Washington State Department of Transportation

Washington State Freight Mobility Plan

Task 2: Interim Data Report

January 2014

Freight Systems Division

Contents

List of Exhibits

Executive Summary

Overview

The three components of Washington State's freight system are:

- Global Gateways – International and National Trade Flows Through Washington.
- Made in Washington – Regional Economies Rely on the Freight System.
- Delivering Goods to You – The Retail and Wholesale Distribution System.

These components underpin our national and state economies, support national defense, directly sustain hundreds of thousands of jobs, and distribute the necessities of life to every resident of the state every day.

First, Washington is a gateway state, connecting Asian trade flows to the U.S. economy, Alaska to the Lower 48, and Canada to the U.S. West Coast. More than 95 percent of U.S. cargo imports arrive by ship. West Coast ports, including Seattle/Tacoma, accounted for 75 percent of Asian imports. These imports are then connected to the U.S. intermodal system and are able to arrive at the U.S. East Coast in about 18 days start to finish. As the Panama Canal expansion project draws to completion in 2014, efficient intermodal movement of imports from the ports of Washington will become ever more vital to maintaining Washington's competiveness.[1]

Second, our own state's manufacturers and farmers rely on the freight system to ship Washington-made products to local customers, to the big U.S. markets in California and on the East Coast, and worldwide. Washington's producers generate wealth and jobs in every region in the state.

Finally, Washington's distribution system is a fundamental local utility, since without it our citizens would have nothing to eat, nothing to wear, nothing to read, no spare parts, no fuel for their cars, and no heat for their homes. In other words, the economy of the region would no longer function.

The value and volume of goods moving in these freight systems is vast and growing.

What is the Purpose of the Washington State Freight Mobility Plan Data Report?

This report updates the freight network description and statistics found in the 2008 WTP Freight Report. It is organized in three chapters that explain Washington's role as a gateway state, how freight transport supports Washington's regional economies, and the role of the local distribution system. It defines terms to create a common vocabulary, and summarizes data from state and federal freight studies relevant to Washington.

[1] USDA-AMS. *Impact of Panama Canal Expansion on the U.S. Intermodal System.(January 2010).* Retrieved as of December 2011 from: http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5082003 .

Global Gateways: International and National Trade Flows Through Washington

Washington State is a global gateway to the Pacific Rim, Canada, and Alaska. The state's strategic location positions it as an important and growing gateway for trade access to Alaska; producers, suppliers and markets in Washington, Oregon, and California; and as a key transportation hub for Asian and Canadian trade. Washington's transportation system functions as an interconnected network of gateways and transportation corridors – inland barge, seaports, airports, borders, rail, and highway systems – that provide access to markets, create jobs and economic growth, and link business, government, and economic activities together locally, nationally, and internationally.

This chapter of the freight discussion focuses on markets and supply chains, including the gateways and corridors that support freight moving through Washington State. The economic impacts of this system are integrally related to exports produced in Washington and imports that become part of Washington's retail and wholesale distribution system.

This section is organized into three major parts:

- **The importance of trade in Washington's economy**
- **East-West trade,** including containers traveling from Asia to Chicago, agriculture from the Midwest to Asia, and military transport.
- **North-South trade**, including Canadian and North American Free Trade Agreement (NAFTA) related trade, freight along the West Coast, Alaskan freight movement.

The Importance of Trade in Washington's Economy

International and national freight movements in Washington State create and support thousands of state jobs. The business and employment benefits derived from the state's freight system have been documented through numerous sources:

International Trade Increases the Number of State Jobs

As the fifth largest exporting state in the country, behind only Texas, California, Florida and New York, a significant amount of Washington State jobs are linked to international trade. The $65 billion in commodity exports activity and $24 billion in service exports supported 185,123 jobs in 2012. About 86% of these jobs are in the manufacturing sector and 13 percent is in agriculture.[2]

Jobs Created by Local Seaports

Economic impact studies prepared by Martin and Associates for the Port of Seattle shows 21,695 direct jobs generated by the port's seaport activities in 2007[3]; the Port of Tacoma's economic impact analysis reports 9,370 direct jobs in 2004[4], a value that has held relatively constant in light of the economic recession of the past several years[5]; the Port of Vancouver's estimates about 2,300 direct jobs in 2010[6]; and other seaports in the state support a significant number of direct jobs, as well as indirect and induced jobs created by

[2] U.S. Chamber of Commerce. *Trade Supports Jobs: Washington.* Retrieved as of August 2013 from: http://www.tradesupportsjobs.com/state/WA

[3] Martin Associates. *The 2007 Economic Impact of the Port of Seattle.* (February 2009). Prepared for the Port of Seattle.

[4] Martin Associates. *2004 Economic Impacts of the Port of Tacoma.* (July 2005). Prepared for the Port of Tacoma.

[5] Anderson, Megan, "Port of Tacoma Employment Numbers," e-mail message, August 11, 2011.

[6] Brooks, Katy, "POV Jobs Impact Inquiry," e-mail message, August 8, 2011.

seaport activities.

Railroads and Interstate Trucking Employment

The BNSF Railway Company employed 3,514 people[7] and the Union Pacific Railroad (UP) employed 342 in Washington in 2012[8], generating in excess of $274 million in combined wages.

Interstate Trucking companies are also a source of employment in Washington. In 2011 there were 803 long-distance, freight trucking firms in the state, employing 12,477 people and generating $534.2 million in wages.[9]

Washington's Role in International Trade

International merchandise trade through our state is not just important for generating Washington jobs, it also supports the larger U.S. economy. Imports support U.S. manufacturers and provide goods to consumers. Agricultural exports support family farms throughout the Pacific Northwest and Midwest.

