



Washington State Transportation
Commission

Statewide Rail Capacity and System Needs Study
Task 2.1.B – Freight Transportation Demand Forecasts

Technical

Memorandum

prepared for

Washington State Transportation Commission

by

Cambridge Systematics, Inc.

with

Global Insight, Inc.

Technical Memorandum

Statewide Rail Capacity and System Needs Study

Task 2.1.B – Freight Transportation Demand Forecasts

prepared for

Washington State Transportation Commission

prepared by

Cambridge Systematics, Inc.
555 12th Street, Suite 1600
Oakland, California 94607

July 2006

Table of Contents

Summary	1
Objective	2
Methodology	2
Findings	3
Sector Freight Demand Forecasts	3
Agriculture and Foods Products Industries	4
Merchandise Trade and Retail Industries.....	5
Manufacturing Industries	8
Lumber and Wood Products Industries	9
Municipal Solid Waste Industry	11
Military	12
Overall Transportation Demand Growth for Washington State Industries	12
Rail Traffic Forecast	13
Domestic Forecast	17
North American Cross-Border Forecast	23
Conclusions.....	25

List of Tables

1.	Freight Demand Agriculture and Food Products.....	5
2.	Freight Demand Merchandise Trade and Retail.....	7
3.	Freight Demand Manufacturing	9
4.	Freight Demand Lumber and Wood Products Industries.....	11
5.	Modal Transportation Forecast	13
6.	Growth of Rail Tonnage	18
7.	Carload and Intermodal Tons	20
8.	Cross-Border Tonnage Forecast by Traffic Type	23
9.	Shift of Top Origin Destination Pairs	24

List of Figures

1.	Washington Rail Traffic Origins by District in 2025.....	14
2.	Washington Rail Traffic Termination by District in 2025.....	14
3.	Carload Traffic Volumes in Annual Tons National Perspective: 2004.....	15
4.	Carload Traffic Volumes in Annual Tons National Perspective: 2025.....	15
5.	Intermodal Traffic Volumes in Annual Tons National Perspective: 2004.....	16
6.	Intermodal Traffic Volumes in Annual Tons National Perspective: 2025.....	17
7.	Rail Tonnage Forecast.....	18
8.	Rail Freight Distribution.....	19
9.	Carload Units Forecast.....	20
10.	Intermodal Units Forecast.....	21
11.	Washington Rail Tonnage Commodity Distribution Forecast.....	21
12.	Outbound Washington Rail Tonnage by Termination Region.....	22
13.	Inbound Washington Rail Tonnage by Origin Region.....	23
14.	Cross Border Tonnage Forecast.....	24

Task 2.1.B – Freight Transportation Demand Forecasts

■ Summary

This Task 2.1.b Technical Memorandum addresses projected freight transportation demand across Washington's freight network. Fundamental traffic data was drawn from the Surface Transportation Board's Rail Waybill Sample for railroad traffic and Global Insight's TRANSEARCH INSIGHT freight flow database for highway, water, and air modes.¹ Traffic was projected for 2015 and 2025 using Global Insight's goods movement forecast. This forecast depicts the demand for goods movement between regions, and by six economic sectors that account for the greatest freight volume. The forecast is not a general economic projection; rather, it takes into account industry, regional, national, and international economic trends to estimate commodity-level trade flows.

Most of Washington's recent growth in rail traffic has been driven by Asian trade through the Puget Sound ports. These trends are expected to continue over the next 20 years. By 2015, the railroads are expected to move more than 103.5 million domestic tons of freight, up from 81.5 in 2004, and a 2.2 percent compound annual growth rate. In 2025, it is projected that there will be close to 129.5 million tons moved, a 2.3 percent annual growth over the 10 years from 2015 to 2025, and a steady 2.2 percent growth rate over the 21 years between 2004 and 2025. By 2025, intermodal will account for 2 out of every 5 tons and 4 out of 5 units of rail freight.

The growth in the different modes of freight transportation is affected by the growth of the industries using freight transportation. In general, the agriculture and food industry, along with the manufacturing industry will cause the largest increase in freight truck demand in Washington. Merchandise trade and retail will affect intermodal rail demand the most. The municipal solid waste industry will increase demand for transportation as

¹ This Technical Memorandum relies in part on data provided through the Surface Transportation Board's (STB) Rail Waybill Sample and source data collected by the consultant. The Waybill Sample reasonably reflects traffic volumes of the two major carriers serving Washington State (i.e., BNSF and Union Pacific). In addition, there are a number of smaller railroads that also operate in the region. Unfortunately, the Waybill Sample's coverage of small railroads is generally incomplete or entirely missing, as the STB does not collect data from railroads terminating fewer than 4,500 carloads. Since traffic data is confidential and proprietary, only general summaries are provided herein. A description of the Waybill Sample file can be found at <http://www.stb.dot.gov/stb/docs/2002userguide.pdf>.

population increases, but precisely which modes will be most affected by the increased demand are not apparent.

■ Objective

The objectives of this technical memorandum are to provide forecasts of demand by economic sector for freight transportation for the rail, truck, air, and water modes over the next 10 and 20 years. With the sector-level demands known, the impact on the rail system can be assessed along various characteristics, which include intermodal versus carload, and origin and destination geography. The Washington state rail network handles not only traffic destined from and/or to Washington industries and ports, but also carries traffic from and to other regions.

■ Methodology

The analysis reported in this technical memorandum was developed as follows.

The consultants examined recent economic and trade forecasts for Washington State, the Pacific Northwest, and the United States focusing on four primary sectors – agriculture and foods products, merchandise trade and retail, manufacturing, and lumber and wood products. In addition, two other sectors of unique interest – military and municipal solid waste (MSW) – were also examined. Particular attention was paid to the Pacific Rim trade that will account for much of the volume of import containers and exports (grains, fertilizers, food products, wood products, etc.) that is expected to move by rail in the State. Among the forecasts reviewed was the Marine Cargo Forecast produced in 2004 for the Washington Public Ports Association, which utilized economic and trade forecasts developed by consulting team member Global Insight, as well as individual trade forecasts developed for the Port of Tacoma and the Port of Seattle. Also reviewed were the Lower Columbia River cargo forecasts produced for the Port of Vancouver, Washington, and the Port of Portland, Oregon, in 2002; and the Oregon State Commodity Flow forecasts done for the Oregon Department of Transportation (DOT) in 2004.

Global Insight used its own forecasts and local sources to develop and adapt economic forecasts for industries that are domestic and local rail shippers. From these and other relevant forecasts, Global Insight synthesized economic growth conditions and trend projections, making adjustments and extensions, where appropriate, to bracket the most likely growth rates and freight forecasts for Washington State. The resulting forecasts are annual long-term forecasts out 10 and 20 years, capturing the path of growth between 2005 and 2025, as well as the forecast endpoint level of projected economic activity and trade.

Forecast data for the years 2015 and 2025 was created by routing the rail traffic and other modes across the respective modal networks. The carload and IMX forecast synthesizes economic growth conditions and trend projections, making adjustments and extensions where appropriate, to bracket the most likely growth rates and freight forecasts for Washington State. The resulting forecast projects the long-term growth through 2025.

The general and rail traffic forecast presented in this technical memorandum is also discussed in the Task 1.2.a Technical Memorandum, *Washington State Rail Traffic*. These are treated in both memoranda for purposes of topic continuity and context.

■ Findings

In 2004, the most important economic sectors on a total tonnage basis (originated and terminated, but not overhead) was manufacturing at 172 million tons in 2004, followed by agriculture and food products at 95 million tons and 85 million tons for lumber and wood products. Merchandise trade and retail came in last at somewhat less than 10 million tons. By 2025, this ranking is expected to remain unchanged; however, relative variations in growth will lead to the greatest growth among the merchandise and retail trade and manufacturing sectors. For the former, volumes are expected to increase to 26 million tons, while for the latter an increase of over 100 million tons to 278 million tons is anticipated. For the agricultural and food products sector, growth is expected to be slower, but still robust at 42 million tons, while growth in lumber and wood products tonnage will remain static, increasing only 4 million tons.

