

General industrial demand patterns relate to the production and consumption of commodities and products, but the rising importance of logistics in both manufacturing and final product distribution has create "intermediate demand" for air and other cargo transportation. Particularly for high tech and high value products, the distribution process (including distribution of components to manufacturing sites) has become increasingly as important as the production process. The trend towards regional distribution centers to service large geographical areas has created new air cargo for some airports (e.g., LAX) based on not on local demand, but the efficiency of transferring cargo to satisfy other regions' demands. Traditionally, Portland has been an origin/destination market rather than a transfer point for other markets. Its small size relative to Seattle's market has tended to concentrate regional distribution there. The extent that Portland is able to attract and expand local distribution and logistics activities for non-local demand could therefore affect airport traffic significantly.

AIR CARGO SERVICE MARKET

The air cargo service sector responds to underlying demand patterns in the context of available technology, air system capacity, the market structure of industry participants, and other factors such as route restrictions. Some of the service factors that will influence future growth include:

- Unlike other modes, air cargo flight capacity is significantly affected by passenger demand and service patterns, particularly in the international market. In simple terms, passenger flights are scheduled to satisfy traveller demand, creating some excess belly capacity that is sold based on market conditions determined by both the total availability of passenger lift and the availability of

all-cargo services. Future shifts and growth in passenger service will drive cargo routing patterns, as will fleet changes that may reduce cargo capacity (e.g., reduction in wide-body Transcon flights) or increase it (e.g., Airbus A380).

- The most important development in worldwide air cargo transportation has been the evolution of the integrated carriers from small package overnight delivery companies serving a single region to multi-modal value-added transportation companies operating worldwide networks. As mentioned above, the emergence of the U.S. integrated carriers resulted in a significant decline in the need for general all-cargo freighters for the U.S. domestic market, and a similar effect could be seen in U.S. international markets. The future changes to the integrated carriers participation in air cargo and related markets will greatly affect routing patterns, particularly for their hub and gateway airports.
- General all-cargo freighter service typically provides flight capacity on routes where passenger flights can not satisfy demand either in terms of capacity or capabilities (e.g., oversized shipments). In fact, many passenger airlines operate their own freighters for just that purpose. While limited in the U.S. domestic market, non-integrated freighters continue to have a strong role in the international market, but the future will depend on both the passenger and integrated carrier sectors. While traditionally operated on an airport-to-airport basis, it is possible that the general all-cargo airline may assume some of "integrated" traits and develop full-scale distribution networks that can compete with the integrated carriers.
- The pattern of air cargo routings is affected by the range and payload characteristics of both passenger and freighter aircraft and future fleet trends will affect future patterns. For example, many U.S.-Asia freighter flights are required to make a technical stop in Alaska, increasing traffic and flight activity at Anchorage and West Coast airports not requiring a tech stop. Most international freighters are wide bodies leading to more concentration in the large gateways that can both handle the aircraft and feed enough cargo to fill it. Two trends for future aircraft will have counteracting effects on air cargo. The introduction of the Airbus 380 freighter and passenger aircraft (including both FedEx and UPS) will limit the markets that can handle the aircraft or support its enormous capacity, probably to the advantage of the top gateways or hubs. On the hand, the introduction of longer range middle-sized aircraft into international markets may increase the use of less congested secondary gateways whose markets are suited to their capacity.
- A related factor is the level of future fuel prices that will not only affect operating costs, but will drive many fleet decisions. Fuel price increases disproportionately affect air relative to other modes increasing rates and causing mode shifts. This is partially the reason for the recent shift of U.S. express shipments from air transport to LTL ground networks (often operated by the integrated carriers). High consuming aircraft may not be efficient to operate, thereby reducing (or shifting) capacity.
- Air cargo routing patterns are not driven entirely by cost and time factors, but also depend on structural factors for the airline and forwarder industries. The concentration of air cargo at just a few international gateways is partially caused by airlines wanting to use common airports for their passenger and freighter

flights and by airline partnerships. Most forwarders operate under "gateway" systems whereby local offices have incentives to route their freight to a limited number of airports where the local office can consolidate and negotiate low rates. Forwarders have a major influence on routing decisions, particularly when shippers do not fully understand the air cargo market. While having some economies of scale advantages, this system shifts routing decisions from shippers and local forwarders to corporate offices, often to the detriment of emerging international airports.

- International regulation has also affect cargo routing with many U.S. markets controlled by bilateral agreements that limit carrier entry and routes. This has also tended to concentrate services at a limited number of gateways, both in strict terms and in terms of making it more difficult to choose a secondary gateway with valuable route authority. The trend towards "Open Skies" agreements that would eliminate these limits may reduce this as a factor. One possible long-term possibility is that the elimination of all route restrictions could allow foreign carriers to serve U.S. domestic and international markets not involving their home market. This may increase the attractiveness of secondary gateways.
- Increased post-9/11 security has affected the air cargo market significantly including the restriction of cargo handling on passenger flights, and cost impacts from increased screening and security review. In the future, increased cargo screening could decrease the competitiveness of air vs. other modes, both in terms of cost and time. Security changes could also affect air routing patterns. A requirement to use specialized screening equipment would tend to further concentrate traffic at a few airports that can afford to efficiently operate that equipment. On the other hand, the ability to conduct security activities at less congested secondary gateways might be an advantage.
- On the environmental side, the key issues are noise and emissions. The direct effect of local noise concerns over integrated cargo flights were discussed above, but noise and emissions restrictions could affect the cost of operating all-cargo fleets, many of which are heavily populated with the older aircraft targeted by the regulations.

OPPORTUNITIES AND CHALLENGES

The sections above describe the underlying factors affecting the future growth of air cargo at PDX. In simple terms, future traffic levels will depend on:

- Growth and shifts in local and regional demand
- Attraction and expansion of throughput and transfer activity
- Changes to the size and scope of the service market hinterland relative to competing gateway airports
- Attraction and expansion of direct air and related services relative to shifts in underlying structure
- Airport infrastructure capacity and capabilities relative to changing requirements.

These factors can be interrelated. For example, the size of the local origin/destination market will determine whether airlines choose to serve it with direct flights or via truck service to larger markets. On the other hand, the attraction, retention and expansion of air-dependent industries depend on the available air services compared to other industrial locations. Pure transfer activity (e.g., hub sorting) may be attracted to large O/D markets based on economies of scale or may go to smaller less congested airports. Finally, the ability to handle air cargo traffic depends on having adequate and suitable infrastructure, the development of which depends on attracting sufficient air services to cover costs and may be driven by factors unrelated to the airport (e.g., local roads).

Assuming the objective is to develop the PDX air cargo system to best serve local and regional shippers, future opportunities and challenges relate to enhancing and leveraging market advantages while minimizing or mitigating any disadvantages. The following describes these opportunities and challenges.

AIR CARGO SERVICE DEVELOPMENT

In general terms, PDX faces the same opportunities and challenges on the service side as most airports trying to expand air cargo activity. The advantages relate to having underutilized infrastructure and less congestion and delays than the major gateways, while the disadvantages relate to not having enough base activity to build on.

One general advantage of the PDX market is the relatively high concentration of large air shippers who would most benefit from enhanced air services. Despite being mostly served via other gateways, these shippers have located in the Portland/Vancouver area. The challenge is to identify the benefits of direct air service to these shippers and have those benefits understood by the shippers and then translated into routing decisions and ultimately airline service patterns. These benefits should be analyzed on a door-to-door basis, rather than airport-to-airport, to take advantage of Portland excellent ground and intermodal systems. The availability of large important air shippers could be utilized to promote PDX, but any new direct service would have to translate into lower costs or better service for the shipper and increased market share for the airline. One challenge will be mobilizing shipper support as it is unlikely that shippers and their forwarders would be willing to make hard commitments to use a new service as has been done in the passenger market.

A major challenge in the international market is that routing decisions for import shipments are typically made overseas where PDX is not known as a cargo gateway (and LAX may be thought to be the only gateway). Those routing decisions may be being made without an understanding or consideration of the benefits of direct PDX services, particularly if those benefits pertain to the local PDX consignee. The airport and its partner could work to enhance PDX's overseas profile as a cargo airport and try to get large local consignees to influence routings.

The major opportunities and challenges exist for the international market, as the domestic market is mostly controlled by the integrated carriers who can adapt their networks to

meet future needs. The long-term service goal for the international market is to develop a mix of direct services to all significant world markets including Asia, Europe and Latin America. In addition to shipping via multiple modes, most air shippers deal with a full range of world markets. In terms of attracting air-dependent industries, good service to just one region limits the scope of industries that can be attracted.

The typical international gateway "builds" using a combination of passenger-based lift and freighter capacity. While optimally shippers would like direct freighter flights to a variety of major cargo airports, emerging gateways must build one service at a time. Ultimately, service expansion results from airlines deciding where to put the "next" flight and it is often difficult for them to choose a new gateway as opposed to adding capacity to a proven market. Cargo activity via passenger flights can be a building block to future services, offsetting this incentive. A well-supported passenger flights (in terms of cargo) can lead to freighter services, particularly by carriers that operate both types of aircraft. The airport could support existing passenger-based services as a building block for future services and also to benefit local shippers using the services.

Whether a passenger or freighter service, "building block" services should optimally involve quality airlines with strong overseas networks. While the introduction of marginal or irregular services may increase traffic in the short-term, it does not create conditions that allow development of long-term capabilities, particularly airline-forwarder-shipper relationships that drive so many routing decisions. Direct service to a strong airline's network hub overseas (e.g., Frankfurt for Lufthansa or Hong Kong for Cathay) provides semi-direct service to a wide range of markets, satisfying shippers' needs.

In terms of short-term opportunities, the importance of Asian markets and the recent loss of direct freighter service to South Korea provides an opportunity to replace that service with that of one of several strong Asian carriers. Direct European service is provided with a passenger service to Germany and that service should be supported with future expansion as the market dictates. Most local and regional traffic to and from Latin America currently moves via Miami and Los Angeles using long-haul trucks and interline connections. While relatively small compared to Asia and Europe, Latin America is a growing market and adequate air access could be a critical factor in attracting some industries. Short-term enhancements to the Miami and Los Angeles gateways (e.g., scheduled truck or direct freighter service) could assist in attracting direct service in the future.

Another possible opportunity is the attraction of international gateway service by an integrated carrier. As described above, these U.S. and European carriers are expanding the worldwide networks in order to serve inter-regional markets (e.g., U.S.-Asia) as efficiently as their base intra-regional markets. The original inter-regional links were between the carriers' regional hubs (e.g., Memphis, Subic Bay and Paris for FedEx) where shipments are distributed to and from the intra-regional networks. Increasingly, the carriers are seeking to bypass their primary hubs using coastal gateway airports where international traffic is sorted typically to serve a single region (e.g., FedEx's Newark

gateway for the U.S. Northeast). As existing gateways become congested and regional markets grow, these carriers will add additional gateways possibly at PDX. One challenge is that because these carriers conduct both air and forwarding activities, freight forwarders are reluctant to use their flights for competitive reasons. This is particularly true for smaller markets (such as Portland) where forwarders have long-term shipper relationships they are protective of.