In 2012, 4.9 percent of total U.S. exports and 2.1 percent of total U.S. imports transited through Washington's gateways.[10] As shown in Exhibit 1, Washington gateways rank high in the U.S. by value.

Exhibit 1: Washington's Rank in the Top U.S. International Freight Gateways in 2011
By Value in Billion $

Gateway	Mode	Rank	Exports	Imports	Total
Los Angeles, CA	Waterborne	1	44.2	170.4	214.6
Seattle, WA	Waterborne	23	14.0	29.2	43.1
Tacoma, WA	Waterborne	27	6.5	28.3	34.7
Blaine, WA	Land	47	12.1	6.8	18.9

United States Department of Transportation, Bureau of Transportation Statistics. *National Transportation Statistics, 2013.* "Table 1-51" Retrieved as of August 2013 from: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_51.html

Washington and Major U.S. Trading Partners

In 2012, $123.2 billion in U.S. international trade entered or exited through Washington—$675.6 billion in exports, of which $36.7 billion was related to aircraft[11], and $47.6 billion in imports[12]. As shown in Exhibit

[7] BNSF. Washington: A Crucial Gateway for International Trade. (April 2013). Retrieved as of August 2013 from http://www.leg.wa.gov/JTC/Meetings/Documents/Agendas/2013%20Agendas/July24/BNSF_Handout.pdf
[8] Union Pacific, *Union Pacific in Washington 2012 Fast Facts*, Retrieved as of August 2013 from: http://www.up.com/cs/groups/public/documents/up_pdf_nativedocs/pdf_washington_usguide.pdf
[9] U.S. Census Bureau. *2011 County Business Patterns (NAICS): Washington State by Industry Code*. Retrieved as of 2013 from: http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl. Industry code 48412, "General freight trucking, long-distance."
[10] United States Census Bureau, Foreign Trade Division. 2012 Washington State Exports and 2012 Washington State Imports. Retrieved as of August 2013 from http://www.census.gov/foreign-trade/statistics/state/data/index.html
[11] U.S. Census Bureau, Foreign Trade Division. *Total U.S. Exports (Origin of Movement) via Washington.* Retrieved as of 2013 from: http://www.census.gov/foreign-trade/statistics/state/data/wa.html#ctry

2, important U.S. trading partners are linked to the U.S. economy through Washington. China, Canada, and Japan were the top three international trading partners for goods moving through Washington in 2012; trade with these three countries together constitutes about 42 percent of exports through Washington and over 60 percent of imports to Washington. Other key trade partners include South Korea, Taiwan, Mexico, the United Kingdom, and Germany which together comprise an additional 14.8 percent of international trade value.

Exhibit 2: Value of International Trade of Goods by Country through Washington
2012 by Value

Country	Billion $	Share of WA Total Trade	Share of U.S. trade with Country
China	$22,621	18.4%	14.0%
Canada	$22,201	18.0%	16.1%
Japan	$15,168	12.3%	5.7%
Korea, South	$5,576	4.5%	2.6%
Taiwan	$3,463	2.8%	1.7%
Mexico	$3,420	2.8%	12.9%
United Kingdom	$3,153	2.6%	2.9%
Germany	$2,683	2.2%	4.1%
France	$2,574	2.1%	1.9%
Australia	$2,392	1.9%	1.1%
Other	$39,972	32.4%	37.0%
China	$22,621	18.4%	14.0%
Canada	$22,201	18.0%	16.1%
Japan	$15,168	12.3%	5.7%
Korea, South	$5,576	4.5%	2.6%
Total	**123,223**	**100%**	**100%**

Total Value of U.S. trade (Seasonally Adjusted) in 2012 = $3,821.03 billion (Exports = $2,275.32; Imports = $1,545.71). Retrieved as of August 2013 from: http://www.census.gov/foreign-trade/balance/c0004.html

Trade Continues to Grow – Worldwide and in Washington

Since 1950 world trade has grown faster than the average annual world Gross Domestic Product (GDP)—in the last 30 years, it has generally grown at an even faster pace. As shown in Exhibit 3, the value of total U.S. international trade more than tripled from 1980 to the peak year of 2008, while the value of total international trade for Washington State doubled. Despite 2009 drop-offs to near 2005 levels, Washington State's international trade value increased 36% from 2009 to 2012.

By value, Asia is the largest importer and exporter of merchandise to and from the U.S., comprising almost 28 percent of U.S. exports and over 38 percent of U.S. imports in 2012.[13] In contrast, 30 years