All common transportation modes serving Washington will experience substantial increases in freight demand between 2004 to 2025. International trade will be the primary driver for this growth, with rail intermodal, growing at a compound annual rate exceeding 5 percent, being the greatest beneficiary. For similar reasons, air cargo growth comes in second, with an anticipated compound annual growth of 3.6 percent during the forecast period. Growth in the other modes that rely more heavily on domestic traffic is expected to be less, with water and motor freight tied at 1.8 percent, and rail carload coming in last at 1.3 percent. The tepid growth in carload traffic, which includes a decline in intrastate traffic, is not surprising, given the tendency for increasingly longer hauls and the static nature of Washington State economic sectors that have been most heavily reliant on short-haul rail service.

■ Sector Freight Demand Forecasts

In Washington State, four economic sectors account for the vast majority of the regional freight transportation demand: 1) agriculture and foods products, 2) merchandise trade and retail, 3) manufacturing, and 4) lumber and wood products. In addition, two other sectors of critical importance are military and municipal solid waste (MSW). In the case of

the former, volumes are rather modest and somewhat irregular, but the transportation system must be capable of moving significant volumes at very short notice between particular locations. For MSW, as local landfills near the major metropolitan areas fill up and close, what was previously local traffic must move long distances to rural landfills. In this role, MSW is likely to require increasing amounts of infrastructure capacity, particularly on the railroads.

The following section reviews the economic outlook for each of the six sectors, along with the forecasted modal traffic volume between 2004 and 2025.

■ Agriculture and Foods Products Industries

Washington State, as the largest agricultural producer in the Northwest, has relied on freight transportation to serve the farming and food processing sector. The outlook for this sector is for a decline in the coming years. In the 5-year period, from 2000 to 2005, total sales in this sector grew at a 3.6 percent compound annual growth rate, and now stand at \$33 billion for 2005. The weaker growth outlook is for growth to ease to 0.7 percent per year, in the next 5 years, and 0.2 percent annually from 2005 to 2025.

Employment in this sector is expected to decrease over the entire forecast period. Historically, employment in this sector declined 1.7 percent annually, from close to 130,000 in 2000 to 119,000 jobs in 2005. Employment is projected to decline near 1.0 percent per year over the entire forecast, to just fewer than 100,000 workers by 2025.

The diversity in Washington State's agricultural industry can be found in both the variety of crops and in the differences between eastern and western Washington. The larger farms can be found on the east, those which produce grains, fruits, and vegetables. On the smaller farms of the west, production comes from dairy, poultry, and berries.²

Washington State's agricultural and food processing industries once greatly benefited from a number of advantages in location relative to Asian markets, as well as in lower energy (hydropower from dams) and water costs. Low energy and water costs, now with increased competition for water, seem to be a thing of the past. Increased competition from Asian producers has also hurt agriculture in the State. Washington State also has felt the strain of a lower supply of low-cost labor.¹

The forecast for freight demand in the Agriculture and Food Products industries can be found in Table 1. Truck has the highest mode percentage of all freight types and can expect the largest growth over the forecast period. Truckers hauled slightly more than 57 million tons, or slightly more than 60 percent, of all freight in 2004. Truck freight

² *Agricultural Lands – Introduction*, <http://www.mrsc.org/subject/planning/aglands.aspx>, April 2003, Municipal Research and Services Center of Washington, May 2006.

tonnage is forecast to grow 2.4 percent annually from 2004 to 2015 and 2.2 percent annually over the entire forecast to 2025.

More than 34 million tons of freight was shipped by carload rail service, nearly 36 percent of all freight tons. Carload rail also comprised 99 percent of all rail traffic tons. It is expected that rail carload demand will increase 1.2 percent per year to 2015 before easing to 0.7 percent per year growth from 2015 to 2025.

Air cargo represents the smallest percentage of all mode freight tonnage demand in 2004 and will continue to move the least tonnage over the forecast. Air accounted for only 143,754 tons, 0.2 percent of all freight demand in Washington State. This is not surprising, since air cargo shipments are usually the lowest weight, highest value of all shipments.

Table 1. Freight Demand Agriculture and Food Products

Tons	2004	2015	2025
Rail CL	34,000,324	38,666,050	41,318,807
Rail IMX	364,075	466,687	533,750
Truck	57,113,874	74,103,242	91,058,893
Water	3,507,853	4,013,971	4,458,500
Air	143,754	168,608	191,584
Compound Annual Growth Rate	CAGR '04-'15	CAGR '15-'25	CAGR '04-'25
Rail CL	1.2%	0.7%	0.9%
Rail IMX	2.3%	1.4%	1.8%
Truck	2.4%	2.1%	2.2%
Water	1.2%	1.1%	1.1%
Air	1.5%	1.3%	1.4%

■ Merchandise Trade and Retail Industries

The Merchandise Trade and Retail industry, comprised of the Wholesale Trade (NAICS 42) and Retail Trade (NAICS 44 and 45) industrial sectors, has been one of the faster growing sectors in Washington State. This sector accounted for nearly 30 percent of total sales for the State in 2005, and sales have grown 4 percent annually since 2000. We

expect growth to ease from historical levels, but still come in at a strong 3 percent per year over the next 5 years, and at a 3 percent compound annual growth rate over the forecast.

The merchandise trade and retail industry sector has experienced very little job growth since 2000 and the forecast projects little change. Employment in this sector grew only 0.3 percent annually from 2000 to 2005. It is expected that employment growth will average 0.2 percent per year over the entire forecast, adding only 16,000 workers by 2025.

It is expected that the growing significance of China as a producer of imports into Washington State and as a customer for U.S. exports through Washington State will continue. At the same time, traditional important overseas trade partners, such as Japan and South Korea, are losing share of trade through Washington State. By 2025, China will be the number one trade partner with Washington State. Measured in total tons of imports and exports moving by sea, China will represent a full one-third of total tonnage trade (imports and exports) with the Pacific Northwest. Japan's share will fall from 34 percent in 2000 to 18 percent by 2025. The low production costs and growing middle class in China, combined with increased openness to trade following China's accession to the World Trade Organization, have combined with source-country supply shifts by importers to greatly advance the importance of China to Washington State and the entire U.S. There are downward risks to this outlook for future trade in the event of political disruptions within China, or more rapid change in protectionist trade policies and investment patterns in other developing countries such as India. Risks to the forecast that could have the greatest impact on rail demand include increased protectionist policies that would dampen exports and imports or slower Gross Domestic Product growth that would reduce output and goods demand, and therefore demand for rail service to transport the goods.

The forecast for freight demand in the Merchandise Trade and Retail industries can be found in Table 2. Intermodal rail shipments accounted for more than one-half of all freight demand in the industries in 2004. Close to 5.7 million tons were shipped using rail. This was also more than three times the amount shipped by rail using carload. We expect that the forecast for intermodal rail will also be greatest of all surface modes of freight. Intermodal is estimated to grow at a 7.2 percent compound annually growth rate from 2004 to 2015, and at a 5.8 percent compound annual growth rate over the forecast period. More than 18 millions tons will be shipped via intermodal rail service in 2025.

Water transport had the second largest modal share of all freight demand in 2004 at 24 percent, carrying close to 2.4 million tons of freight. Truck freight is projected to have slower growth over the entire forecast period. It is expected that truck tonnage will grow 1.6 percent annually from 2004 to 2025. Compared with other transport modes, little tonnage, less than 0.01 percent all freight, was shipped by air.