In the domestic market, the opportunities and challenges depend mostly on identifying and satisfying the needs of the integrated carriers who currently handle 86% of the market with 9% of the market moving on flights dictated by the passenger market. Future growth will mirror general industrial and population trends in the local market and these carriers need the ability to expand their multi-modal systems to meet demand. Some of these requirements may include:

- Expansion of on-airport sort facilities
- Efficient access to off-airport facilities
- Continued operation of night and feeder flights
- Improved integration with ground operations

To the extent these carrier needs can be met, the market will continue to expand. In some cases, operating restrictions or high costs at primary airports have driven these operations to secondary airports (e.g., Boeing Field in Seattle). While in some cases this may be desirable (e.g., to relax congestion), any impediments to providing the best level of express services will directly affect local shippers and residents. The integrated carriers need to continue to have the ability to operate nighttime flights and have efficient ground access to local and regional markets. One possible challenge could be if a new integrated carrier needs to be accommodated, although that is obviously also an opportunity for enhanced competition and services.

Similar to attracting international gateway activity, there is also the future opportunity to attract a regional domestic sort hub for one of the integrated carriers. Overlaying the primary hub system, these carriers operate regional hubs where intra-regional traffic can be sorted more efficiently than at the national hub. As markets growth, new regional hubs will be established and PDX could possibly attract one. The most likely opportunity would be for carriers that don't currently have a regional sort hub for the Pacific Northwest (e.g., DHL or even a new competitor). The challenge would be to find additional cargo space to handle the flights and handling activity, but the opportunity lies in having more space than some other airports.

There may also be opportunities for expansion of general domestic all-cargo services, particularly if cargo activity is reduced or eliminated on passenger planes due to security concerns. This may include the opportunity to develop domestic links to international gateway airports (e.g., Miami, Anchorage).

A final area of service development involves the support services provides by forwarders, brokers, handling agents, truckers and others. The efficiency of this locally-based

network must complement that of the air services in order to enhance the ultimate door-to-door service paid for by shippers. A major challenge is the location of most of these activities off-airport. Any planning or support of the PDX air cargo system should include these operations and consider the importance of ground access to overall efficiency. In terms of attracting new direct air services, the airport should work to assure that airlines would have access to competitive handling and trucking services and suitable handling equipment, often a challenge at developing gateways.

LOCAL AND REGIONAL DEMAND MARKET DEVELOPMENT

The relationship between air cargo systems and economic development goes both ways. Efficient air cargo services can attract air-dependent industries to an area, (or more likely allow them to locate away from large congested airports). These industries are typically growing high tech businesses that are highly desirable for local communities based on their high wage levels and trade volumes. On the other hand, growth in local businesses that ship by air can attract new air services.

On the demand side, the greatest opportunities and challenges relate to developing efficient air transport linkages in order to attract, retain and expand local and regional businesses dependent on air cargo. These businesses include manufacturing of high tech products such as integrated circuits, computer components, and specialized equipment and instruments, as well as the major apparel and footwear manufacturers in the area. The opportunity exists to leverage the high concentration of these high volume air shippers to expand air services and thereby make the area more attractive for more of these businesses. One challenge is to maintain good access to the airport and to expand the region where industrial sites can be "near airport" using efficient local road access. As discussed above, the air cargo system cannot be limited to just on-airport activities.

Another challenge is to provide competitive air access during the period when the PDX gateway is developing. The "target" shippers may require efficient access to markets with no direct service (e.g., Latin America), and a business may be driven to another site by lack of service.

One advantage of the PDX market is the excellent combination of air, ocean and ground systems. This provides an opportunity to target multi-modal industries that would most benefit from this quality. The challenge is to assure that multi-modal and intermodal access meets shippers' needs. Good access to developing industrial areas (e.g., Southern Oregon and Boise) is also an opportunity to extend market reach. The attraction of distribution and logistics activities unrelated to local consumption and production also is an opportunity to increase the size of the local market, but there is the same challenge to meet the high level of transportation needs and to compete against larger markets (e.g., Seattle). A critical area for the future will be to continue to work with local and regional modal and development agencies to coordinate these efforts.

AIR CARGO INFRASTRUCTURE DEVELOPMENT

The opportunities and challenges faced directly by the airport involve maintaining the competitiveness and capabilities of the air cargo infrastructure. PDX has the capacity to expand air cargo activity, but must leverage its lack of congestion and expandability to offset the disadvantage of having a relatively smaller local market than competing gateways. This is a particular challenge when development costs for specialized facilities and equipment necessary to attract new services much initially be spread over low traffic levels. It is important that existing advantages be maintained including the easy access to cargo areas at airport, good local road and highway access, and efficient Customs clearance.

A major challenge will be to balance the air users' needs that might conflict with the interests of the local community (e.g., night flights). For air cargo in particular, it is important to associate the growth and prosperity of the air cargo sector with the interests of local businesses and residents (e.g., overnight gift delivery or emergency organ transplants) while emphasizing the large economic impact of air-related trade and transport

As with any infrastructure planning, the challenge is to match the availability and capabilities of facilities and infrastructure to future user needs for relatively volatile markets. The opportunity for a new carrier service may occur tomorrow, but require facilities with long development lead times. For example, the Airbus 380 will require airfield modifications to handle its size. It is unknown whether this capability will be required (particularly for air cargo operations at PDX), but if it is a critical factor in attracting new services, those modifications may take a long time to implement.

In conclusion, the PDX air cargo infrastructure can be suitably modified to handle the baseline traffic forecast as well as any additional growth resulting from new demand and service stimulation.

FINDINGS AND CONCLUSIONS

The Portland/Vancouver air cargo market is relatively small when compared to competing airports in Seattle, San Francisco and Los Angeles, both in terms of traffic demand and direct air services. PDX fulfills the standard role of a service airport for domestic air cargo, mostly using the services of the integrated carriers to support traffic for the local metropolitan area. PDX's integrated carriers also serve the wider Oregon market with feeder flights to smaller communities. PDX has a limited number of direct international cargo flights with much of the local market trucked to other gateways. The existing services do draw cargo from throughout the 5-state service hinterland, and additional services could expect to do the same, as well as retaining a high share of local traffic.

The status quo (Task 1) forecast for air cargo via PDX predicts an increase of total traffic to 521,000 tons in 2010 and 1.3 million tons in 2030 based on average annual growth of

4.3% from 1993 to 2030. This long-term growth is comparable to that predicted by industry forecasts, although declining traffic since the base year will require strong short-term growth to meet the 2010 estimate.

In general, PDX air cargo infrastructure is capable of handling predicted status quo growth through 2030 under current development plans. In fact, air cargo areas and facilities are underutilized and could handle substantial growth in both the short- and long-term. The airspace and airfield are relatively uncongested and could be expanded to handle both passenger and cargo activities. A key concern is that the integrated carriers who handle 86% of the U.S. domestic traffic at PDX are dependent on nighttime flights and any noise-related restrictions could hinder or divert this activity.

The airport has full capabilities for transferring, processing and storing air cargo at both on- and off-airport facilities with no concerns about future congestion based on a development plan to expand and consolidate the on-airport cargo area and expected availability of nearly industrial land. As with many smaller cargo airports, the current market size limits the availability of specialized facilities and equipment, although they could be developed if needed.

The door-to-door intermodal nature of air cargo transportation make ground access issues of high priority including airport gate access, local road access (to shippers and off-airport handling sites), and regional highway access. Good access increases the quality of the air services which is highly dependent on transit time and reliability and which is essential for high-valued air commodities. Efficient ground access also expands the areas where industries can locate and be "close" to a cargo airports and where airports can compete in the regional hinterland. PDX has good road access at the airport and excellent interstate connections to regional markets. While currently an advantage, the future quality of ground access is mostly unrelated to the airport itself but will have a major impact of future efficiency of the air cargo system.

The future level of air cargo activity at PDX will depend on a number of factors related to future changes to traffic patterns, air cargo service levels, and the availability and efficiency of air cargo infrastructure. Local air cargo growth will depend on changes to the underlying industrial structure, which is turn is partially affected by the availability of air cargo services. It will also depend on industrial shifts for overseas markets. The current local market is highly dependent on large shippers who might relocate or expand based entirely on non-tranport factors. While air transport may account for a relatively small share of these companies' traffic weight, air cargo access is a critical competitive factor in driving location and expansion decisions.

The air cargo service sector reflects the underlying market demand, but also is defined by technology and air cargo industry practices and structure. For domestic cargo, most is handled by the integrated carriers who design their networks in order to provide a wide range of service levels over the entire U.S. As the service airport for these carriers' local market, PDX's traffic growth is dependent on any changes to those networks. The international market is still dominated by traditional passenger and freighter operators,

although the integrated carriers are increasing their market share and power. While market size and economics mostly determine routing patterns for international air cargo, certain structural elements (e.g., forwarders' gateway systems and bilateral agreements) have tended to concentrate traffic at a limited number of primary gateways. New aircraft types, rising fuel prices and noise/emission regulations could significantly shift routing patterns.

The future opportunities and challenges for PDX in terms of air cargo relate to satisfying the needs of integrated carriers in the domestic market and attracting expanded international services in competition with entrenched gateway airports. Opportunities can be seized and challenges met by developing the air cargo service sector, attracting and expanding local and regional demand, and coordinating infrastructure development to match future needs of both the shipper and service provider.

In terms of service development, the key advantages are an underutilized infrastructure and less congestion and delays than the major gateways, while the disadvantages relate to trying to build services from a low base in an industry that has traditionally favored concentration at major gateways. The local market includes several highly prominent worldwide shippers of air cargo that would benefit from direct air services and could be mobilized to attract new airlines. The challenge is that many routing decisions are made overseas where PDX is not well-known for air cargo, and current routing and flight decisions are driven to gateway consolidation. In general, the short-term opportunity is to incrementally add services that ultimately lead to the long-range goal of competitive worldwide air access for local shippers. In that regard, a direct service by an established Asian carrier with a strong Asian network system will maximize the probability of success while providing multi-market access through a single hub flight. The current passenger-based service to Europe should be strongly supported with the intention of adding freighter or more passenger capacity when the market dictates. Air access to Latin America could be very important in the future, but the service development plan for that market probably needs to start with better air and truck access to existing gateways (Miami and LAX), prior to establishing direct flights. There may also be an opportunity to attract international gateway service by an integrated carrier.