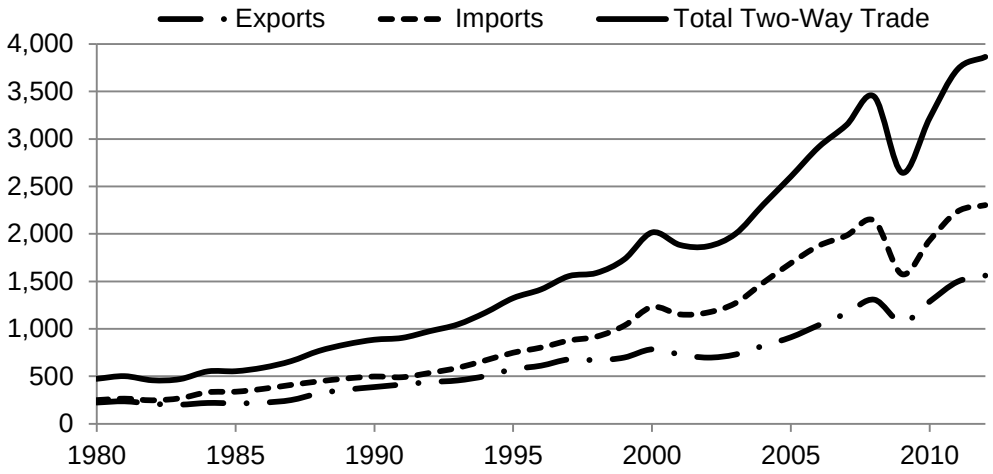
[12] U.S. Census Bureau, Foreign Trade Division. *Total U.S. Imports (Origin of Movement) via Washington*. Retrieved as of 2013 from:
http://www.census.gov/foreign-trade/statistics/state/data/imports/wa.html

[13] U.S. Department of Commerce, Bureau of Economic Analysis. *U.S. International Transactions Accounts Data, Table 2: U.S. Trade in Goods* (June 13,, 2013 Release date). Retrieved as of 2013 from:
http://www.bea.gov/iTable/iTable.cfm?ReqID=6&step=1#reqid=6&step=1&isuri=1&600=3

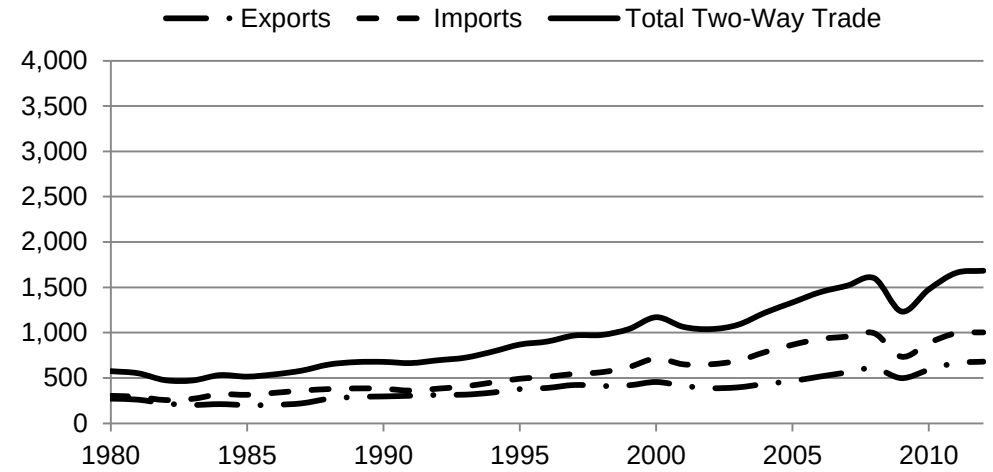
ago Asia's share of U.S. imports and exports constituted roughly 20 and 17 percent of total U.S. trade respectively.

Continued trade growth with China is an important factor for future trade growth in the U.S. and Washington State. China has increased its rank among trading partners for the US from 24th in 1980 to the second largest by 2006, remaining there through 2012. In 2012 over 18 percent of U.S. trade with China moved through Washington State, compared with 10 percent in 1994.[14]

Exhibit 3: International Trade Trends for the U.S.
Value 1980 to 2012
International Trade Entering and Leaving the United States
Nominal Dollars in Billion $ (Nominal Values are those observed in the market at that period of time)



Real Dollars in Billion $ (Real Values are those that account for changes in purchasing power)



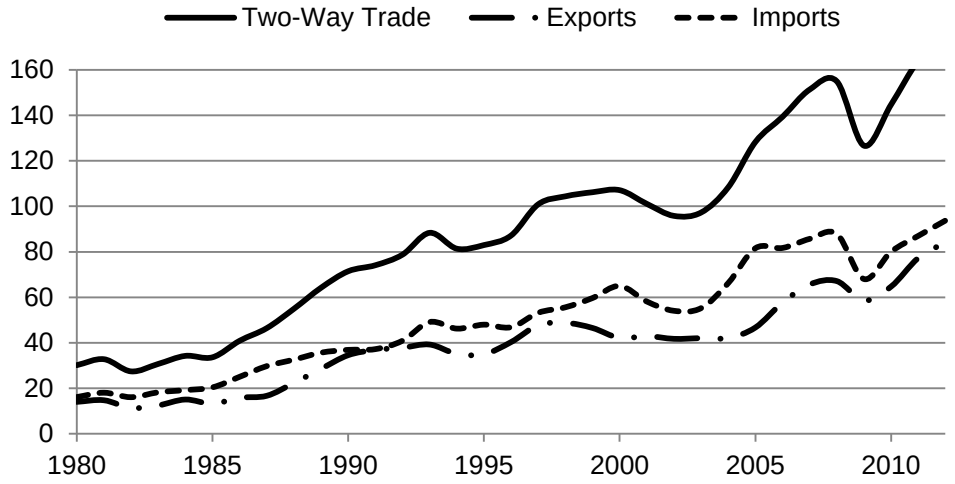
U.S. Census Bureau, Foreign Trade Division. *U.S. Trade in Goods and Services-Balance of Payments Basis.* Retrieved

[14] Washington State Office of Financial Management. *2009 Washington State Data Book, 2005 State Data Book, and State of Washington 1995 Data Book.* U.S. Department of Commerce, *International Trade Administration*: http://www.ofm.wa.gov/databook/default.asp

U.S. Census Bureau, Foreign Trade Division. *Total U.S. Imports/Exports (Origin of Movement) via Washington.* Retrieved as of 2013 from:
http://www.census.gov/foreign-trade/statistics/state/data/imports/wa.html
http://www.census.gov/foreign-trade/statistics/state/data/wa.html#ctry

as of August 2013 from: http://www.census.gov/foreign-trade/statistics/historical/gands.pdf .