Table 2. Freight Demand Merchandise Trade and Retail

Tons	2004	2015	2025
Rail CL	1,441,645	2,126,731	2,651,737
Rail IMX	5,692,699	12,203,593	18,721,500
Truck	411,581	518,981	572,765
Water	2,380,810	3,017,750	3,577,904
Air	572	706	825
Compound Annual Growth Rate	CAGR '04-'15	CAGR '15-'25	CAGR '04-'25
Rail CL	3.6%	2.2%	2.9%
Rail IMX	7.2%	4.4%	5.8%
Truck	2.1%	1.0%	1.6%
Water	2.2%	1.7%	2.0%
Air	1.9%	1.6%	1.8%

Through the Washington State container ports, intermodal rail traffic is expected to approach 6.4 million 20-foot equivalent units (TEUs) by 2025 compared with 2.8 million in 2005. Previous forecasts released by the ports themselves project volumes will reach 7.3 million TEUs by 2025. The very rapid growth in 2004 to 2005 container volumes at the port represents a reaction to congestion problems elsewhere along the Pacific Coast, most noticed in Southern California. These annual growth rates are not expected to continue. The forecast for Port of Seattle reflects an estimate of the shift in some traffic down to Port of Tacoma as expanded container terminals at Port of Tacoma (and consolidation within the steamship line industry) have resulted in some changes in vessel calling patterns.

The long-run growth in container volume continues for international traffic, with Port of Seattle, for example having volumes reach 3.7 million TEUs by the end of the forecast period. Port of Tacoma container volume is expected to grow from just over 1 million TEUs in 2004 to 2.7 million TEUs by 2025. As most of Washington State port container volume now and through the forecast period will be destined or originating outside of Washington State, much of the volume is subject to influences outside the State. This is confirmed by experience of the last decade, first with loss of market share to Southern California ports and recently with gains as the California gateway experienced capacity problems. Looking forward, the Ports will face new competition from Port of Vancouver, British Columbia, a new port being built specifically for North American inland container traffic at Prince Rupert, British Columbia and “all-water” services that use the Panama Canal. The Panama Canal has announced lock expansion plans that may significantly

expand the size of container ship that can use that routing which threatens a greater shift of Asian-U.S. trade towards East Coast ports.

Continued growth in rail service capacity for the container ports is critical to the forecast of volume, because the share of container trade handled through the ports that moves by rail is so high. Port rail service can be described as necessary, but not sufficient to realizing the forecast volumes. The national demand for international containerized freight handling, especially Asian trade, can be met through several alternatives, of which Washington State ports are only a part. Their recent dramatic volume growth is a reflection of the rail service advantage the ports have had providing this national gateway function. In the very long run, the container ports volumes will reflect the combination of their success in serving their functions as a gateway for the national market and as local ports serving just Washington State. The local function serving Washington State is mostly moved to and from the ports by truck, but it is the national demand from distribution center regions, such as around Chicago, Illinois, that are served by rail intermodal and for which there is greater competition and risk to the forecasts.

■ Manufacturing Industries

Manufacturing is another industry that is highly dependent on transportation. This sector requires substantial transportation of materials as inputs, as well as transportation of product shipments. Manufacturing companies in Washington State include industry leaders in electronic machinery, aerospace, and transportation equipment production. While total sales in this sector increased 1.6 percent annually since 2000, the forecast is for even faster growth. Sales are projected to increase three percent per year from 2005 to 2010 and slightly more, at 3.1 percent, over the entire forecast period. Output should reach more than \$142.8 billion in 2025.

Employment is expected to increase modestly, at 0.2 percent annually, in the short term to 2010. However, it is expected that employment will decrease by 0.5 percent annually over the forecast period resulting in a reduction from 206,653 jobs in 2005 to 188,393 workers by 2025. In 2000, there were more than 255,000 employees in the Manufacturing industry.

The forecast for freight demand in the Manufacturing industries can be found in Table 3. At more than 127.5 million tons, truck shipped 74 percent of all freight in this industry in 2004. Truck freight tonnage is projected to increase 2.4 percent per year over the entire forecast, and could reach 211.3 million tons by the end of the forecast in 2025.

Air freight is expected to have the highest growth rate of all modes of freight within the manufacturing industries, yet it had the smallest portion of all freight traffic at only 0.3 percent. Air freight is projected to increase 3.3 percent annually from 2004 to 2015 before increasing 5.0 percent annually from 2015 to 2025. By 2025, air freight should reach 1.2 million tons; more than double the 2004 tonnage.

Carload rail service accounted for close to 96 percent of all rail shipments in 2004. The tonnage shipped by carload will increase slightly over the forecast period as carload rail tonnage is expected to increase 1.8 percent annually from 2004 to 2025, while intermodal rail tonnage is expected to increase 1.4 percent annually over the same period.

Table 3. Freight Demand Manufacturing

Tons	2004	2015	2025
Rail CL	22,055,570	27,464,583	31,763,986
Rail IMX	968,993	1,141,191	1,287,847
Truck	127,537,415	165,385,205	211,315,473
Water	21,183,488	27,566,070	33,352,737
Air	531,830	761,797	1,237,047
Compound Annual Growth Rate	CAGR '04-'15	CAGR '15-'25	CAGR '04-'25
Rail CL	2.0%	1.5%	1.8%
Rail IMX	1.5%	1.2%	1.4%
Truck	2.4%	2.5%	2.4%
Water	2.4%	1.9%	2.2%
Air	3.3%	5.0%	4.1%

■ Lumber and Wood Products Industries

The Lumber and Wood Products industry has experienced increased competition from Canada and other foreign producers and it shows up in historical sales and employment figures. In fact, this sector has seen a decrease in sales from 2000 to 2005. Sales fell 2.3 percent annually over that time period and are projected to continue their decline. It is estimated that sales will fall at a 3.6 percent compound annual growth rate from 2005 to 2010 and will fall 1.2 percent over the entire forecast.

Employment has fallen further than sales figures and the outlook for jobs in this industry is for a decline faster than sales. Employment in the lumber and wood products industry decreased 5.6 percent annually from 2000 to 2005, from slightly more than 30,000 in 2000 to about 22,000 jobs in 2005. Employment is expected to continue to fall over the next

5 years by an average of 3.9 percent annually. Over the forecast period from 2005 to 2025, employment is estimated to decrease 1.7 percent annually.

Due to its location and available resources, Washington State is the largest exporter of wood products in the United States. Washington State had historically had a large share in many Asian markets, but Canada has begun to capture that business. Canada has become a viable competitor to Washington State in the Asian Markets due to lower wood costs, favorable exchange rates, and greater forest sector support from the Canadian government and forest products industry.³

While primary wood manufacturing still dominates the Lumber and Wood products industry in Washington State, growth in primary wood products (i.e., logging and lumber) has been falling. Secondary forest products (i.e., doors, windows, and furniture) have shown improvement with moderate growth and employment gains.

The forecast for freight demand in the Lumber and Wood Products industries can be found in Table 4. At close to 64 million tons, trucking carried 75 percent of all freight tonnage in this industry in 2004. It is expected that freight truck tonnage will decrease over the forecast. In fact, trucking tonnage should decline 0.2 percent from 2004 to 2015 and 0.6 percent per year over the entire forecast period.

Intermodal rail tonnage is also expected to decrease over the forecast at a faster rate than trucking. It is expected intermodal rail tonnage will fall 4.1 percent annually to 2015 and 3.6 percent annually over the entire forecast; losing more than one-half of its 2004 tonnage by 2025. Close to 99 percent of all rail freight came from carload, which is projected to increase at a 1.4 percent compound annual growth rate to 2025.

Waterborne freight tonnage will be essentially flat through 2015 and can expect to increase 0.7 percent through 2025 in the lumber and wood products category. There were 5.58 million tons of freight shipped by water in 2004. It is estimated that waterborne shipments will increase to 6.46 million tons by 2025.

³ *Export Trends and the Health of the Pacific Northwest Forest Sector*, http://www.cintrafor.org/research_tab/links/Fs/FS41.htm, February 2000, Center for International trade in Forest Products, May 2006.