In the domestic market, the opportunities and challenges are primarily dependent on the integrated carriers who currently handle 86% of the market. These carriers will continue to expand their networks to meet demand changes and at PDX might required expanded on-airport sort facilities, more efficient access to off-airport facilities and ground networks, and the continued operation of night and feeder flights. The opportunity is to continue expansion to the benefit of the airport and local shippers, while the challenge is mostly to balance these carrier needs with community interests. It is also possible that PDX could be selected as a regional sort hub for an integrated carrier due to the availability of on-airport space, but it will depend on regional traffic growth and congestion at existing hubs.

There may also be opportunities to expand non-integrated freighter flights in the domestic markets, possibly to an underserved international gateway such as Miami or in support of

new all-cargo services. In addition to air services, there may also be opportunities to expand and enhance the support services such as forwarding and cargo handling. While expansion in these services will follow increases in market size and direct air services, the challenge will be to provide competitive support services as the direct air services build.

There are also opportunities and challenges related to local and regional demand. The primary opportunity is to use efficient air and multi-modal cargo systems to attract new industries that in turn attract new cargo services. For this to be accomplished, current access and efficiency advantages relative to other airports must be maintained with future needs to access developing industrial areas considered. The primary challenge will be to maintain efficient international air access via PDX during the period when direct services are building – air-dependent industries can be diverted as well as attracted. A similar challenge is to leverage the local high-profile air shippers to assist in developing new services and supporting continued infrastructure improvements.

While the air cargo infrastructure is expected to be capable of expanding to meet both status quo and stimulated growth, the infrastructure must adapt to meet changing market conditions, to take advantage of opportunities, and to address any problems in a timely manner. In this regard, long-range planning requirements are a challenge for a highly volatile market and one that is dependent on other sectors of the economy (e.g., local roads). New technology and the ability to invest in new facilities and equipment prior to service development may also be challenges.

In conclusion, the PDX air cargo market can be expected to grow under general economic trends, but there are significant opportunities to expand the airport's role as an international gateway or domestic transfer point. The challenge will be to utilize PDX's advantage in available space, access and lack of congestion to offset and divert existing routing patterns, possibly requiring infrastructure improvements. Improved air cargo access could stimulate new demand, but the opposite is also possible.

Trade Support Infrastructure

PORTLAND/VANCOUVER INTERNATIONAL AND DOMESTIC TRADE CAPACITY ANALYSIS

SUPPORT INFRASTRUCTURE NEEDS REPORT

[Task 4]

September 26, 2006

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Report Overview

This report addresses the objective of the Task 4 work scope for the Portland/Vancouver International and Domestic Trade Capacity Analysis, which is to define the 20 year industrial land supply and transportation system needed to adequately support anticipated growth in domestic and international trade for the greater Portland/Vancouver market area.

To accomplish this objective the report is divided into 3 sections:

I. Summarization of findings from relevant studies and plans.

II. Summarization of findings from the forecasts and assessments developed in Tasks 1, 2 and 3.

III. Major conclusions concerning the ability of the existing industrial land supply process to meet the needs of traded sector businesses and identification of key road and rail corridors and improvements and other key policy initiatives to support the future freight needs.

Section 1

SUMMARY OF EXISTING ECONOMIC AND TRANSPORTATION INFORMATION RELEVANT TO FREIGHT MOVEMENT

I. Overview

This first section of the report summarizes the key findings, conclusions and recommendations from 28 studies and policy documents which the sponsors considered to be most relevant to this analysis. The documents are listed in the Appendix, with their reference numbers cited in parentheses at the end of each summary. Summary information is grouped into categories in order to synthesize similar types of findings and conclusions into one place.

II. Transportation

A. Overall Network

The following findings are extracted from the major transportation studies and plans produced for the region over the past few years:

1. The Oregon Commodity Flow Forecast of 2005 showed an 81% increase in total tonnage to, from and through the state by 2030. Trucking will have the greatest absolute tonnage increase to over 630 million tons per year, followed by rail, with air tonnage growing fastest but representing only a small percentage (less than 1%) of the total. The fastest growing commodity is projected to be electrical equipment at 4.9 % annual average growth over the time period. A significant amount of this traffic is not originating in or destined for the region, growing to 122 million tons by 2030. Truck through traffic is forecast to grow faster than other modes, accounting for about two thirds of the total.(20)

2. Metro's Regional Transportation Plan (2004) projects that, with no new improvements to the transportation system by 2020, there would be an increase in freeway miles experiencing congestion from about 15% to almost 37%, an increase from 6% to almost 25% in arterial miles of congestion, and a 734% increase in vehicle hours of delay. In the same time period the average number of weekday truck trips would be expected to increase by 32%, travel times by 30% and hours of delay by 840%. The corridors with the biggest increase in travel times would be Highway 217, I-5 north to Vancouver and I-205 from Oregon City to PDX.(14)

3. The 2005 regional Cost of Congestion Study concludes that, in addition to specific highway improvements, other key improvements for the transportation

system include: designating freight corridors and freight priority routes; highway pricing policies; and an integrated system package that also includes transit, technological and traffic management improvements.(1)

4. The 2002 Commodity Flow Forecast projected that freight movement tonnage to, from and through the Portland/Vancouver region would double by 2030, with by far the biggest share of that continuing to be by truck (81%), with air tonnage growing fastest. That Forecast also projected that pass-through freight traffic in the region will continue to be significant. The pass through traffic takes up capacity from local industry and automobiles, but also provides support for both public and private improvements to the transportation infrastructure.(4)

5. The City of Portland Freight Master Plan has 3 themes: Mobility, Livability and Healthy Economy. There are a number of actions and on-going activities under each category. Under Mobility are activities such as designating freight classifications for city streets, optimizing signal timing for freight movement in certain corridors, and reducing at-grade rail crossing problems. Livability actions include establishing "good neighbor agreements" to address truck/neighborhood issues, implementing the Design Guidelines for Trucks, and updating loading regulations. Under Healthy Economy are actions such as collaborating with agency partners on public investment strategies. The Plan also prioritizes freight improvement projects by priority tiers and by policy, operational and public benefit metrics.(10)

6. The Portland/Vancouver I-5 Trade Corridor Freight Feasibility and Needs Assessment of 2000 demonstrated that this corridor is critical to the regional, state and national economies. It represents a chokepoint in the rail and road systems and without attention will become much worse in the future. Without improvements it threatens the economic promise of the region, and is key to supporting the region's quality of life. The Assessment concluded that doing only the currently planned projects in the corridor will not address the problems, which require new, multi-faceted freight and passenger capacity across the river. It recommended that the region's decision-makers pursue a phased approach to address these problems, bringing new resources to bear, including more federal money, tolls and private sources where appropriate.(18)

7. The 2003 study of I-5 Transportation Choke Points concluded that, since the regional economy is much more freight dependent than the national average and the I-5 road/rail corridor represents a large choke point on the freight movement system, congestion on the I-5 Columbia River crossings (road and rail) is a strategic issue for the Portland/Vancouver region and the PNW. Peak period congestion will spread from 4 hours in 2003 to almost 10 hours in 2020 if no significant improvements are made, increasing the cost of delay to trucks by 140%, from $14 million annually to $34 million. Rail congestion within the region adds about 40 minutes of delay to every train move. This cost will become an even greater drag on the regional economy as the region grows and the demand

for travel increases. As part of this study the I-5 Trade and Transportation Partnership identified improvements that will:

- Minimize the spread of congested periods, preserving the midday period for truck freight movements;
- Reduce delays for trucks on I-5 generally;
- Maintain or enhance access to ports and industrial areas; and
- Accommodate more freight rail and high speed passenger rail while maintaining or enhancing rail system performance.(17)

8. The 2005 Washington Transportation Plan Update identified a 94% increase in truck trips on I-5 in Washington between 1993 and 2003, and a freight volume projected increase of 80% by 2020. Washington's largest waterborne export is food, primarily grain, 85% of which is shipped to Asia via the Columbia River ports. There are serious impediments to these freight movements with federal restrictions on Columbia River dredging and lock maintenance, and rail congestion at the Port of Vancouver rail yard. The most common form of distributing goods is by small truck from large distribution centers to stores and businesses. The number and frequency of these deliveries are increasing as high land costs put a premium on reducing storage space. Most observers see no alternative to moving goods over Washington's major highway system, especially I-5.(25)

9. Recommendations from the Washington Transportation Plan Update (2005):

- Analyze a public/private truck-toll highway parallel to I-5 from Central Puget Sound to the Oregon border.
- Support east-west mainline rail capacity improvements, particularly Columbia River Gorge sidings and the Vancouver rail yard bypass.
- Implement a strategic dredging and lock maintenance program for the Columbia-Snake Rivers barge system.
- Create an ongoing, appropriate level of funding for regional economic development freight projects.
- Replace the I-5 Columbia River bridge.
- Create fuel pipeline capacity and distribution alternatives to meet long term demand.(25)

B. Road

Specific roadway system findings include the following:

1. Portland's 2006 Freight Master Plan concludes that their roads will experience a doubling in the number of truck trips between 2000 and 2020, while overall congestion continues as well. The locations that will experience the greatest increases in travel delay for freight movement are the roads approaching PDX and the surrounding industrial area, the US 30 industrial corridor, and all of the region's freeways. It also identified several major infrastructure barriers for freight movement, such as: weight restricted bridges; low clearance bridges; at-

grade rail crossings; and restrictions on the Columbia River rail and freeway lift spans.(10)

2. The Portland Harbor Industrial Lands Study identified strong support among harbor businesses for roadway improvements for freight and employee commutes, and for improved transit.(22)

3. The Washington State Freight and Goods Transportation Update of 2005 lists I-5, SR 14, SR 500, SR 501 and SR 503 as Strategic Freight Corridors.(23)

C. Rail

Observations concerning the rail system can be divided into 3 sets of findings. Following are findings from the 2004 study of Freight Rail and the Oregon Economy:

1. The railroad industry nationally does not have the resources to replenish its infrastructure or grow rapidly. They are very capital intensive, reinvesting 18% of their revenue back into capital improvements (5 times the industrial average). They are not currently earning their cost of capital, and may not be able to keep pace with economic growth. If this continues, then shippers will be forced to shift freight to trucks, which will mean more congested highways, higher road maintenance and improvement expenses, higher costs for shippers, slower economic growth, less competitive industries and possibly fewer jobs.(2)

2. There are current or emerging capacity problems in 5 rail corridors that serve key Oregon industries: Portland/Seattle; Willamette Valley; Klamath/West coast I-5; Columbia Gorge; and the Portland Triangle. The most pressing congestion and capacity problems are in the Portland Triangle, which is the interchange between Oregon's north-south and east-west corridors in central Portland. It is the area roughly bounded by the Vancouver Rail Yard on the north, Troutdale on the east and the Clackamas industrial area on the south. (Delay in this area is twice that in Chicago, the nation's busiest rail center.) As freight rail increases significantly over the next 20 years, the Portland/Seattle and Klamath/I-5 corridors will also experience significant capacity problems as will the Columbia Gorge in the longer term.(2)