Exhibit 4: International Trade Trends for Washington State
Value 1980 to 2012
International trade Entering and Leaving Washington State
Nominal Dollars in Billion $



Real Dollars in Billion $

1980 -2002: Washington State Office of Financial Management. Washington State Data Book Versions 1995, 2003, 2005. As cited and sourced by: http://www.wsdot.wa.gov/planning/wtp/datalibrary/freight/GrowingVolume.htm Retrieved December 2011.
2003-2012: WISERTrade: Port HS Database (http://www.wisertrade.org), as generated by Washington State Department of Commerce, September 2013.
Real values are adjusted for inflation based on U.S. Department of Labor Bureau of Labor Statistics CPI. 1982-1983 = 100.

East-West Trade: Washington is a Gateway for Asian Trade to and from the Midwest and the East Coast

Ocean freight vessels that transport goods to and from the West Coast are the most common means of moving U.S. trade with the Pacific Rim countries. Seventy-five percent of Asian exports

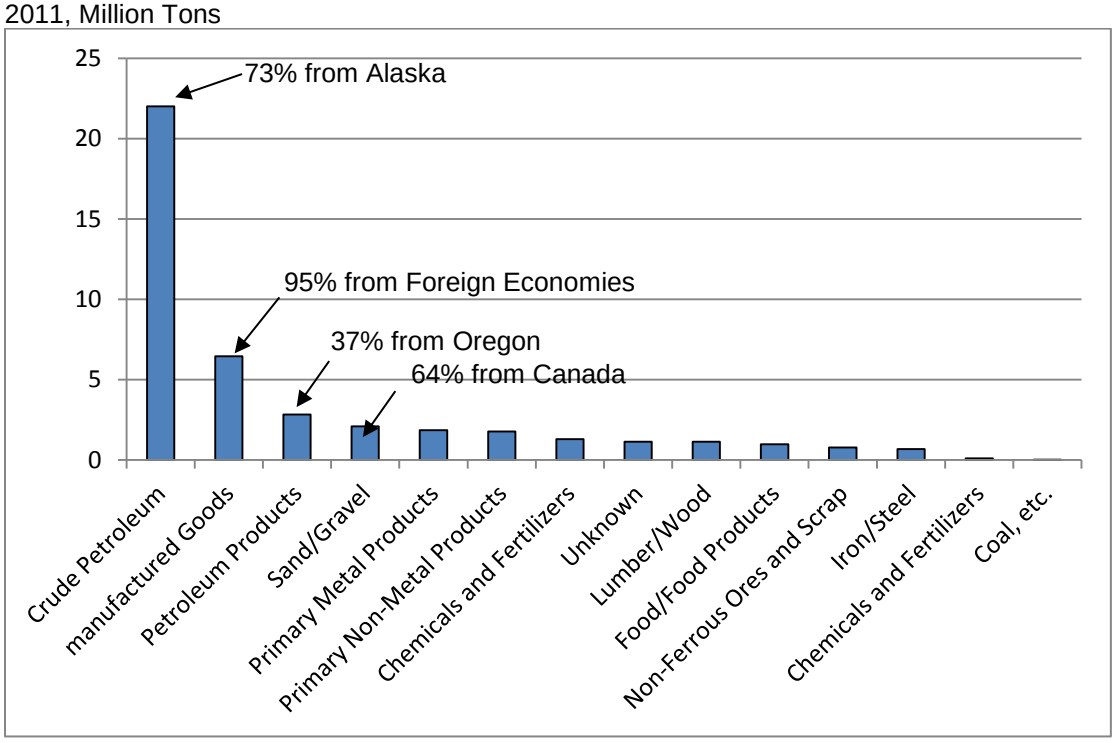
destined for the U.S. enter through West Coast ports.[15]

Washington's Seaports Are Global Gateways for Containerized Asian Imports

A large majority of waterborne international trade moved through the Ports of Seattle and Tacoma. International trade moving through these two seaports exceeded $84 billion in 2012. This made up 90 percent of the value of international imports entering through Washington, and almost 60 percent of waterborne international exports.[16] Using weight as a distinguishing measure, in 2011 Washington State ranked as the fifth largest mover of international waterborne trade, handling 77 million short tons or almost 5 percent of the U.S. total. In 2011, Washington handled nearly 54 million short tons of foreign bound shipments, or 9 percent of the U.S. total. Similarly, Washington received more than 23 million short tons of inbound foreign shipment, ranking it eighth with 3 percent of the U.S. total. [17]

As shown in Exhibit 5, crude petroleum was by far the largest volume waterborne commodity imported into Washington in 2011, and the majority originated from Alaska. Manufactured goods were the second largest commodities entering Washington State by water, most arriving in containers that originated from the Pacific Rim.