Table 4. Freight Demand Lumber and Wood Products Industries

Tons	2004	2015	2025
Rail CL	15,620,107	17,889,021	21,094,803
Rail IMX	206,510	129,776	95,056
Truck	63,943,258	59,960,596	61,666,824
Water	5,577,740	5,581,661	6,459,899
Air	2,956	3,693	4,511
Compound Annual Growth Rate	CAGR '04-'15	CAGR '15-'25	CAGR '04-'25
Rail CL	1.2%	1.7%	1.4%
Rail IMX	-4.1%	-3.1%	-3.6%
Truck	-0.6%	0.3%	-2.0%
Water	0.0%	1.5%	0.7%
Air	2.0%	2.0%	2.0%

■ Municipal Solid Waste Industry

In 2000, total sales in the Municipal Solid Waste Industry topped \$17.1 billion. This value increased to more than \$20.5 billion by 2005 as the industry sustained a 3.7 percent annual growth rate. Over the next 5 years, the industry can expect higher growth, increasing to 4.3 percent annually to 2010. The projection is for a 2.2 percent compound annual growth rate over the entire forecast period.

Employment in the industry also has seen a large historical increase. Since 2000, employment increased 2.1 percent per year, from close to 303,000 to more than 336,000 employees. Growth is projected to ease to 1.0 percent annually in the next 5 years and average 1.1 percent per year over the entire forecast.

Forecast tonnage is expected to increase slower than increases in revenues to this sector, averaging 1.1 percent per year over the forecast period.

Shipments of MSW, measured in tons, should continue to increase generally in line with population growth as they are directly correlated. The future trend in the geographic distribution of Washington State MSW is for it to continue to be shipped away from the

concentrated generation areas of the population centers around urban areas towards rural areas with permitted landfills.

■ **Military**

Employment in the Military in Washington State reached more than 70,175 in 2005. This was only an increase of 300 in military employment, with growth being a weak 0.1 percent annually since 2000. Growth should pick up slightly to 0.8 percent per year from 2005 to 2010, but increase only 0.2 percent annually over the entire forecast, with much of that growth coming in the next 5 years.

Military sector sales were strong growing at a 4.5 percent compound annual growth rate since 2000. Growth will slow to 2.0 percent per year from 2005 to 2010, and to only 0.6 percent per year over the forecast period.

Shipments in the military sector are of two kinds: one related to ongoing transport of materiel to military bases and the other being actual deployment and deployment exercises, primarily to and from gateways for international deployment, such as to and from Fort Lewis.

Though difficult to project from an economic modeling context, it is assumed that there are no significant base closures or force size changes in the State, and that related freight tonnage will grow slowly at 0.2 percent annually over the entire forecast period to 2025.

■ **Overall Transportation Demand Growth for Washington State Industries**

The expected growth in transportation demand for Washington State for the four primary sectors discussed above is summarized in Table 5 below. As noted previously, these sectors account for over 90 percent of all traffic handled in 2004, and are expected to remain equally as dominant in 2025.

At 69 percent of all tons handled, the various forms of motor carriage have been and are expected to handle the bulk of goods movement in Washington during the forecast period. The picture for rail is different. Whereas, the proportion of traffic handled by carload service is expected to decline from 20 percent to 18 percent, intermodal will double from 2 percent to 4 percent between 2004 and 2025. Waterway traffic will remain static at 9 percent of the total market, while air cargo is expected to experience the greatest proportional increase from 0.2 percent to 0.3 percent of the total market. Although air cargo includes some of the highest value goods on a tonnage basis, its impact will continue to be very modest.

Table 5. Modal Transportation Forecast

Tons	2004	2015	2025
Rail CL	73,117,646	86,146,384	96,829,332
Rail IMX	7,232,278	13,941,246	20,638,153
Truck	249,006,128	299,968,023	364,613,955
Water	32,649,891	40,179,451	47,849,040
Air	679,113	934,805	1,433,967
	CAGR '04-'15	CAGR '15-'25	CAGR '04-'25
Rail CL	1.5%	1.2%	1.3%
Rail IMX	6.1%	4.0%	5.1%
Truck	1.7%	2.0%	1.8%
Water	1.9%	1.8%	1.8%
Air	2.9%	4.4%	3.6%

It is important to note that the modal volume calculations assume that the competitive positions among the various modes remain unchanged during the forecast period. Changes in mode share purely arise from shifts in commodity mix that might occur as a result of varying growth rates among the various sectors, each of which produce goods with differing characteristics and logistics requirements that in turn affect mode choice.

■ Rail Traffic Forecast

Forecast data for the years 2015 and 2025 was created by routing the rail traffic and other modes across the respective modal networks. The carload and IMX forecast synthesizes economic growth conditions and trend projections, making adjustments and extensions where appropriate, to bracket the most likely growth rates and freight forecasts for Washington State. The resulting forecast projects the long-term growth through 2025.

Figures 1 and 2 depict the geographical distribution by district of originated and terminated tonnage in 2025. The Seattle, Washington BEA continues to have the highest originating and terminating tonnage over the long forecast. Seattle will take advantage of the large import/export industry. In 2025, the Portland Oregon BEA will also remain the second highest terminating tonnage, attributable to the Port of Vancouver.

Figure 1. Washington Rail Traffic Origins by District in 2025

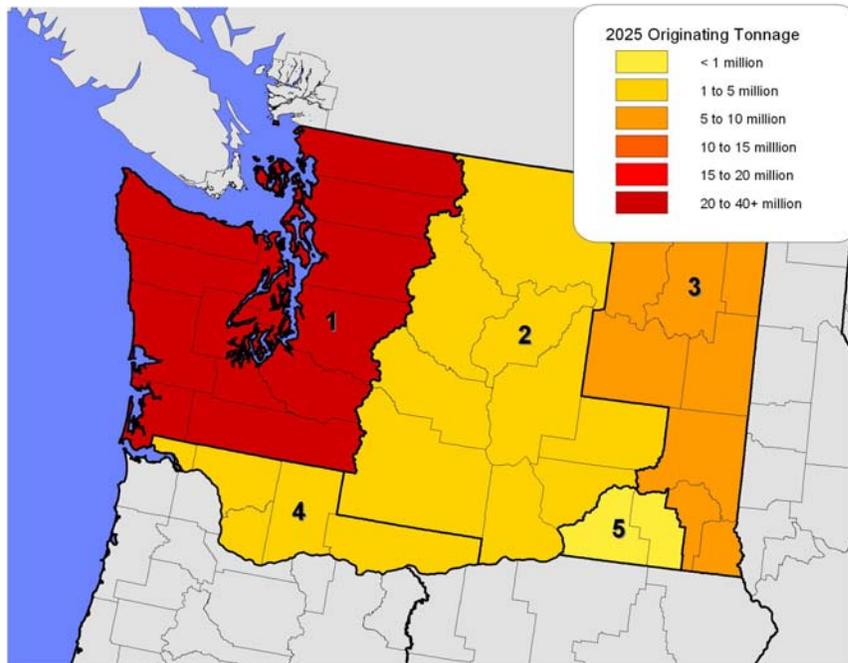
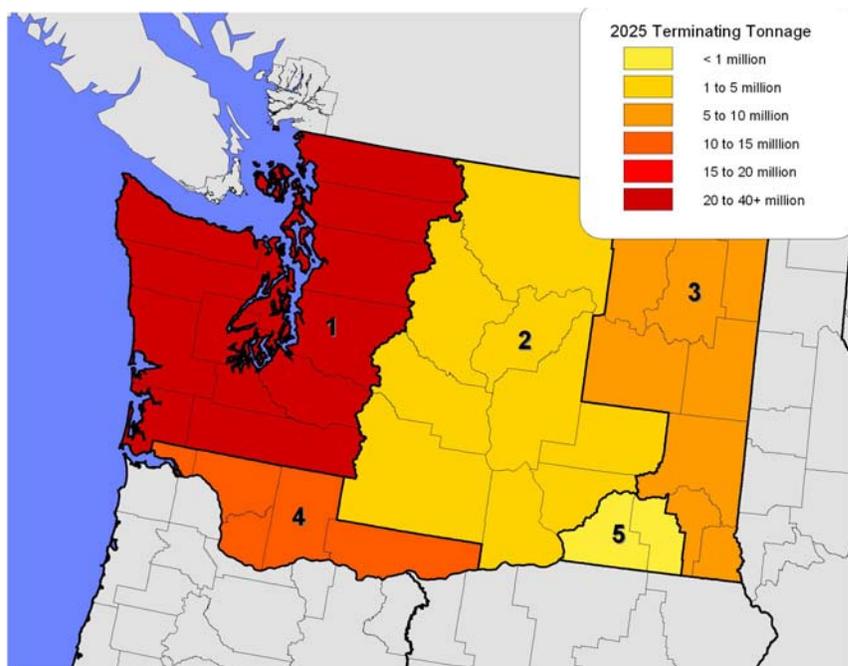


Figure 2. Washington Rail Traffic Termination by District in 2025



Figures 3 and 4 show the national perspective of carload traffic volumes in annual tons in 2004 compared to 2025. These maps show the carload tons increasing in volume close to the Washington state area and along the Mississippi river region over the long term.