3. The public sector has two broad policy choices: remain with a market-driven evolution of the freight rail system, or opt for a policy-driven expansion of capacity. The first leads to the problems identified above. The second means increasing state involvement and investment in rail. It also carries the risk that, even with public dollars, the railroads will not be able to deliver the needed services that will retain and attract shippers in a difficult business environment.(2)

4. Especially if the public sector opts for partnership with the railroads, the following initiatives should be considered: link public rail initiatives to economic development goals; clarify public roles and responsibilities by convening a PNW

freight advisory committee; improve public rail planning, analytical and decision-making capabilities to identify major capacity constraints and improvements; and leverage public resources for these improvements.(2)

The following findings come from the 2003 I-5 Rail Capacity Study:

5. Several incremental improvements to the inner Portland and Vancouver rail system can significantly improve the capacity of the I-5 rail corridor for the next 5-10 years. Without these, the reliability of rail service in this area will decline and costs to shippers may increase. In 10-20 years additional improvements will be needed to accommodate growth.(6)

6. The economics of freight movement result in freight rail not being as competitive with trucks at distances of less than 500 miles, depending on commodity.(6)

The last two findings relate to the rail situation in Washington and come from the Statewide Rail Capacity and System Needs Study:

7. The Washington state rail network is at or near capacity due to inadequate infrastructure and inefficient operating practices. Freight demand is growing, much of it driven by shippers and receivers outside the state, and the Class I railroads are not keeping pace with the demand. Their business model is changing, now emphasizing throughput capacity and consolidation facilities to enable profitable "hook and haul' services, accompanied by pricing to discourage lower-profit traffic such as carload and domestic intermodal services. This will lead to some of their (especially low volume) stakeholders losing out, and increased highway costs from additional truck traffic. Short line rail companies will be handling an increasing share of local service, although many are not positioned well in the current business climate. International trade growth will continue to dominate rail traffic and make rail connections to ports critical to their competitiveness.(27)

8. The Study identified a number of potential policy options and improvement strategies, including:

Financial incentives and assistance for operational improvements to enhance throughput and mainline capacity, selective investment in port access and terminal capacity, new intermodal terminals and transload centers, and short line systems providing access to industrial customers.

Permitting assistance for strategic projects.

Development of regional freight rail districts for support of short line services.

Cost effective means of improving passenger mobility, including better coordination of operations, investments to eliminate bottlenecks, and separating passenger from freight rail service.

III. Land

A. General (planning, demographics, etc.)

The 2004 Metro Regional Transportation Plan forecast regional population growth of 51% by 2020, to about 2.3 million people, with approximately 2/3rds being new residents. Employment is expected to grow by 70% to about 1.6 million jobs, with the highest growth in retail employment. Substantial growth is also projected in the trade and transportation dependent sectors, accounting for about half of the region's total employment by 2020.(14)

The 2005 Metropolitan Transportation Plan for Clark County determined that the County's population grew 80% between 1980 and 2000, and employment grew 124%. Projections are for significant growth to continue, with population growing by 72% to almost 600,000 by 2030, with jobs growing over 100% to about 240,000. Transportation improvements are required to keep pace with land development by the Growth Management Act. A major County goal is to reduce dependence on the auto.(12)

The Portland Harbor Area has about 940 firms employing over 39,000 people in 2000, of which about half were in manufacturing and one third in distribution. Metals and equipment manufacturing are the biggest industrial clusters, and are highly interdependent. Portland's share of the nation's manufacturing base continues to grow even as manufacturing represents a smaller component of the nation's total employment base. Marine cargo tonnage handled in Portland harbor grew by 253% since 1960, about 2.3% per year, with continued growth forecast through 2030. Rail is the primary inland mode for ocean cargo, handling about 51%, with 26% hauled by barge and 22% by truck. The harbor area is a regional job engine, with each of the 34,300 industrial jobs supporting an additional 1.9, accounting for about 1 in 8 jobs in the region. The total annual payroll for those jobs is approximately $3.5 billion. Since the harbor is the region's primary port and distribution hub it provides a specialized function to the region's shippers which is estimated to save them about $68 million per year.(21)

B. Industrial (overall)

1. When it was published in 2001, the Regional Industrial Land Study (RILS) concluded that:

- Large industrial parcels are in short supply in the Portland/Vancouver region and there is a need for public help to fix this problem, including transportation access improvements, land assembly, and permit streamlining, among others.
- The most critical factors in identifying viable industrial land are location (access to freeways, major arterials, and rail and air facilities, proximity to labor, etc.), and the characteristics of the land (slope, size, water and sewer availability, etc.).
- Potential industrial policy strategies to address these issues include: Creating a regional economic development strategy; preserving strategic land for industrial

development; linking public investments to the economic development strategy; and a series of land-related and infrastructure policies that address those specific issues.(5)

2. In 2002 CREDC concluded in its Economic Development Strategy that Clark County should:

- Maintain the current industrial land inventory by guarding against conversion to non-industrial uses.
- Increase the industrial land supply to provide large (over 75 acres) sites and master planned, mixed use development (?) on industrial land.
- Designate additional industrial land in growth nodes to accommodate industrial clusters.
- Establish urban land banks in areas that have the capability to support development of industrial clusters, and use public sector mechanisms to consolidate parcels.
- Create a special high tech/knowledge-based industrial corridor along I-5 between Salmon Creek and LaCenter.
- Continually update development codes to reflect emerging markets, for instance allowing more non-retail office uses in industrial zones.(7)

3. The Report to Clark County on the Current Industrial Land Inventory (2000) noted that Clark Co. had 807 acres of "prime" industrial land, those with few building restrictions. However, the only two over 80 acres were for lease only, and there were only two more over 40 acres. The rest were small and scattered. There were 1717 acres of secondary industrial land, with some significant constraints such as lack of infrastructure. There were 3428 acres of tertiary industrial land, those with severe restraints such as wetlands or steep slopes. The report also commented that Clark Co. should designate sufficient buildable (primary) industrial land (3000 acres) to meets its need, including several larger parcels and enforce a no-net-loss of industrial land policy.(8)

4. Portland's 2006 Freight Master Plan determined that the City's industrial land supply has 3 major limitations to being readily developable: lack of good access; environmental and ownership constraints; and expensive redevelopment of previously developed industrial land.(10)

5. The 2003 Portland Harbor Industrial Lands Study laid the foundation for extensive planning for this area. Following are highlights of the 2 parts of that Study:

    - The Study covered a 5532 acre area of mostly industrial land, representing about one third of the City's supply. This area is Oregon's freight transportation hub, connecting the region's main seaport with 2 trans-continental railroads, Columbia/Snake Rivers barge routes and 2 interstate highways. River-dependent uses occupy about 1700 acres (72%) of the developed riverfront property. 735 acres of the total were classified as

undeveloped, with over half of that in Rivergate. Most of this area is protected by industrial sanctuary zoning, with relatively little converting to other uses. River-dependent uses have also been stable or growing, at an annual average of about 21 acres per year since 1960. Existing freight transportation investment is a significant locational advantage for the harbor area as both a freight hub for distribution industries and as a marine and rail access location for manufacturers that require those facilities. In combination with the adjacent Columbia Corridor, the harbor area is the center of Oregon's freight distribution industry and is well positioned to maintain that position with continued growth as a West Coast distribution hub. The harbor is also the location for the region's largest heavy industrial district, and many of the industries located there are also highly interdependent.(21)

- Business activity in the Portland Harbor is expected to remain stable, with limited job growth and minimal need for added industrial land. The major local issues affecting harbor industries are: the uncertainty caused by the Superfund designation; maintaining competitive multi-modal transportation for riverfront businesses; regional congestion; non-industrial encroachment; permitting; and public policy/community support for all businesses.(22)

- There is general consensus among industries to continue the industrial sanctuary prohibitions against residential uses, though not for commercial uses. There is a desire to allow some corporate office, support retail, information technology and flex space uses.(22)

C. Distribution

The Portland Harbor Industrial Land Study also noted that distribution firms that serve the local market will continue to value a harbor area location, though regional and national firms do not necessarily need that location.(22)

D. Manufacturing

In this sector the Study noted that mid - larger manufacturer land needs in the harbor area will be modest, with most growth in smaller firms. Chemicals, electronics, printing, publishing, and especially metals and transportation equipment have significant inter-linkages in the harbor area and may have a need for other support businesses in the area.(22)

E. Riverside Land

The Study also noted that river-dependent industry needs multi-modal access, including 20+ foot barge depth and 40 foot depth for larger vessels, and that only auto import businesses are projected to need much new riverfront land. Reserving land for potential

riverfront users, even if demand is not readily apparent today, is an expressed interest by many harbor area firms and associations.(22)

IV. Land Supply Factors for Industrial Land

The most complete studies of site suitability factors for industrial uses is the Metro work documented in their memo titled "Industrial Land Location and Siting Factors", dated June 9, 2003. That work was supplemented by a memo titled "Formation of new Industrial Neighborhoods" dated October 24, 2004. Both of these studies relied on extensive discussions with industrial siting experts, and followed the lead of the Regional Industrial Land Study, which was published in 2001. This long term study involved extensive participation by all those with an interest in industrial land, including industrial operations, real estate and development businesses.

A. Location and Siting Criteria

Metro developed location and siting criteria for 3 types of industrial land need: distribution, general industrial and tech-flex uses, and these are summarized below.

1. Distribution Uses

   Different parts of the distribution industry serve different customers, and as a result there are somewhat different locational considerations for each. However, access to transportation facilities is key to all. Businesses that need access to marine or air facilities place a premium on being close to those transportation facilities. Local distributors place a premium on a location central to the region, while distributors with a much wider customer base (the PNW for instance) will prefer outlying, less congested locations. All parts of the distribution industry (except for those few that deal exclusively with rail or barge services to carry bulk products) rely on good truck service. If new land is needed for most distribution businesses there are several criteria that need to be met:

   - Interstate freeway access (primarily I-5 or I-205 and to some extent I-84), within 3-5 miles of an interchange (depending on the intervening conditions) via an arterial street, with no conflicting land uses (e.g. residential, schools and high traffic generating commercial uses) between the freeway and the site;
   - Less than 5% slope across the useable portion of the site; and
   - A minimum amount of land area to accommodate a number of uses, not just a single small use.