Exhibit 5: Goods Entering Washington State by Water*
2011, Million Tons



* Excludes goods originating and terminating in Washington.
U.S. Army Corps of Engineers Navigation Data Center - Waterborne Commerce Statistics Center. *2011*

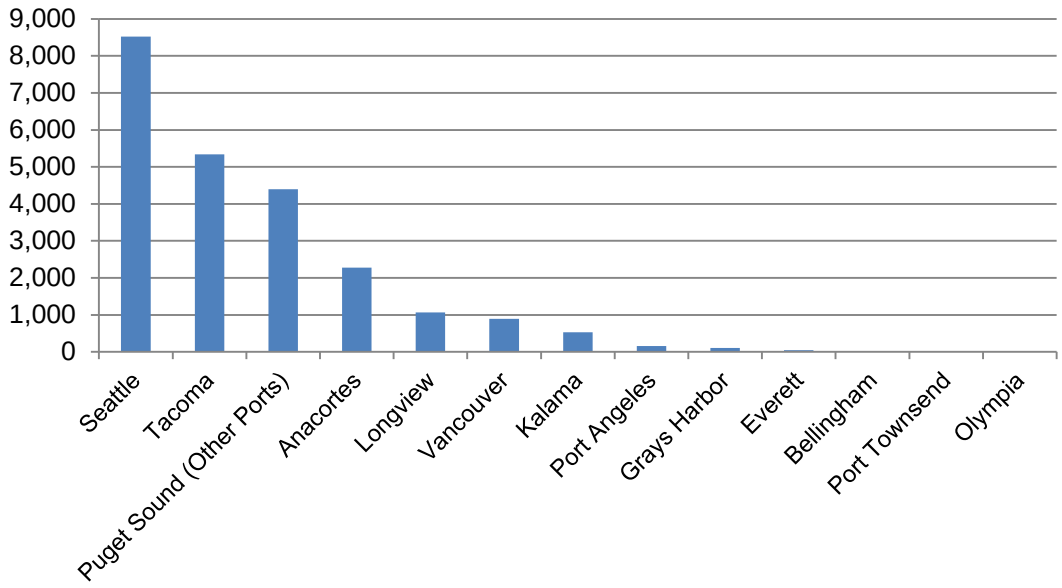
[15] USDA-AMS. *Impact of Panama Canal Expansion on the U.S. Intermodal System.(January 2010).* Retrieved as of December 2011 from: http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5082003 .
[16] Port of Seattle. *2012 Foreign Waterborne Trade Report*. Retrieved as of September 2013 from: http://www.portseattle.org/About/Publications/Statistics/Seaport/Documents/Summary_Foreign_Waterborne_Trade.pdf .
[17] BTS, *State Transportation Statistics 2012*, Table 3-5. Retrieved as of 2013 from: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/state_transportation_statistics/state_transportation_statistics_2012/html/table_03_05.html

Commodity Movements from the Public Domain Database. State to State by Destination and Origin. Retrieved as of August 2013 from: http://www.navigationdatacenter.us/wcsc/pdf/pdstdo11.pdf

Seattle and Tacoma Are Washington's Major Container Ports

As shown in Exhibit 6, the Ports of Seattle and Tacoma handle the majority of Washington's international waterborne imports along with other combined ports in the Puget Sound. Both the Port of Seattle and the Port of Tacoma experienced declining total international container movements between 2006 and 2009. The trend at the Port of Tacoma reversed in 2011 and its international container traffic increased 5% compared to 2010 (Exhibit 7). The move of Grand Alliance shipping lines, NYK Lines, OOCL and Hapag-Lloyd, from Port of Seattle to Tacoma's Washington United Terminal in 2012 is expected to bring 400,000 and 425,000 additional TEUS per year, and boost Tacoma's critical container business by 25 percent[18]. In 2012 Port of Tacoma saw a significant increase in international container traffic (24% compared to 2011). The international container traffic for Port of Seattle increased 42% from 2009 to 2010, and then experienced a slight decrease (6%) in 2011, and a 10% decrease in 2012.

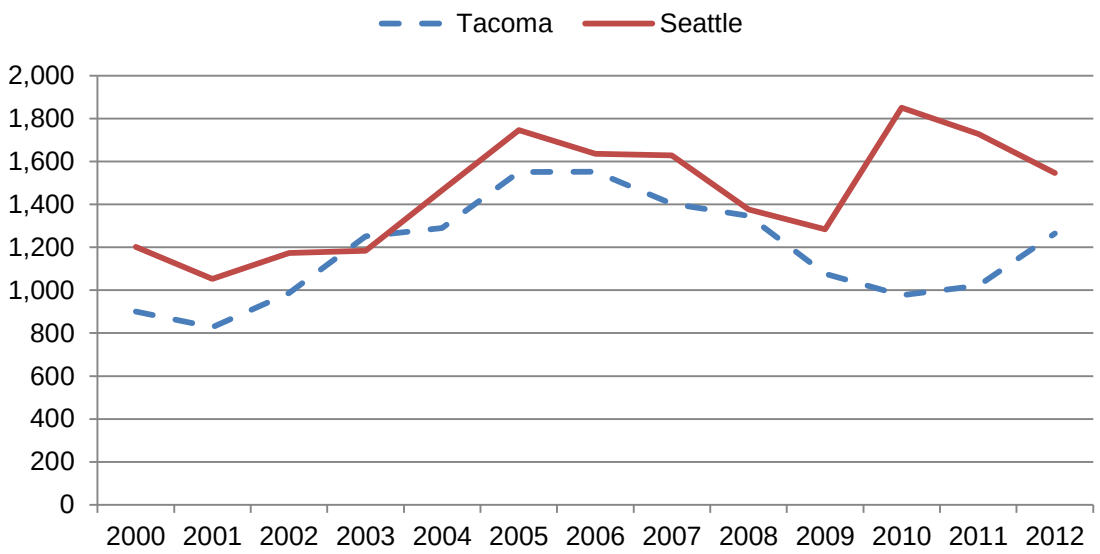
Exhibit 6: International Imports Entering Washington's Seaports.
2011, Thousands of Short Tons