Figure 3. Carload Traffic Volumes in Annual Tons
National Perspective: 2004

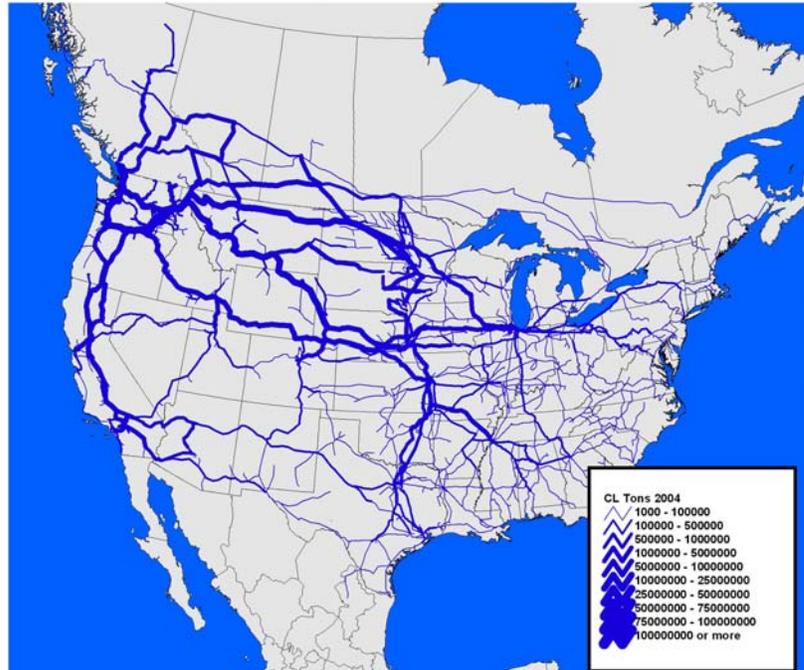
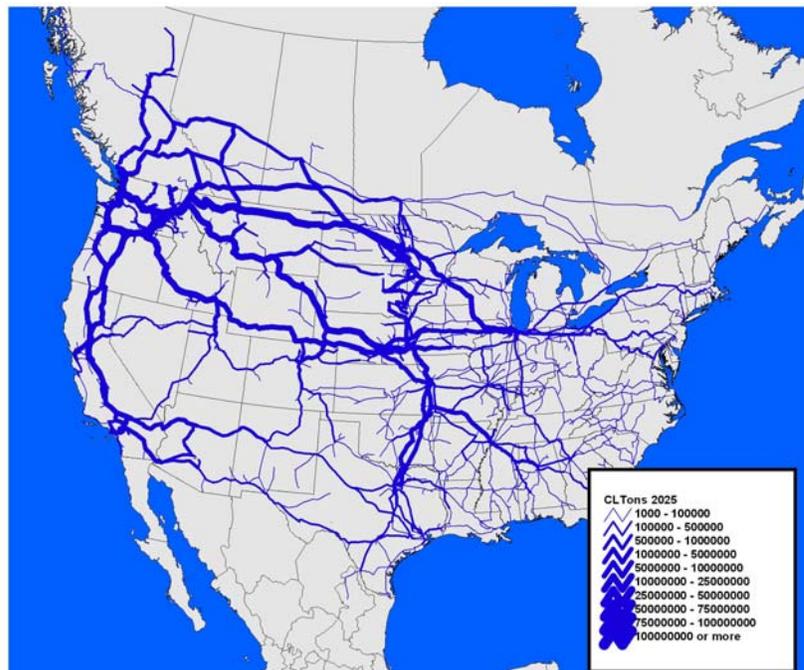


Figure 4. Carload Traffic Volumes in Annual Tons
National Perspective: 2025

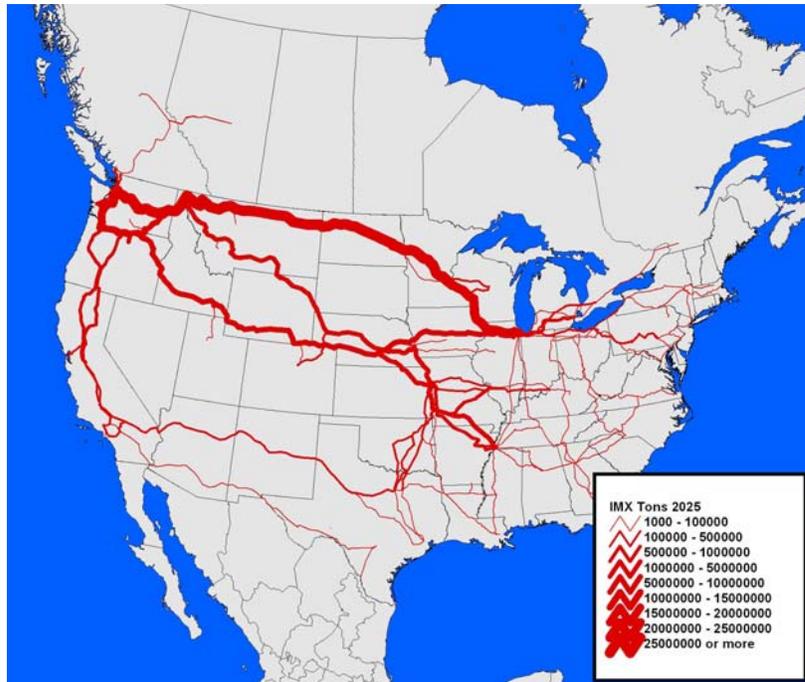


Perhaps more interesting is the national perspective of intermodal traffic volumes in annual tons in 2004 compared to 2025, shown in Figures 5 and 6. These maps easily show the intermodal tons increasing in volume. The flow of traffic that will expand the most is between Washington State and Chicago, with traffic linking to the eastern seaboard. The Washington and California routes will also experience an increase in tons, with traffic extending to Texas and the southern region of the U.S.

Figure 5. Intermodal Traffic Volumes in Annual Tons
National Perspective: 2004



Figure 6. Intermodal Traffic Volumes in Annual Tons
National Perspective: 2025



■ Domestic Forecast

Washington State's freight railroads can expect continued growth over the next 10 and 20 years. The railroads are expected to move more than 103.5 million domestic tons of freight in 2015, up from 81.5 million in 2004, a 2.2 percent compound annual growth rate. In 2025, it is projected that there will be close to 129.5 million tons moved, a 2.3 percent annual growth over the 10 years from 2015 to 2025, and a steady 2.2 percent growth rate over the 21 years between 2004 and 2025. Figure 7 and Table 6 show the growth of rail tonnage in the forecast years. While local and inbound traffic continue to grow, they will slow to slightly lower levels of growth from 2015 to 2025 compared to 2004 to 2015 growth levels. Outbound and through traffic will both grow at higher rates in the more distant future as compared to the next 10 years.