2. General Industrial

   This category includes light to heavy manufacturing, and can encompass a wide range of related activities such as research and development and office functions. The most important criteria that apply to this category are:

- Freeway access within 3 miles via an arterial street;
- Ability to divide property into individual sites between 1 and 5 acres and 10 and 20 acres;
- Stable soils and slopes no greater than 3% for manufacturing sites over 20 acres; and
- Stable soils and slopes no greater than 10% for individual 1-5 acre sites.

3. Tech-flex

These sites can tolerate more topographical variation than the other 2 categories, generally utilizing multiple, smaller buildings to accommodate such uses as light assembly, product storage, research and office activities. The most important criteria for these sites are:

- Net parcel size greater than 10 acres;
- Availability of specialized utilities such as specialty gases, triple redundant power, abundant water, dedicated fire and emergency response services;
- Stable soils, with limited rolling topography and overall no more than 5% slope.

4. Common Factors

There are a few common characteristics which are important to all industrial uses:

- Relatively flat slopes;
- Freeway access, especially for distribution uses, but also manufacturing and high tech industries for people movement, in particular to PDX (45 minute maximum mid-day travel time);
- Close proximity to other similar uses for access to suppliers and customers, and to their workforce.

5. Findings Concerning The Criteria

The substantial history of this region in examining how to provide land for industry has produced a good catalog of criteria to be used in determining what type of land should be made available for industrial activities. The above criteria have been analyzed and refined by private and public sector experts in this field. However, there are refinements that can be made to make them more complete, and these will be explored in Section 3 of this report.

B. Metro's Industrial Land UGB Expansion Process

The current status of the region's industrial land supply has been set since the 2005 decision by LCDC to accept Metro's adjustments to the expansion of the UGB in 2004. Combined with the existing industrial land in Clark County, this constitutes the scope of

the supply of industrial land in the 4 county region. Metro's decision-making process to arrive at this land supply is described below.

In order to amend the region's UGB in 2004 and 2005 to accommodate the need for additional industrial land, Metro staff used a methodology that had evolved over a number of years, starting with the RILS effort back in the mid-1990s. In 2002 the general demand for vacant industrial demand, from the Employment Urban Growth Report (Employment UGR), was determined to be 4285 acres. The 2002 UGB expansion added 533 net acres of "employment" land, 818 net acres of "industrial" land and 1499 net acres of Regionally Significant Industrial Area (RSIA) land. The latter was to be set aside largely for "traded sector" uses, which are essentially equivalent to those industries defined in this report as the most transportation dependent – distribution uses and many manufacturing businesses.

For the next UGB expansion decision in 2004, Metro determined that there were efficiencies which could be factored into the land demand equation since traditional land use categories are less applicable because of the tendency to mix commercial uses into industrial areas. By specifically limiting the amount of retail and office use in RSIAs the industrial land need was reduced by 1400 acres. Factoring that in, the 2004 20 year industrial land need was determined to be 1968 acres. When combined with a commercial land surplus of 393 acres, the net amount of land to be added to the UGB was set at 1575 acres. The Employment UGR also identified that 70% of the new acreage should be for distribution uses, 13% for general industrial and 17% for tech-flex uses. Lot size needs were also determined for each sector.

The process then turned to the land availability side of the equation and utilized a number of factors to determine areas to consider for UGB expansion. The location and site criteria discussed in A. above were a major element, as were factors relating to the aggregation potential of adjacent parcels, and the guidelines provided by Statewide Planning Goals 2 and 14 and Metro's own policies from the Regional Framework Plan. Through this process the lands under consideration were reduced considerably from 59,263 acres remaining from the 2002 UGB expansion to approximately 29,000 acres, divided into distinct study areas around the region.

Primarily applying the location, siting and aggregation factors, and recognizing the fact that approximately 1377 acres (70% of 1968 acres) needed to accommodate distribution uses, the majority of the recommended lands for final consideration by the Metro Council were within 2 miles of I-5, I-205 or I-84. Some consideration was also given to the need for local distribution sites in other areas as well.

Metro Council added 1956 total acres in their 2004 decision, which meant 1157 net acres after reductions for stream corridors, slopes, etc., and a shortfall in comparison to the identified need. In 2005 they took further action to modify the 2004 decision to address that shortfall and an LCDC requirement to factor in street needs and further reductions in demand for industrial land due to a higher redevelopment and infill rate for

commercial development. They also added another site, for a new total net acreage of 1207 acres, which met the new identified need number.

The 2005 decision was based in part on a rationalization for meeting the 70% number for distribution uses. The analysis included documentation and confirmation for much of the basis for including industrial land that would meet the distribution need. For instance it validated the need for close connections to the interstate freeways. It also described the need for more local distribution facilities to serve different parts of the region. The conclusion was that when combining the pre-2002 vacant acres of industrial land within close proximity of Port facilities and the freeways with the new land brought into the UGB in 2002 and 2004 in Tualatin and Damascus, approximately 77.6% of the total amount of the Metro area's vacant industrial land is available for distribution uses.

Findings Concerning the UGB Expansion Process

The above process has produced a significant UGB expansion for industrial land within the Metro part of the overall region, meeting general industrial and tech/flex needs. A major question remains, however. Since the distribution sector is the largest and has the most diverse needs, will the added land meet all of those needs? There is evidence that the current industrial land supply does not meet the need for regional distribution facilities, as opposed to local distribution facilities. It is also clear that rail/truck intermodal and transload facility land needs, as well as aviation and marine facility needs, were not directly addressed as part of the process.

V. Economic Impact

This part of the report summarizes the economic impact information developed for several different agencies. The first 4 points are from the 2005 report on the Cost of Congestion to the Economy of the Portland Region.

1. The region's economy is based on "traded industries", which are those core or primary businesses such as manufacturing, transportation/port distribution, and service activities located in the Portland/Vancouver region that serve broader regional (PNW), national and international markets. The core industries with the highest concentration locally relative to national averages (computer/electronics, metal products, wood/paper, publishing, etc.) all bring money into the Portland/Vancouver region by selling their products and services elsewhere.(1)

2. Since these core businesses serve markets well beyond the region, they are particularly dependent on the area's transportation system for delivery of products and services, and are vulnerable to changes in the transportation system's performance. Reasonably good transportation access needs to be maintained in order for these industries to remain and grow in the Portland/Vancouver region.(1)

3. All modes are important but few alternatives exist for a smoothly functioning roadway system for on-the-clock business travel. The roadway system is the linkage among all other forms of transportation, and among the land uses critical to business. Roadway congestion significantly increases the cost of doing business for those activities that are transportation dependent.(1)

4. The costs of congestion to the regional economy are estimated by comparing a "Planned Investment Scenario" with an "Improved System Scenario" for 2025. The value of the latter improvements to the economy compared to the former are: 28 hours of travel time savings per household; $844 million annually; 6500 additional permanent jobs and 2-3000 construction jobs annually. The return on investment under the Improved System Scenario is $2 for every dollar invested.(1)

The report on Economic Impacts of the Portland International Airport informed point 5.

5. PDX had the following economic impacts in 2003:

- Almost 9,000 direct jobs, over 5,000 induced jobs to support purchases of goods and services by the direct employees and over 3300 indirect jobs due to over $200 million in purchases by firms directly dependent on the airport. Over $750 million of income and personal expenditures were generated as a result of those jobs.
- Approximately $3.2 billion of business sales were generated by airport activity, including $785 million in air cargo activity.
- The federal government received over $200 million in airport-specific taxes, and state and local governments received $72 million in revenue from airport activity.
- Over 57,000 direct, induced and indirect jobs were supported by visitors arriving via PDX, who spent about $2.4 billion on area businesses, and over $100 million in state and local taxes.(26)
- Over 230 million pounds of air freight passed through PDX, supporting about 70,000 jobs with firms producing that cargo.
- (Most of these numbers reflect a decline during the recent recession, which has now been reversed.)(26)

The report on the Impacts of the Value Added Distribution Industry in the Portland Area is summarized in point 6.

6. In 2003 there were 17,000+ direct, induced and indirect jobs in the Portland/Vancouver area value added regional distribution industry. This industry produced $800 million in personal income, $2.8 billion in business revenue, and $87 million in state and local taxes. The average wage for these businesses is over $46,000 annually as opposed to an average of $37,000 for all industries.(3)

The 2006 report on the Economic Impacts of the Port of Vancouver is summarized in point 7.

7. The Port of Vancouver is responsible for almost 2300 direct jobs, over 2200 induced jobs and more than 1400 indirect jobs, plus almost 9700 jobs with related shippers, resulting in $1.6 billion of total economic activity and $82 million in state and local taxes. Most of that impact is from maritime activities, with the balance from industrial real estate activities.(28)

VI. Implications for the Region's Land Use and Transportation Systems

When considered together, the above findings have the following implications for the region's land use and transportation systems.

1. The region's economy is based on traded sector businesses – those core businesses such as manufacturing (electronics, metal products, etc), distribution and service activities that serve a non-local market. These industries bring money into the region and support the rest of the economy. They are particularly dependent on the area's transportation network since they all use some aspect of the network to move freight and/or people to destinations outside the region. Reasonably good access to, and mobility on, the transportation network needs to be maintained in order for these industries to remain and grow.

2. All modes are important, but the roadway system links all of the others, and links land uses critical to business. Roadway congestion significantly increases the cost of doing business for those activities that are transportation dependent.

3. One of the primary transportation-dependent "traded industries" is the value-added regional distribution industry, which represents $2.8 billion in business revenue in the region, with higher than average wages. This industry is primarily dependent on trucking but touches all modes of transportation.

4. Over the next 30 years trucking within the region is projected to double its freight tonnage, have the greatest absolute tonnage increase, and the largest share (81%). Metro has projected that, with no significant improvements to the transportation network in the next 15 years, there would be very significant increases in congestion on the area's freeways and arterials, particularly those corridors that are heavily used by trucks – I-5 between downtown Portland and Vancouver, I-205 between PDX and Oregon City, Highway 217, and the streets approaching PDX and surrounding industrial area, and Hwy. 30 through the Portland harbor industrial area.

5. The I-5 road and rail corridor is critical not only to this region, but also to the national economy. The Columbia River freeway and rail bridges are chokepoints on this corridor. If no major improvements are made within the next 15 years, peak period freeway congestion will grow from 4 to 10 hours a day, increasing

the cost of delay to trucks by 140%. On the rail system, increasing congestion in Vancouver Yard and on the Columbia River Bridge will add about 40 minutes of delay to an already poor situation. This is a strategic issue for the Portland/Vancouver region and the PNW. Without new, multi-faceted freight and people capacity improvements across the river, the region's economic future and its quality of life will be seriously compromised. The region's decision-makers need to pursue a phased approach to address these problems, and bring new resources to bear, including tolls, more federal money and private sources. Improvements identified would: minimize congested periods, especially during prime truck operating times; maintain good access to the ports and industrial areas; and accommodate more freight and passenger rail traffic while enhancing performance.