U.S. Army Corps of Engineers Navigation Data Center - Waterborne Commerce Statistics Center. *2011 Waterborne Commerce of the United States Waterways and Harbors.* Retrieved as of September 2013 from: http://www.navigationdatacenter.us/wcsc/webpub11/Part4_Ports_tonsbycommCY2011.HTM

[18] C.R. Roberts. First ship with Grand Alliance arrives at Port of Tacoma. Retrieved on July 2012 from: http://www.thenewstribune.com/2012/07/02/2202619/first-ship-with-grand-alliance.html

Exhibit 7: International Movement of Containerized Cargo at the Ports of Seattle and Tacoma 2000-2012
Thousands of TEUs



Port of Seattle. *About the Port. Containerized Cargo in TEUs.* Retrieved as of September 2013 from: http://www.portseattle.org/About/Publications/Statistics/Seaport/Pages/10-Year-History.aspx
Port of Tacoma. *About the Port. Monthly Cargo Statistics.* Retrieved as of September 2013 from: http://www.portoftacoma.com/Page.aspx?nid=155

In 2010 Washington's two largest seaports, the Port of Seattle and the Port of Tacoma, ranked as the third largest container port complex behind Los Angeles/Long Beach and New York/New Jersey. The two ports combined handled more than 2.2 million twenty-foot equivalent units (TEUs), which is equal to 8.0 percent of all U.S. containerized exports and 7.6 percent of U.S. containerized imports.[19] By value, primary imports to the Port of Seattle are electrical and general machinery. Reflecting the Puget Sound's status as an import gateway, the value of imports exceeded exports at the Ports of Seattle and Tacoma by a ratio of over three to one: $64.3 billion to $20.1 billion in 2012.[20]

Washington's Major Ports Are Investing

As the globalized economy continues to evolve and develop, so to must Washington's ports. The Port of Tacoma plans to invest approximately $500 million in their infrastructure over the next decade to move cargo more efficiently. They will realign Piers 3 and 4 to allow for simultaneous berthing of two of the largest container ships. Design also includes installing 100-gauge crane rail to support larger container cranes capable of serving ships up to 24 containers wide[21].

Washington's Rail Corridors Move Containers to U.S. Markets

Railroads play a major part in the movement of containers, automobiles, and merchandise from Washington's seaports to final markets. In 2011 the Washington state freight rail system carried 105.7 million tons of freight; 46.1 million tons arrived in the state from other states and Canada, while 20.9

[19] U.S. Department of Transportation Maritime Administration (MARAD). Official U.S. Waterborne Transportation Statistics: *U.S. Imports by U.S. Customs District and Port – 2010.*
[20] Port of Seattle. *2012 Foreign Waterborne Trade Report*. Retrieved as of December 2013 from: http://www.portseattle.org/About/Publications/Statistics/Seaport/Documents/Summary_Foreign_Waterborne_Trade.pdf
[21] Port of Tacoma. 2012 Annual Report. http://www.portoftacoma.com/annual-report

million tons shipped from Washington to other states and Canada. About 5.4 million tons moved within the state's borders and 33.3 tons moved through the state without loading and unloading. Farm products are the primary commodity and made up 29% of the total rail freight tonnage in Washington[22].

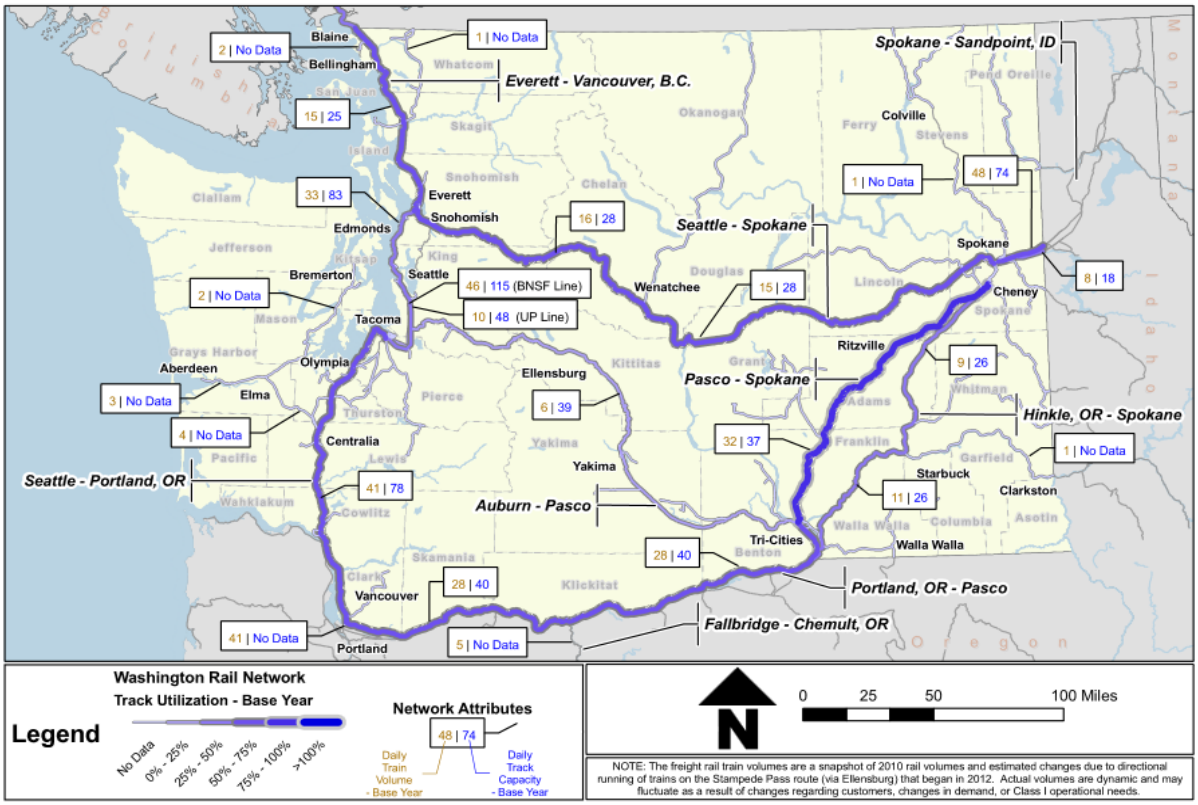
Operations of Washington State's Mainline Railroads