Figure 7. Rail Tonnage Forecast

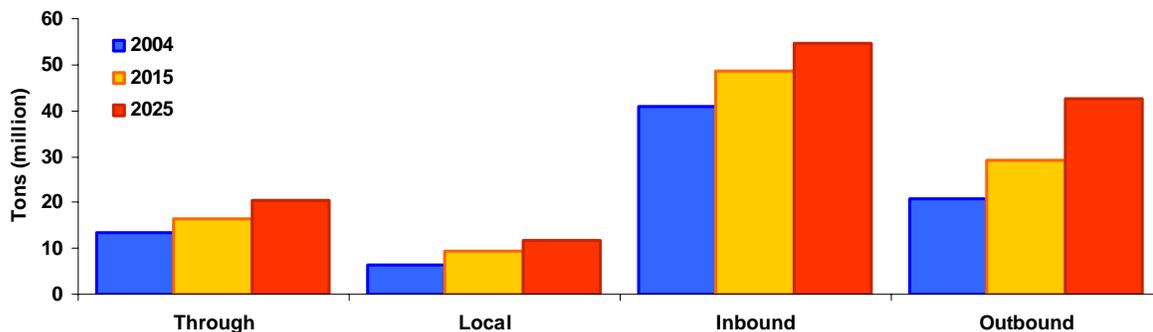
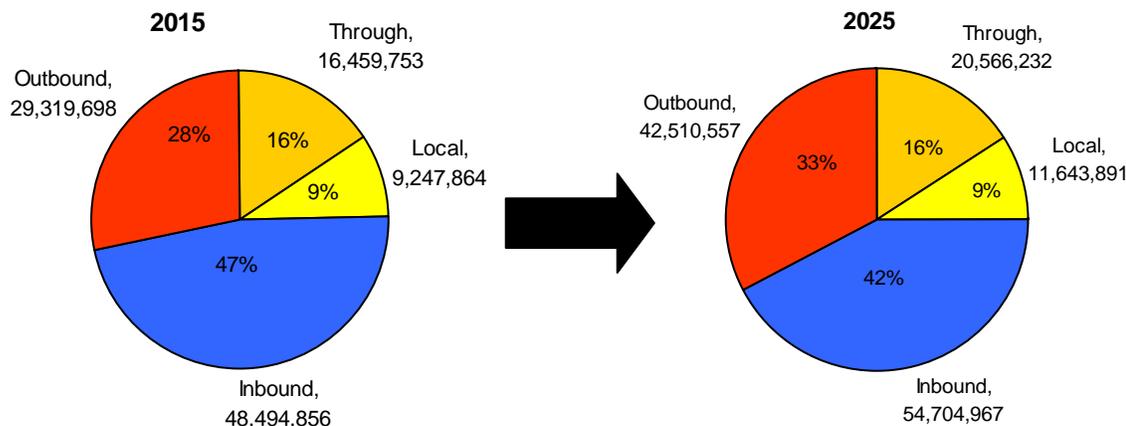


Table 6. Growth of Rail Tonnage

Class	Rail Tonnage			Compound Annual Growth Rates		
	2004	2015	2025	2004-2015	2015-2025	2004-2025
Through	13,385,771	16,459,753	20,566,232	1.9%	2.3%	2.1%
Local	6,465,985	9,247,864	11,643,891	3.3%	2.3%	2.8%
Inbound	40,974,496	48,494,856	54,704,967	1.5%	1.2%	1.4%
Outbound	20,700,013	29,319,698	42,510,557	3.2%	3.8%	3.5%
Total	81,526,264	103,522,170	129,425,647	2.2%	2.3%	2.2%

Figure 8 shows the distribution of the inbound, outbound, through, and local shares of Washington State’s total freight rail tonnage for both forecast years of 2015 and 2025. Of all shares, outbound traffic continues to grow the most between 2015 and 2025, growing from 26 percent to 28 percent between 2004 and 2015, and expanding to 42.5 million tons – a 33 percent share of freight rail transportation in 2025. Local and through traffic will continue to maintain approximately 9 percent and 16 percent of the tonnage, respectively, over the next 10 and 20 years. Inbound traffic will encompass a smaller percent of the traffic as it will claim 47 percent of the tonnage in 2015 and only 42 percent in 2025.

Figure 8. Rail Freight Distribution



The difference in units moved versus tons moved by carload and intermodal shipments will continue to be significant, as illustrated in Table 7. Though the share of intermodal tons will continue to increase, up from 24 percent in 2004 to 40 percent in 2025, tonnage from carload traffic is expected to continue to dominate.

Local carload traffic will only grow at 0.3 percent over 11 years between 2004 to 2015 before experiencing a decline in growth of -1.0 percent over the next 10 years between 2015 and 2025. Inbound, outbound, and through carload traffic will all continue to increase at higher levels over the long term than over the short term. Total carload traffic will grow to 77.8 million tons, a compound annual growth rate of 1.1 percent between 2004 and 2025. Intermodal traffic will enjoy higher levels of growth, up to 51 million in 2005, a 4.6 percent compound annual growth rate between 2004 and 2025. While inbound traffic enjoys the largest share of carload traffic, outbound traffic benefits from the largest share of intermodal traffic.

Figures 9 and 10 depict the growth of carload and intermodal units by share type. Mirroring tonnage, inbound traffic enjoys higher levels the majority of the carload units, while intermodal units are more evenly distributed between in and outbound traffic, with outbound growing at slightly faster levels.

The distribution of traffic tonnage by commodity through the forecast years is shown in Figure 11. Farm products continue to be a significant tonnage commodity group, growing to more than 31.6 million tons in 2025, up from 28.3 in 2004. Not surprisingly, the fastest growing commodity will be miscellaneous mixed shipments, primarily in the form of imports, increasing from 12.2 million tons in 2004 to 30.9 million in 2015 and 31.7 million in 2025. This amounts to a 4.9 percent compound annual growth rate between 2004 and 2025.

Table 7. Carload and Intermodal Tons

Carload	Rail Tonnage			Compound Annual Growth Rates		
	2004	2015	2025	2004-2015	2015-2025	2004-2025
Carload						
Inbound	34,629,512	38,677,815	39,968,874	1.0%	0.3%	0.7%
Outbound	12,196,589	15,204,925	19,585,606	2.0%	2.6%	2.3%
Local	4,095,163	4,217,045	3,812,858	0.3%	-1.0%	-0.3%
Through	10,565,393	12,380,634	14,518,630	1.5%	1.6%	1.5%
Total	61,486,656	70,480,419	77,885,969	1.2%	1.0%	1.1%
Intermodal						
Inbound	6,344,984	9,817,040	14,736,093	4.0%	4.1%	4.1%
Outbound	8,503,424	14,114,772	22,924,951	4.7%	5.0%	4.8%
Local	2,370,822	5,030,820	7,831,033	7.1%	4.5%	5.9%
Through	2,475,116	3,670,511	5,592,176	3.6%	4.3%	4.0%
Total	19,694,346	32,633,143	51,084,252	4.7%	4.6%	4.6%