6. Pass through freight traffic (road and rail) in the region will grow faster than regional traffic. While this takes away capacity from local users, it also provides national support for enhanced regional transportation systems.

7. The most pressing rail congestion problems are in the Portland Triangle, the interchange area for the major north-south and east-west lines serving the PNW. Delays in this area will worsen as freight rail volumes increase significantly over the next 20 years. A series of incremental improvements over the next 5 – 10 years in this area will improve capacity for the whole regional system. Increasingly significant capacity problems will also develop in the I-5 corridor (Vancouver – Seattle and Portland – Klamath Falls) and the Columbia Gorge over the next 20 years, and will need to be addressed as well to accommodate forecast growth.

8. As the new business model for the Class I Railroads evolves, there will be increasing pressure on local, state, and federal governments to become involved in freight rail infrastructure improvements. This will require governments to develop strategies to ensure that they receive good value for their financial participation in improving how freight rail operates. It will be important to link this participation to public economic development goals and possibly a more substantive stake in the rail industry (e.g. ownership of ROW ?) to ensure the public receives good long term value for the investment.

9. Trade and transportation-dependent industries will account for about half of regional employment by 2020. Manufacturing businesses are unlikely to experience much growth, and will mainly be concerned with maintaining and enhancing the protections and flexibility they need from the land use system in order to stay competitive. What additional land needs they have can be accommodated through modest increases in industrial land. The large land need is for distribution/logistics industries, primarily in locations close to I-5, I-205 and to some extent I-84. In addition to large sites for truck distribution facilities there may be specialized site needs for rail "consolidation" facilities.

10. The primary concerns for the public sector are to provide adequate land for the distribution/logistics sector in the right locations, and to enable them to expand without making the costs too high for their continued competitiveness in the world market. Protecting industry from conflicts with other uses, particularly housing, is also a major concern, as are environmental issues such as the uncertainty surrounding the Superfund area in the Portland Harbor.

Section 2

KEY FINDINGS AND IMPLICATIONS

Key Findings	Implications
AIR	
Annual growth - 4-5%	
Speed, certainty and service quality are key factors. It is door-to-door service - ground transportation is critical	On-airport facilities planned for air cargo are adequate for foreseeable needs. Off-airport roadway system must be free of major congestion to enable good cargo movement to and from the airport.
Integrated carriers 86% of PDX market. Meet overnight delivery needs of region. Air feeder service to PNW is major factor. Needs to operate at night	
Secondary gateway for international service - 70+% of regional cargo diverted to other airports. PDX could pull cargo from 500 miles; primary market within 100 miles.	
Underutilized infrastructure capacity and space. Low delay factor.	
Much of cargo handling off-airport - gate access and local streets are critical. Congestion from cars on regional and local system can have affect on cargo moves.	
Portland can use multi-modal and distribution capabilities to attract cargo	
Getting direct service to major international destinations is critical to enhancing air cargo and giving manufacturers the connections they want.	Continue efforts to attract international air cargo service.
WATER	
Projected growth in general cargo (container and break bulk), but only back to 1997 levels by 2020	
Containers:	
Other west coast ports reaching capacity, unlikely to expand due to congestion, environmental and community issues; operators looking for other ports	
Portland/Vancouver has available waterfront land for container expansion.	
Columbia Gorge rail corridor currently less congested for container land shipments.	
Autos:	

Doubling throughput of autos in the region by 2030	Autos: Need to double amount of marine terminal land devoted to autos by 2030.
75% of current auto shipments by rail to inland destinations - expected to continue.	Rail connections from the marine terminals to and through the Columbia River Gorge will need to be improved to keep pace with demand for eastbound auto shipments.
Unit train business from marine terminals.	
Grains:	
Continued slow growth in grain shipments	
43 foot channel will allow larger vessels	
Shipments arrive by barge (40-45%) and rail (55-60%) now	
Barge system threatened by environmental issues. If unable to handle short haul grain traffic in PNW, uncertain whether rail will be able to pick up the slack as RRs move to focus on long haul service.	Truck not viable alternative if barge and rail combination is compromised. Need to ensure both barge and rail systems continue to make improvements to the Columbia River corridor to keep pace with demand for westbound shipments.
Dry Bulks:	
Strong growth projected for dry bulks, both inbound and outbound	
Ports are planning expansion of terminal capacity.	
Virtually all cargo uses rail.	(same as grain and autos)
Liquid Bulks:	
No growth projected; handled by truck and pipeline.	
Barge System:	
Growth projected after 2010, mostly in grain.	
Barge system provides an effective way to move bulk and container cargo, from both a financial and transportation perspective.	If the barge system is compromised there may be no cost effective alternative for grain products to move from PNW farms to overseas markets, especially if rail is unwilling to accommodate this cargo.
Significant system constraints: dams threatened by ESA and other environmental issues; 2 locks need major improvements within 5 years, and all have ongoing maintenance and repair needs; Vancouver rail bridge lift span needs replacement in 10 years; ongoing Columbia and Willamette channel maintenance dredging needed, as well as dock dredging.	The barge and rail systems work effectively as alternatives for one another within the PNW. If the barge system is compromised and rail is not significantly improved there is a very real danger that there will be significant loss of cargo movement capability in the Columbia River corridor.

RAIL	
Both BNSF and UP have changed to "wholesale" business model - focus on long haul, longer trains; priced smaller customers to encourage short haul by others to central terminal facilities for makeup into full trains for "hook and haul" service; increase profits by increasing volume through the system. Big impact on local, small shippers and businesses that have relied on "retail" service. Operating costs (including labor) are a major impetus for this change.	To accommodate the new operating dynamic, there will be pressure to relocate and consolidate small, local rail facilities to larger facilities outside urban areas. Public sector impacts: higher road and bridge costs for longer truck routes to and from the new rail centers; pressure to use farm land for new facilities. Short line RRs will be increasingly important to handle the local needs of rail customers to access the central large rail terminals.
Industries in US not generating as much heavy cargo, which means rail shipments will not grow as fast as they have in the past, although rail volumes in the region will still grow by 50% by 2035. Means roughly 24 - 32 more trains per day in and out of the region, which exceeds the capacity of the system.	
RRs not able to attract capital as fast as infrastructure and equipment is needed; very conservative on taking on new debt that cannot be easily liquidated (tracks, rolling stock, etc.); they spend about 18% of revenue on infrastructure compared to 4-5% for typical industry.	
Major impediment to increasing rail service to southeast and south central US is huge volumes of coal being shipped through mountain states - runs constantly, RRs will not disrupt those politically sensitive and profitable train movements for service from PNW. Affects all eastbound movements, which now all go through the bottleneck in Chicago. RRs shifting eastbound container traffic to southern California to avoid this conflict.	There appears to be a need to reconsider the exclusive reliance on the private sector to solve a looming national rail service crisis. This is especially important given the very probable need to rely even more heavily on rail freight shipments as the price of fuel sends the cost of truck shipments continually higher. Should the public sector take over responsibility for funding rail infrastructure and leave the RRs to operate the freight services (same as on the road system)?
The Portland Triangle is the most critical rail bottleneck in the region. Virtually all rail movements have to pass through this complex of tracks and bridges that is severely limited by single tracks on key segments and the lack of a critical south to east connection in central Portland.	Congestion in the Portland triangle impacts all of the region's major marine terminal customers and eventually will erode the perception of the region as a relatively less congested gateway. Prioritize improvements to the Portland Triangle.

The I-5 north-south corridor is also heavily congested, especially between Vancouver and Kelso, Wa. UP's line to Eugene is also frequently at capacity.	Funding for a series of bypass and siding improvements in this corridor will be critical soon.
The Columbia Gorge is the major east-west corridor connecting the PNW with the national rail system, but operates largely on single tracks north and south of the river. Congestion in this corridor is growing and will soon cause major service disruptions.	While the short term outlook for bulk, auto and container train usage of the Columbia Gorge is good, the long term is less certain if it is not reliable as volumes grow. Lengthening sidings, and eventually double tracking both sides of the Gorge, will be needed improvements in the longer term.
Portland & Western RR provides short line service to the Portland area, and discussions are underway to broaden its service to the Rogue Valley and other Oregon locations.	Short line RRs will need to be encouraged and reinforced in order to provide the necessary access to nationwide rail services for PNW customers

Section 3

MAJOR CONCLUSIONS - TRANSPORTATION SYSTEMS AND INDUSTRIAL LAND

I. Overview

This section of the report takes the implications compiled in the previous two sections, summarizes them, and then draws conclusions that will inform and help analyze the ability of the existing regional transportation systems and industrial land supply to meet the requirements of international and domestic trade.

II. Summary of Implications from Previous Sections

The following points summarize the key implications listed in the previous two sections:

- The region's economy is based on traded sector businesses, and they are particularly dependent on the transportation network to move freight and people to and from destinations outside the region.
- All modes of transportation are important for freight movement but the roadway system links them all together, and links the land uses critical to those businesses.
- Trucking is projected to double its freight tonnage over the next 30 years. Congestion on the primary truck routes will limit the ability of traded sector businesses to support a prosperous economy.
- The I-5 road and rail corridor is critical not only to the prosperity of this region, but to the national economy. The Columbia River freeway bridge and the rail chokepoints in the "Portland Triangle" need to be the focal points for long term improvements to these surface transportation modes. Other freeway and arterial roadway congestion problems as well as railway system limitations in the Columbia Gorge are also major concerns.
- There is a dramatic change going on in the rail industry which is affecting the ability of the Class I railroads to make the improvements necessary to provide the full range of services needed by regional freight customers. The public sector will need to play an increasingly important role in funding rail improvements.
- Good road access to PDX is critical to the movement of time sensitive freight between this region and outside markets.
- PDX has an adequate land supply to handle the need for direct airside freight movement facilities in the foreseeable future. The need for additional off-airport distribution facilities to handle the projected strong growth in air cargo is a subset of the more general distribution industry addressed below.
- The combination of Port of Portland and Port of Vancouver vacant and re-developable riverfront property will be adequate to handle the need for marine cargo facilities for the near-term future. However, for the longer term,

environmental and financial issues could make it difficult to implement current plans for development of riverfront lands which are very important to the continued growth of marine transportation facilities. Under current projections a good portion of the land need will be for auto handling facilities.

- The Columbia River barge system is a key freight service for much of the PNW, providing an important low cost transportation alternative that keeps traffic off the roadway and rail systems.
- While the manufacturing sector is strong in the region, it is also not projected to experience much growth in its future land needs. All indicators point toward manufacturers consolidating their market positions and diversifying products and services to stay competitive. The main land need appears to be to accommodate relatively small spin-off and support businesses.
- By far the largest amount of industrial land need is to accommodate the fast growing distribution/logistics industry. The biggest issue is providing sites that meet the location, size and other characteristics this industry needs. The primary unmet need appears to be for regional distributors and specialized needs such as transload and intermodal facilities.
- Protecting industrial uses from conflicting uses and allowing them to expand where needed without extraordinary costs or controversy are major factors for all segments of the industry.