The BNSF Railway Company is the largest rail operator in Washington, handling a total of 1.367 million carloads in 2011 over a 1,633-mile network in the state. Its primary network consists of three east-west lines and one north-south line: the Everett to Spokane line passes through the Cascade Tunnel under Stevens Pass, the Auburn to Pasco route crossing through the Stampede Pass Tunnel, the Vancouver to Pasco route following the north bank of the Columbia River, and the north-south I-5 rail corridor from Canadian border at Blaine to Vancouver. The I-5 rail corridor is owned by BNSF, with UP holding trackage rights between Portland and Tacoma. Amtrak's long-distance services operate between Portland and Everett, Amtrak Cascades provides intercity rail over the entire route, and Sounder commuter rail uses the line in the Central Puget Sound region.

The Union Pacific Railroad (UP) operates on 532 miles of track, 260 miles of which are through trackage rights on other railroads, and handled a total of 550,000 carloads in 2010 in Washington. UP's primary east-west corridor serving Washington is in Oregon, running between Portland and Hinkle on the south bank of the Columbia River.

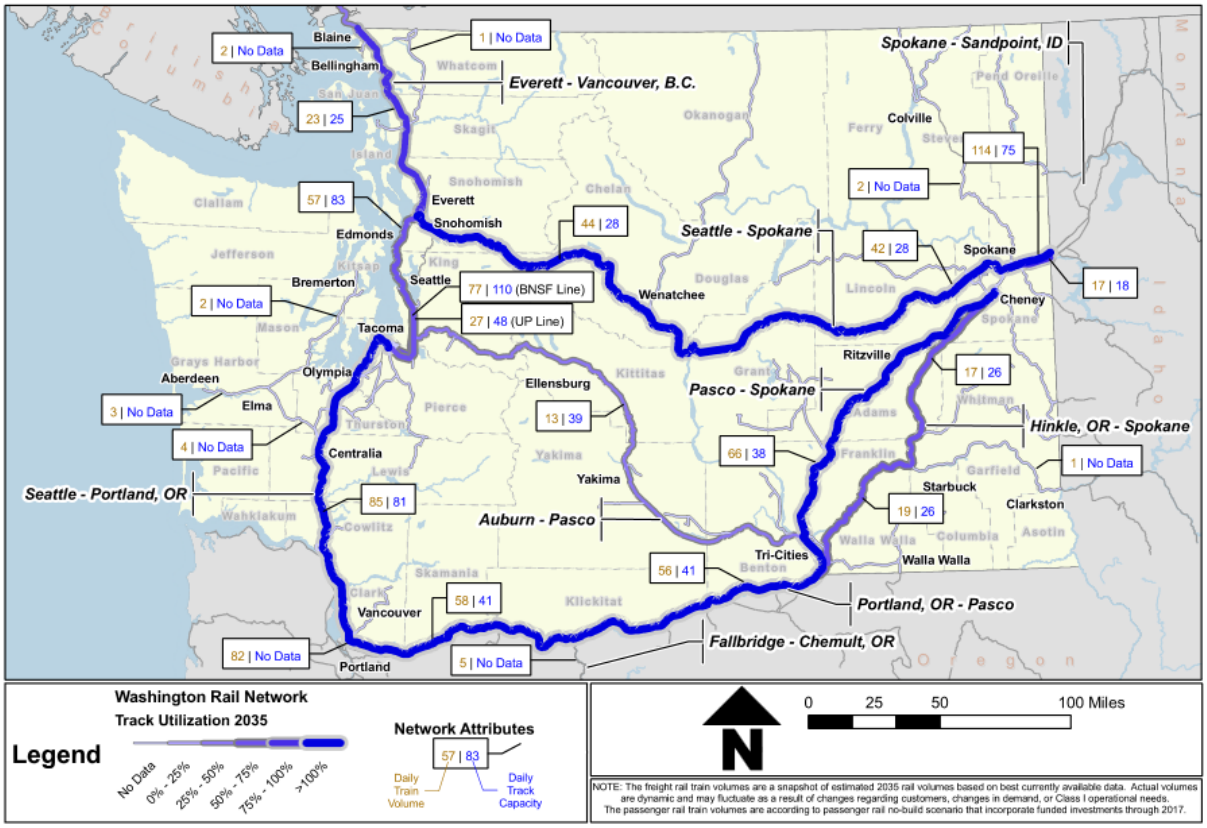
Class I railroads hold critical importance for rail operations throughout the state. Exhibit 8 and 9 provide a high-level overview of current and projected use of the system for handling freight[23].