Figure 9. Carload Units Forecast

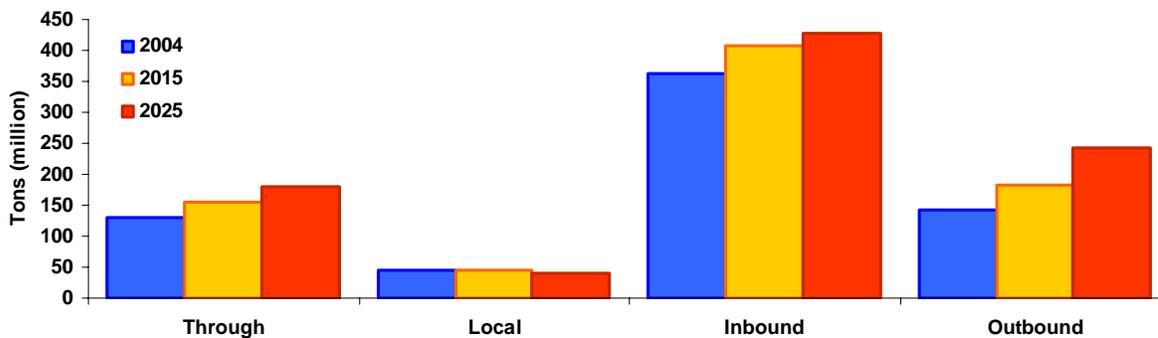


Figure 10. Intermodal Units Forecast

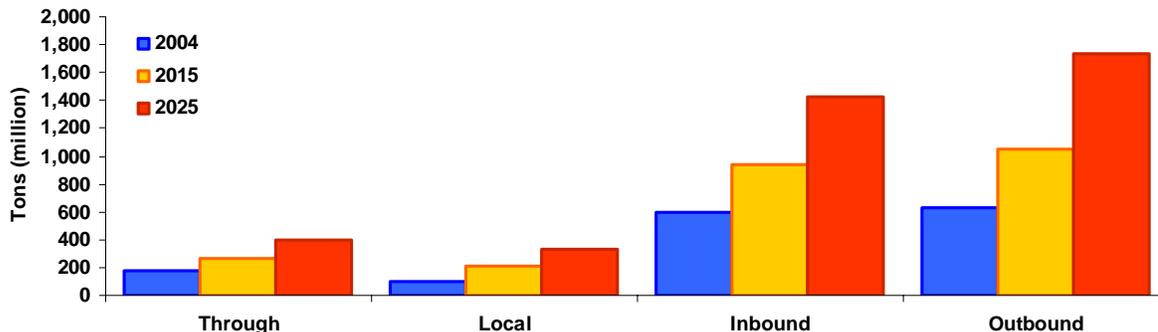
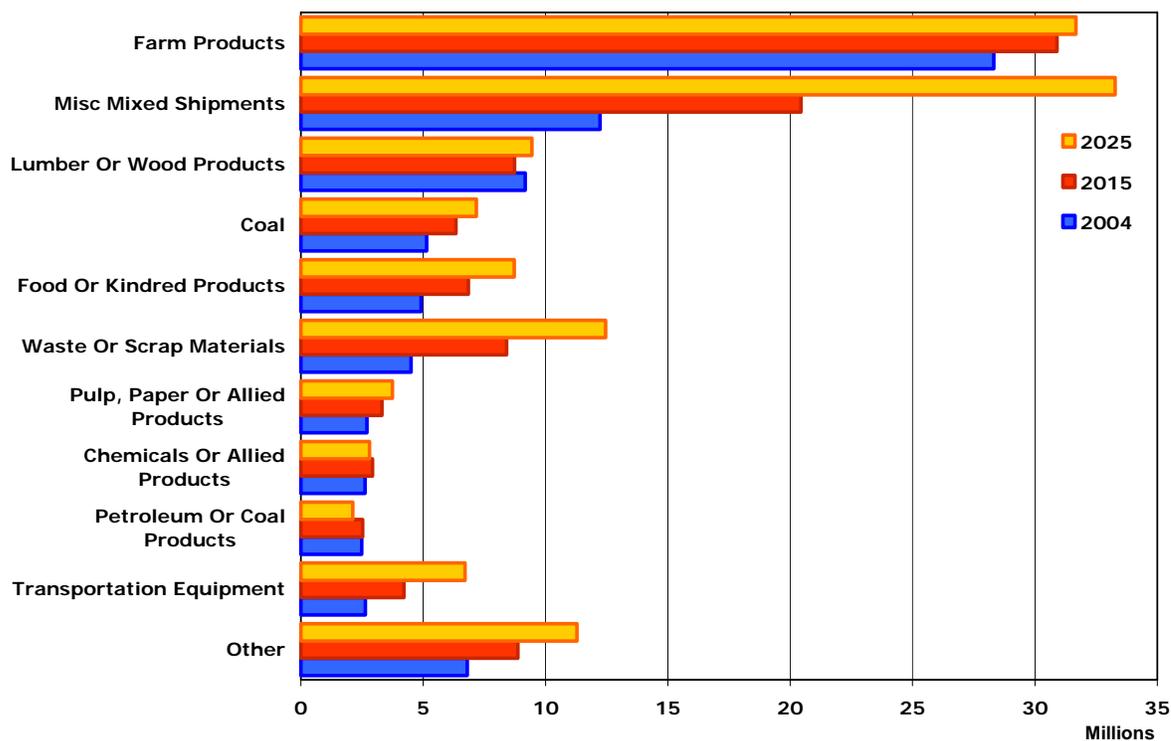
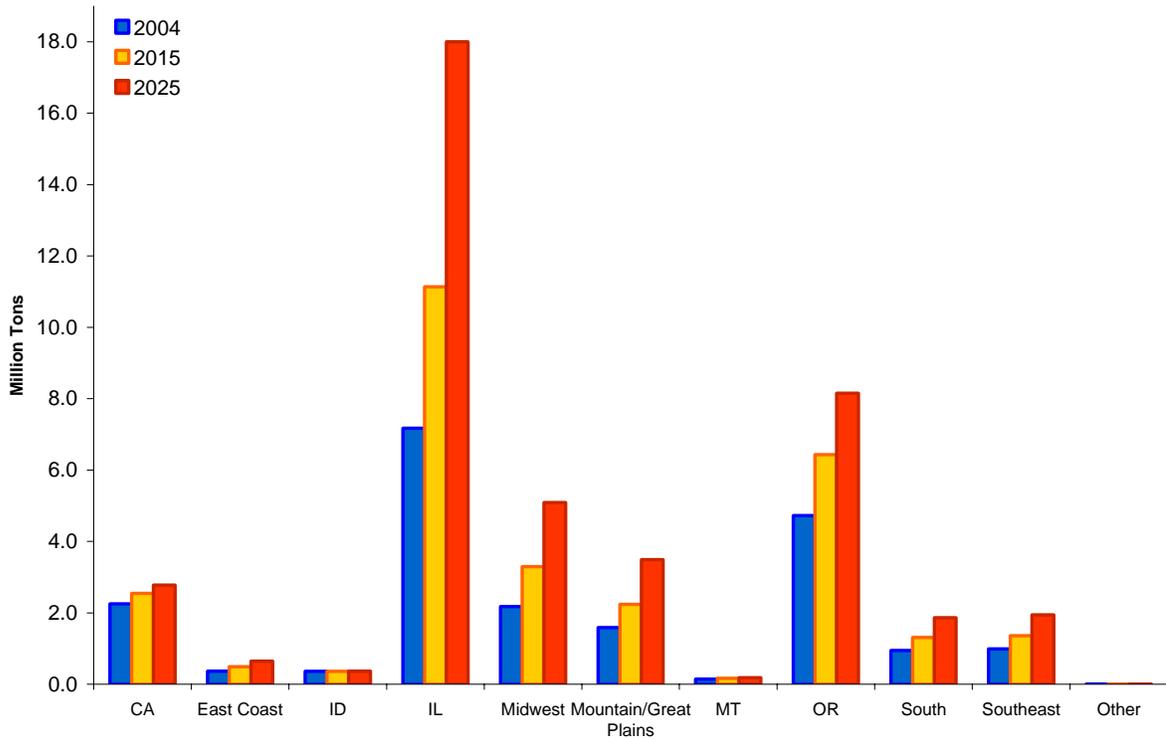


Figure 11. Washington Rail Tonnage Commodity Distribution Forecast



Illinois is the most prominent terminating region of commodities from Washington State with close to 18 million outbound tons in 2025, up from 11 million in 2015, a 4.9 percent compound annual growth rate over the 10 long-term forecast years (Figure 12).