Key Regional Road and Rail Corridors for Freight Movement

The rail and road corridors discussed in this sub-section have been identified as the most critical to meet the future freight movement needs of transportation-dependent industries in the Portland/Vancouver region. It provides a catalog of the road and rail facility needs to keep the region's traded sector businesses competitive in the world market.

Rail System Conclusions

Over the past 4 years there have been several studies of the rail system in the region, including broader studies of the entire PNW area. They are consistent in identifying improvements to the same three "corridors" as the most important for freight movement. The biggest bottleneck is in the Portland Triangle, and given its strategic location as the part of the system where the major east-west and north-south corridors come together, it has the highest priority for improvements. The I-5 and Columbia Gorge rail corridors have important improvement needs, but can wait a few years. In any case, the full benefit of those improvements will only be felt after the central Portland improvements are made. Below is the list of the improvements recommended for those three areas over the next 20 years.

The Portland Triangle

This area extends on the east side from near Troutdale where the Kenton and Graham lines merge, to the Vancouver Rail Yard on the north and the Clackamas industrial area on the south along the old SP line. It also includes the rail lines and yards throughout the North Portland Peninsula. The I-5 Rail Capacity Study identified a series of "incremental" improvements that need to be made as soon as possible in order to untangle the very congested system of tracks and rail operations that now make up this area. The City of Portland Freight Master Plan lists the same projects as part of its rail recommendations, although those outside the City are not listed. The Port of Portland 2006 Transportation Improvement Plan also lists these same projects. The following improvements should be completed within the next 2 - 7 years. (Note that these projects were all identified as being needed in 5 – 10 years several years ago, which should put the emphasis on being completed within a shorter timeframe than 10 years.)

- A two main track bypass around the Vancouver Yard.
- Revised crossovers and higher turnout speeds at North Portland Junction and improved track conditions on the Columbia and Willamette River bridges.
- A second main track and track improvements on the Kenton Line between N. Portland Junction and approximately 82nd Ave.
- Expanded capacity and longer tracks at Ramsey and Barnes yards.
- A direct east-south connection between UP's Brooklyn and Graham lines at E. Portland Junction and an added siding on the Graham line at Rockwood.
- A new track in one key location and upgraded existing track and signals from Albina Yard through the E. Portland Junction south to Clackamas.

Total cost of these improvements has been identified as approximately $180 million (2003 dollars). In the 10 – 20 year timeframe a grade separation at the N. Portland Junction would be required to separate the UP and BNSF mainlines which cross at that point. (See IV. below for additional policy and regional public/private partnership initiatives for funding these improvements.)

I-5 North and South Corridors

Within the next 5-15 years the congestion on the rail lines from Portland south and from Vancouver north along the I-5 corridor will dictate the need for capacity improvements. These largely consist of either double tracking or sidings, signalization upgrades and grade separation at key locations between Clackamas and Eugene and between Vancouver and Tacoma. The north part of the corridor is at or near capacity today and should receive a high priority for rail funding in the early part of that timeframe.

Columbia River Gorge Corridor

This corridor functions fairly well today, but at current growth projections will become increasingly congested within 10 years, and over capacity in the 10 – 20 year timeframe. The primary need will be for an increased number of sidings, and eventually either double tracking on both the north and south sides of the river, or an operating agreement between BNSF and UP to run trains eastbound on one side and westbound on the other.

Special Facilities

As the train yards in the region become increasingly congested and functionally obsolete it will become increasingly important to determine the types of facilities needed for consolidation yards and efficient rail/truck intermodal or transload operations, and the approximate locations where they would be needed on the rail system. A study of this issue needs to be initiated soon to determine the long term feasibility of these facilities in the region.

Road System Conclusions

The road system studies that have specifically analyzed freight movement in the region in the past few years have identified a number of problem areas for trucks. The consensus is that the I-5 corridor between I-84 and downtown Vancouver is the highest priority. Also on the freeway system, the I-205 corridor between PDX and Oregon City and Highway 217 has bottlenecks that will need to be addressed within the next 10 years. On the arterial street system the key improvements will be to address congested intersections in the Columbia Blvd. corridor around PDX, and access to certain parts of the Portland Harbor in north and northwest Portland.

I-5 Corridor between I-84 and Vancouver.

The key freight mobility improvement on the road system is the complex of projects which will address the bottlenecks on this section of I-5. The widening of the freeway between Lombard and the Expo Center to 3 lanes in both directions is funded and will begin soon. Interchange improvements for I-5 and Columbia Blvd. are also on the region's priority list for funding in the near future. Other major elements of the overall solution to this set of problems are being determined through the I-5 Columbia River Crossing Project, which is in the project identification phase. The I-84/I-5 interchange has undergone a series of studies over the years without providing a solution to this important bottleneck, and will need significant attention to identify a solution.

2. I-205 and Hwy. 217

Other key regional facilities for truck movement include the section of I-205 from the Columbia River to Oregon City. Truck capacity improvements have not been fully identified at this point but include northbound on-ramp and southbound off-ramp projects

at the Airport Way interchange and capacity improvements to handle increasing truck traffic near the Clackamas industrial area. Hwy. 217 is a major bottleneck for truck movements. General capacity enhancement projects on this corridor will help relieve this problem. (See Metro RTP 2004.)

3. Arterial Improvements

The two major industrial areas in the City of Portland each have a series of truck access improvements delineated to address specific problems. In the Columbia corridor industrial area, particularly around PDX, there are intersection and street widening improvements already funded and prioritized for funding at the regional, and city levels. In the Portland harbor area there are also several projects already funded and several more intersection and traffic improvement projects prioritized for funding that will improve truck flow in the region. (See City of Portland Freight Master Plan)

Transportation Policy Initiatives

There are a number of non-infrastructure issues that have been identified in looking at the existing studies and plan documents and in reviewing the implications of the Task 3 work. This sub-section identifies potential initiatives that should be undertaken to address these issues, grouping them under the headings for each freight movement mode.

A. Rail Conclusions

The major rail issues can be essentially summarized as follows:

The changing business model for Class I railroads to a "hook and haul" emphasis.

The apparent need for public funding for rail infrastructure to ensure adequate service to regional freight shippers.

These two issues are intertwined. A set of policy initiatives has been suggested to address them, and they are summarized here.

1. Clearly link the region's economic competitiveness enhancement strategies to local and state freight movement policies. It is key to achieving long term economic stability that local and regional decisionmakers understand that linkage and act on it when making decisions. This implies that both overall economic strategies and specific freight policies have been well conceived and that all responsible parties have accepted them.

To accomplish this, the public's roles and responsibilities in this arena need to be clarified. One suggested mechanism to accomplish this task is to convene a PNW Freight Advisory Committee that would include railroads and rail shippers in addition to public representatives. This committee would have to work closely with local and state interests to achieve consensus on how the public and private sectors will interact, including a frank discussion of what the public sector can expect for its participation in funding improvements to the rail system. This also implies strengthening the analytical capabilities and decisionmaking processes at the state, metropolitan and local levels with regard to rail issues.

Ultimately, there are a series of decisions that will need to be made, most of them about spending public money. The above policies and strategies need to give clear guidance concerning the types of incentives that should be provided for: operational and capacity improvements; the type of selective investments that need to be made in short haul and branch line systems, and for port access and terminal capacity to meet throughput needs; and assistance with new intermodal and transload facilities. There are a number of financial resources that can be leveraged to accomplish much of this agenda, and these need to be thoroughly explored and advocated for at all governmental levels as part of this regional effort. Finally, there are permitting and other non-funding issues that will need to be considered, especially for new rail facilities, and these need to be addressed as part of a coordinated public/private effort to support freight movement in the region.

B. Marine Conclusions

There are several distinct issues which should be addressed with regard to waterborne freight transportation, and these can be summarized as follows:

- Increasing the region's container traffic in support of regional economic goals.
- Ensuring that the land planned for the growth of marine freight, particularly for new automobile movements in the foreseeable future, is able to be brought on line as needed.
- Ensuring that the Columbia/Snake Rivers barge system can continue to provide competitive freight service in the future.

The following points should be considered in attempting to address these issues:

- The region's economy would benefit from the enhanced connectivity with the world economy through increased regional container shipping opportunities. Local and regional businesses, in particular those basic industries that support the rest of the economy, need cost effective connections to markets around the world in order to stay competitive. The most effective way to ensure the necessary connections are there in the future is to have a cooperative regional approach to this issue.
- The container issue has been addressed over the years by the Port of Portland as an integral part of their marine strategy. Finding the right set of incentives and ways to communicate the region's advantages have been major elements of that strategy, and these need to be continuing elements of a regionally supported marine strategy. Having the unified support of other regional economic development interests will enhance the effectiveness of these measures. But in order to achieve a more effective regional strategy implies that the two ports and the other entities involved in achieving regional economic goals agree on all elements of that strategy.
- At the present time there is ample land available for the various marine industrial and transportation functions to meet the region's needs. In the future, as current vacant and underutilized marine properties are used up, there will be a need to prepare more riverfront land for marine development. Funding for such facilities is always challenging given their high cost. But the

biggest challenge may be in the realm of environmental permitting. The way to overcome this challenge is to have a unified regional strategy that makes an overwhelming case for the need for such facilities. This also points toward strong regional consensus to influence the decisionmaking process.

- The barge system faces similar challenges. The dams and locks that make up the systems infrastructure need to be maintained and enhanced, but the other issue facing them is environmental. The endangered salmon runs present the region with a conundrum: how to balance the legitimate concerns on both sides of this issue. A clear understanding of the tradeoffs and implications of losing the dams as a functioning part of the freight transportation network is imperative for making decisions about the future of the rivers. Once again, a strong regional process that provides clear direction to the decisionmaking process is a necessity.

C. Air Conclusions

The economic issue for air cargo is tied directly to the regional objective of aligning air service to the needs of local and regional businesses that rely on air connections with the rest of the world. In order to meet their shipping requirements, the region will have to form a strategy that satisfies the needs of the integrated carriers in the domestic air freight market, and attract expanded international service. The strategy should consider the following points:

- Current cargo routing patterns through major gateway airports and Portland's relatively small cargo base present challenges to be overcome in carrying out this strategy.
- The strategy should actively maintain Portland's current advantages in infrastructure and available space while building demand for better service with local and regional shippers and the businesses that they serve.
- Specific elements of the strategy include developing the air cargo service sector, attracting and expanding local and regional demand for air freight services, and coordinating the infrastructure development to match the future needs of both the shippers and the service providers.