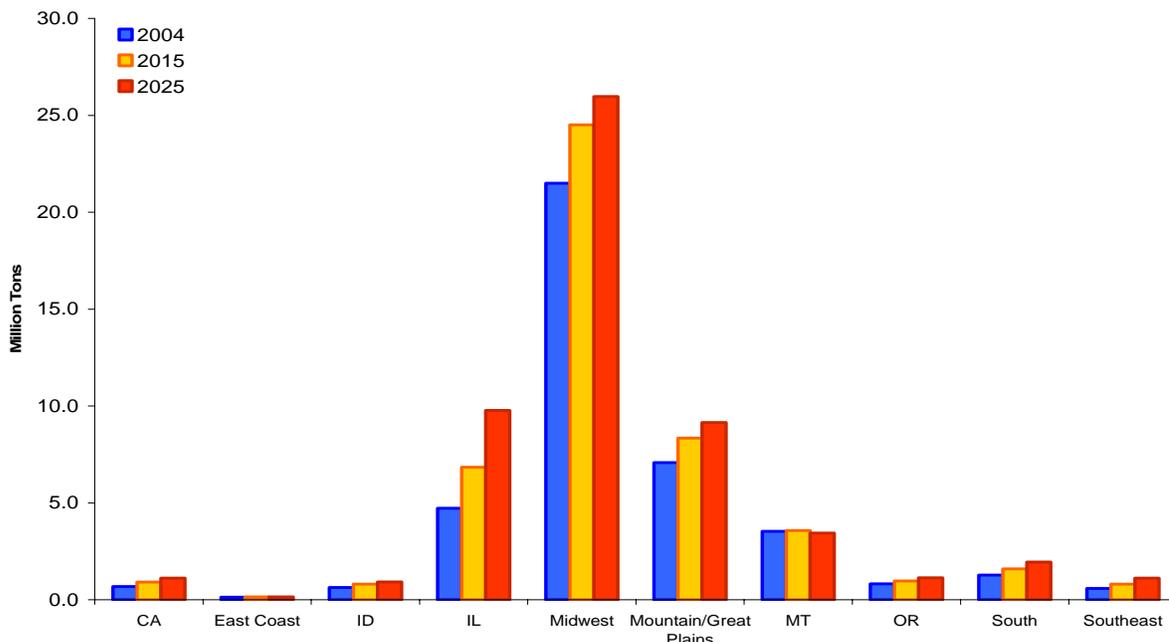
Figure 12. Outbound Washington Rail Tonnage by Termination Region



As expected, farm products remain the most important inbound rail commodity over the forecast period, as it creates the highest inbound tonnage to Washington State with 23.1 million tons in 2004, 24.8 million in 2015, and 24.3 million in 2025. Miscellaneous mixed shipments, coal, food, and chemicals industries are all top inbound commodities over the forecast horizon. While some commodities shift slightly in rank, there are no industries which change significantly in rank.

The Midwest is the most prominent region of inbound commodities to Washington State with close to 26 million outbound tons in 2025, up from 24.5 million in 2015, a modest 0.6 percent compound annual growth rate over the 10 long-term forecast years (Figure 13).

Figure 13. Inbound Washington Rail Tonnage by Origin Region

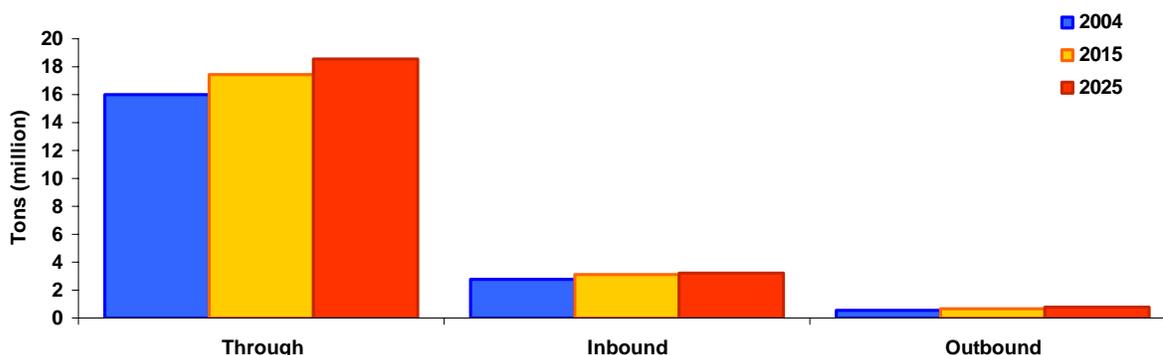


■ **North American Cross-Border Forecast**

More than 18.5 million tons of freight is 2025 cross-border traffic, primarily with Canada. This is an increase from 21.3 million in 2015, a 0.6 percent growth rate between 2015 and 2025, and a 0.7 percent annual increase in the 21 years between 2004 and 2025 (Table 8 and Figure 14). Through traffic represents the majority of cross-border traffic at 18.5 million tons in 2025. An additional 3.2 million tons are inbound traffic, and 0.8 million tons are outbound traffic.

Table 8. Cross-Border Tonnage Forecast by Traffic Type

Class	Rail Tonnage			Compound Annual Growth Rates		
	2004	2015	2025	2004-2015	2015-2025	2004-2025
Through	15,981,439	17,461,745	18,507,192	0.8%	0.6%	0.7%
Inbound	2,797,538	3,111,580	3,220,985	1.0%	0.3%	0.7%
Outbound	574,628	692,291	766,690	1.7%	1.0%	1.4%
Total	19,353,605	21,265,617	22,494,867	0.9%	0.6%	0.7%

Figure 14. Cross-Border Tonnage Forecast

The shifting prominence of rail tonnage of the top origin and destination lanes for Washington's international rail freight traffic over the forecast period are shown in Table 9. The origin destination pairs show British Columbia, Saskatchewan, Alberta, Oregon, and California as the regions creating the highest rail tonnage.

Table 9. Shift of Top Origin Destination Pairs

Origin State	Destination State	Rail Tonnage		
		2004	2015	2025
British Columbia	Oregon	3,322,411	3,518,435	3,902,518
Saskatchewan	Oregon	2,085,816	2,288,856	2,160,844
Alberta	California	1,549,924	1,771,485	1,925,419
Alberta	Washington	1,366,520	1,449,986	1,372,822
British Columbia	Washington	1,059,765	1,244,898	1,426,738
British Columbia	California	981,214	1,002,640	1,066,933
British Columbia	Arizona	654,364	623,882	657,242
Montana	British Columbia	636,539	788,544	903,886
British Columbia	British Columbia	606,555	785,155	770,748
Alberta	Oregon	568,024	653,524	668,689
British Columbia	Texas	514,288	490,331	514,306
British Columbia	Illinois	368,078	376,585	399,887
British Columbia	Nevada	309,338	317,924	334,835
Oregon	British Columbia	292,890	355,297	407,171
Alberta	Idaho	260,107	288,796	287,807
Saskatchewan	Washington	248,343	265,910	250,003
British Columbia	Colorado	227,788	233,811	248,316
British Columbia	Missouri	227,124	217,404	228,040
California	British Columbia	196,730	208,222	182,288
Saskatchewan	California	190,010	221,952	246,647

■ Conclusions

With an expected compound annual growth rate of 2.2 percent in overall freight volumes through 2025, Washington's transportation network will be expected to handle almost 60 percent more freight traffic than in 2004. This substantial increase will be absorbed across all modes, of which motor freight accounts for 68 percent and the rail sector accounts for approximately 22 percent of all tonnage. Capacity demands for both modes will be substantial; however, given the long-haul nature of most rail traffic, the impact on Washington State's rail network may well be disproportionate, as capacity will be consumed on larger sections of the network than will be the case for the highway and waterway modes.

Between 2004 and 2025, the relative ranking of the four key economic sectors will remain unchanged. However, growth will disproportionately affect the manufacturing and merchandise/retail trade sectors, with the agricultural and forest products sectors experiencing slower growth. These expected trends are not surprising, and are consistent with general economic trends in other regions of the United States. Interestingly, the impact of international trade on the region is disproportionate, both in terms of the rapid growth in Asian goods coming into the ports of Seattle and Tacoma, and also as exports. These exports underpin a high-technology economy that is distinctive, and which is expected to continue to grow at a healthy rate. A key prerequisite to supporting this growth rate will be the continued availability of a high-quality goods movement system.