D. Road Conclusions

The biggest challenge on the roadway system is achieving agreement on the importance of freight movement, particularly in the funding arena where the various modes are in direct competition with one another. The region has successfully integrated truck movement into the list of improvement project priorities. Following are points to consider in creating a strategy to address freight road funding needs:

- The main issue is the overall adequacy of funding for improvements. This issue is much bigger than this region. It is a nationwide problem, and needs a nationwide solution. The Portland/Vancouver region should continue to exert pressure on the federal government to fully fund the legitimate infrastructure needs of the country. Basic measures of economic prosperity, such as

productivity indicators, clearly show the great power that transportation improvements have on the nation's long term prosperity.

- In this era of higher energy costs, it is imperative that the overall transportation network be balanced.
- An intelligent allocation of resources will lead to enhanced truck movement capacity by encouraging less single occupancy driving and fewer and shorter auto trips.

V. Assessment of the Ability of the Industrial Land Supply to Support Trade

The implications from Tasks 1, 2 and 3 and previous studies summarized in II. above indicate that the need for transportation-dependent industrial land is potentially problematic. Metro has taken great pains over the past decade to address this need, and has largely succeeded. Clark County is also aware of this issue and has provided a significant amount of appropriate industrial land. However, there are several areas of inquiry that need to be examined further in order to understand whether the region can do more to provide enough land for this purpose. These can be grouped into several different categories: technical, private market, political and regulatory issues.

1. Technical issues –

While the locational and siting criteria discussed in Section I. are good, there is clearly a need to address the differentiation of distinct uses within the overall distribution category. This category could include at least three sub-caetgories: local distribution, regional distribution and more specialized distribution uses such as rail transload facilities, and aviation and marine facilities. While local distribution needs seem to be well addressed in the recent Metro UGB decisions on industrial land, there is a significant question as to whether regional distribution needs have been met, and specialized needs were not addressed at all in those decisions.

2. Political issues-

The inability to completely anticipate the locational requirements of all parts of the distribution industry has made the application of the criteria through the political process difficult. There has been room for political judgment to enter into how to apply the locational and siting criteria and determine the large blocks of land that will best meet industry's needs. Without more specific information about the requirements of the sub-categories within distribution, the inevitable result is that there will be controversy about whether the land brought into the UGB is really as well suited for the intended uses as it should be.

The political challenge does not end with Metro, however, because acceptance of local responsibility can also be a problem. Local jurisdictions must implement the regional decision to make industrial land available to the businesses that will use it. There have been several instances of local jurisdiction dissatisfaction with designating

land in their urban service area for distribution uses and, since this is by far the largest need, this can be an enormous obstacle in the path of eventually placing land in the hands of the end user.

Another major challenge is how to address the full distribution market geographically. Metro only has a portion of the responsibility for the full market area, which includes Clark County and parts of Columbia and Yamhill Counties, and for some uses could extend as far south as Salem. These other counties supply industrial land for regional distribution uses as well. All parts of the land supply need to be considered together when determining how the need for these uses will be met in the Portland/Vancouver region.

3. Private market issues –

The availability of land for industrial purposes is something that is difficult for the public decision-making process to take into account. For instance, private land owners are not always willing to sell when the industrial land market wants to buy. More generally, existing parcels are rarely the right size or shape to accommodate large industrial users. Metro has studied the potential ways that various sizes of property ownerships could be aggregated to assemble larger parcels to create industrial parks that make sense in the context of their physical surroundings. While there appears to be great merit in their analysis, it does not, and maybe cannot, anticipate all of the variables present in the array of land ownership situations present in the region.

There is also an acceptance issue in the real estate development community that plays a role in the viability of the decision Metro and local jurisdictions (including Clark County) have to make about adding certain property to the industrial land inventory and not others. However, this is part of the inevitable political maneuvering that takes place any time the public sector takes responsibility for tough decisions. As long as the decision has clear and consistent criteria and the process is perceived as fair, this issue should not be a major problem.

4. Regulatory issues-

Regulation of industrial land (newly added or existing) can also present problems in enabling the full and appropriate use of the region's industrial land supply. In addition to the familiar environmental concerns, there are a host of "compatibility" concerns that zoning and other development regulations attempt to deal with, often with only marginal success. For instance, at the regional level, Metro has designated Regionally Significant Industrial Areas (RSIAs) to help preserve property needed to meet the distribution land needs of the next 20 years. While in theory most interested parties agreed with this, when it came time place the RSIA designations on the regional map, the scope of the regulations to be enacted for those properties made it difficult for many local jurisdictions and even industrial advocates to agree with the end result. At the local level, traditional zoning codes have always strictly divided industrial uses from others, but in the past twenty years there has been a blurring of the distinctions among some types of industrial and commercial uses. Many firms engage in a mixture of the two that defies conventional zoning, and therefore makes it difficult to figure out how to regulate the placement of industrial uses. Industrial users themselves oftentimes find that they are

conflicted by this issue as well as the public planners who have to implement the regulations.

VI. Land Supply Process Conclusions

To address all of these issues, the following points should be considered:

Industrial land demand and supply should be addressed at the regional market level

- Both the demand for, and the supply of, industrial land, especially for the spectrum of distribution uses, should be determined at the level of the full market region. This includes the three Metro Counties, Clark County, and parts of Columbia and Yamhill Counties.
- At the minimum this would mean including the full market area in the analytical framework to determine where land with the proper characteristics is located.
- The decision-making process for determining where additional industrial land should be located is more difficult given the jurisdictional issues involved. However, establishing voluntary cooperative agreements among the parties involved would be a start, and could achieve a much better outcome than what currently occurs.

The location and siting criteria for Distribution uses should be refined

- The distribution category that Metro uses should be broken down into as many sub-categories as are required to adequately address the regional need to meet the full range of distribution and related transportation-dependent industrial uses.
- Local and regional distribution and specialized uses such as rail transload and intermodal facilities need to be included in this expanded category, along with marine and airside accessible industrial land needs.
- The land requirements for each of these sub-categories should be determined within the full market region, then allocated across the full region using the expanded location and siting criteria.

The regulatory processes governing the development of industrial land should be carefully reviewed and adjusted to ensure an adequate industrial land supply

- Local jurisdictions should be required to allow the full range of industrial uses within their general and/or heavy industrial zoning categories in order not to exclude distribution uses.
- While local zoning codes might allow a mix of residential, commercial and even light industrial uses throughout a jurisdiction, the potential impacts and conflicts inherent with most true industrial uses dictate

that they be provided for separately, with supporting retail services and accompanying office uses the only other uses allowed.

- Federal, state and local processes that regulate the re-development of existing industrial land should be re-examined to ensure that brownfield sites can be as easily developed for industrial use (where appropriate) as for other, higher value uses.
- Federal, state, regional and local regulations that govern the conversion of environmentally sensitive land should give priority to trade sector business uses, such as marine terminals and air cargo facilities that have severe locational limitations.

Support Infrastructure Needs Report

Appendix

Reference Documents

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PEER REVIEW AND OBSERVATIONS
Portland/Vancouver International Trade Capacity Analysis

The Port of Portland and its partners recently completed an international trade capacity analysis for the Portland/Vancouver region. The purpose of this report is to provide a peer review and observations of the results and findings from the trade capacity analysis. There are five specific observations as follows.

CONSERVATIVE GROWTH FORECASTS

Observation: The international trade growth forecasts produced by Global Insight Inc. suggest that annual trade volumes will double from a level of 300,000 annual tons in the year 2000 to a level of 600,000 annual tons by the year 2035, a compounded average annual growth rate of 1.9%. By comparison, the historical growth rate for the domestic economy ranges at 2-3% annually, and the recent growth in real output for the Portland/Vancouver region was at 5-6% annually. In light of the fact that the international sectors are growing faster than the domestic sectors, demonstrated by the growth rates used by other West Coast ports, specifically 5% for international trade forecasts, it is our observation that the forecasts for the Portland/Vancouver International Trade Capacity Analysis are conservative.

Strategic Opportunity: In the context of the overall Asian trade phenomenon, the region is viewed as an alternative on the West Coast to accommodate some of the growth in Asian imports, specifically containerized traffic.

CHANGING RAIL BUSINESS MODEL

Observation: The Class I railroads are shifting their business focus to the sectors that increase their opportunity for "hook 'n haul" traffic, specifically traffic with significant and concentrated volumes to generate unit trains at a single load center. Transcontinental international intermodal container traffic and coal traffic are examples of such sectors. As a result they are "de-marketing" the traditional business lines that generate incremental carload and boxcar shipments from a dispersed market area. The implications for the Portland/Vancouver region include land use for larger staging facilities to build long unit trains, deteriorating transportation capacity along key corridors that service the transcontinental intermodal and coal unit trains, and declining market access for smaller markets which are increasingly ignored.

Strategic Opportunity: Growing a successful base load of intermodal traffic in the region is important from an environmental standpoint as well as from a local economic development standpoint. The greatest strategic opportunity for growing intermodal traffic in the region is to emphasize the growth in international container traffic through the port.

DISTRIBUTION GATEWAYS

Observation: Companies are expanding from a four corner mega distribution center philosophy to

encompass smaller sub-regional distribution centers in the secondary markets such as the Portland/Vancouver region. Moreover, warehouse/distribution, logistics and transportation land uses are shifting south from Seattle towards Portland/Vancouver and vice versa, indicating that the greater Portland/Seattle market is increasingly being viewed as a single trading/ distribution market.

Strategic Opportunity: The allocation of sufficient land for the use of warehouse/distribution, logistics and transportation, specifically within the context of the growth boundary framework, is critical to sustaining a well balanced economic structure for the region. The logistics sector plays an important role in providing employment opportunities and upward social and economic mobility for blue collar employees, especially with a declining traditional industrial job base.

WATERFRONT LAND

Observation: The international trade forecasts suggest that preparing waterfront land is important to sustaining the region's transportation capacity. For example, the region is forecasted to grow as an important gateway for automotive imports, requiring twice as much space as it currently has committed for imports from the sector.

Strategic Opportunity: In order to support this niche market, as well as the other international trade sectors, additional waterfront land with good truck and relaxes is needed.

ROAD ACCESS FOR AIR CARGO

Observation: While the region has sufficient airside land capacity for air cargo, the road access for air cargo is increasingly congested. The scheduled and time sensitive nature of the air cargo sector requires reliable and timely access to air cargo facilities. The industries dependent on the air transportation of freight will be at a disadvantage if ready access to the airport is not available. The implication of deteriorating air cargo service is a decline in the region's competitiveness to attract and keep sectors that typically pay higher than average salaries and benefits.

Strategic Opportunity: Invest in additional highway capacity among key corridors that serve the airport.