Exhibit 8: Average 2010 Daily Train Use



[22] WSDOT Freight Systems Division. 2011 Surface Transportation Board Waybill Data Analysis.
[23] Washington State Rail Plan Public Review Draft. September 30, 2013.
http://www.wsdot.wa.gov/rail/staterailplan.htm

Exhibit 9: Projected Rail System Use, 2035



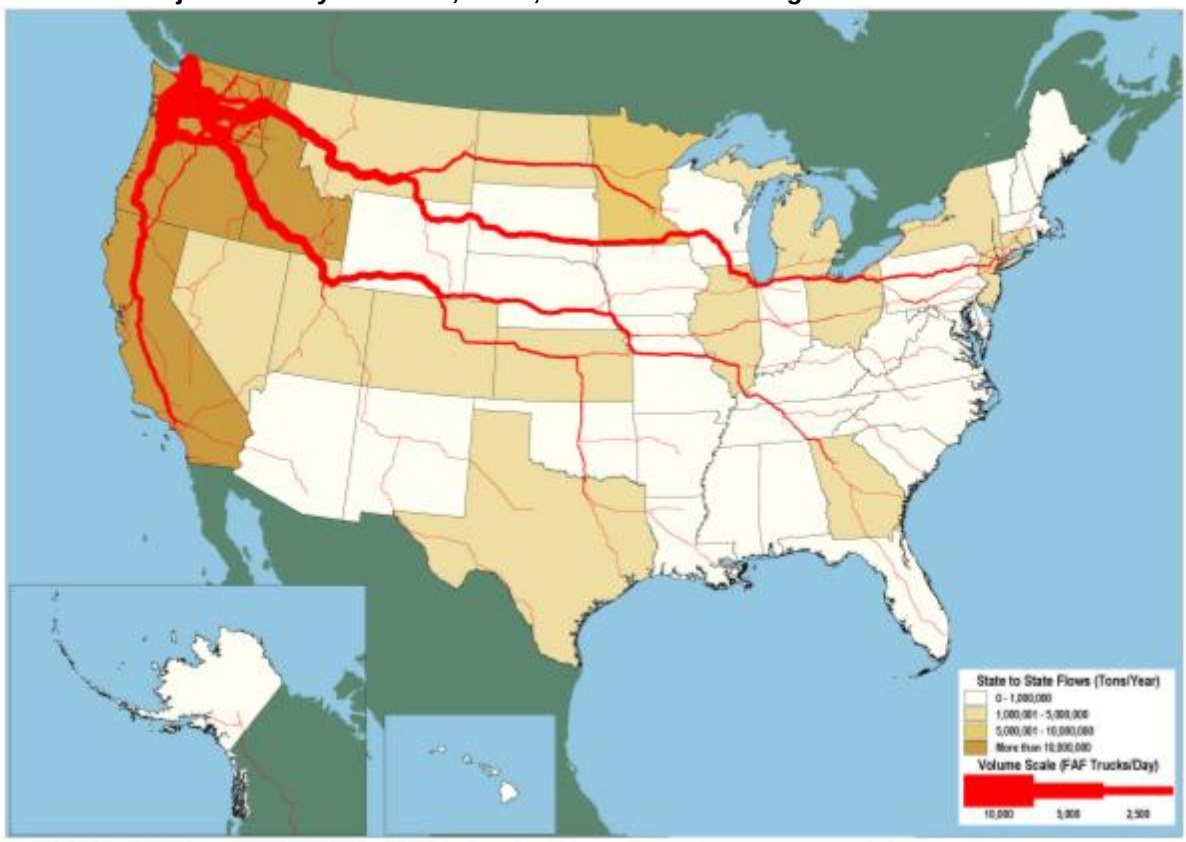
Source: Washington State Rail Plan Public Review Draft. September 30, 2013.
http://www.wsdot.wa.gov/rail/staterailplan.htm

Highways Are Also Important East-West Freight Corridors

As shown in Exhibit 10, there is also international trade moving on highway corridors in Washington. I-90 and Snoqualmie Pass are the main highway routes for east-west commerce in Washington. This route connects eastern Washington agriculture business and other industries with urban markets in northwest Washington and Puget Sound, along with global markets via the Port of Seattle and Tacoma. I-90 Snoqualmie Pass moved 6,100 daily trucks and 34.8 million tons of freight annually in 2012[24]. Snoqualmie Pass closure due to severe weather hinders the through movement of freight and east-west commerce and has big economic impacts. Eighty-nine hours of I-90 closure due to winter weather in January – February 2008 resulted in a total of $27.89 million freight-related economic losses[25].

[24] WSDOT. Washington State Freight and Goods Transportation System 2013 Update.
[25] WSDOT. Storm-related Closures of I-5 and I-90: Freight Transportation Economic Impact Assessment Report, Winter 2007-2008.

Exhibit 10: Major Flows by Truck To, From, and Within Washington: 2007



Note: Major flows include both domestic and international freight moving by truck on highway segments with at least 25 FAF (Freight Analysis Framework) trucks per day and between places typically more than fifty miles apart.

U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations. *Freight Analysis Framework, version 3.1.2, 2011*. Retrieved as of November 2011 from: http://ops.fhwa.dot.gov/freight/freight_analysis/state_info/washington/truckflow.htm .

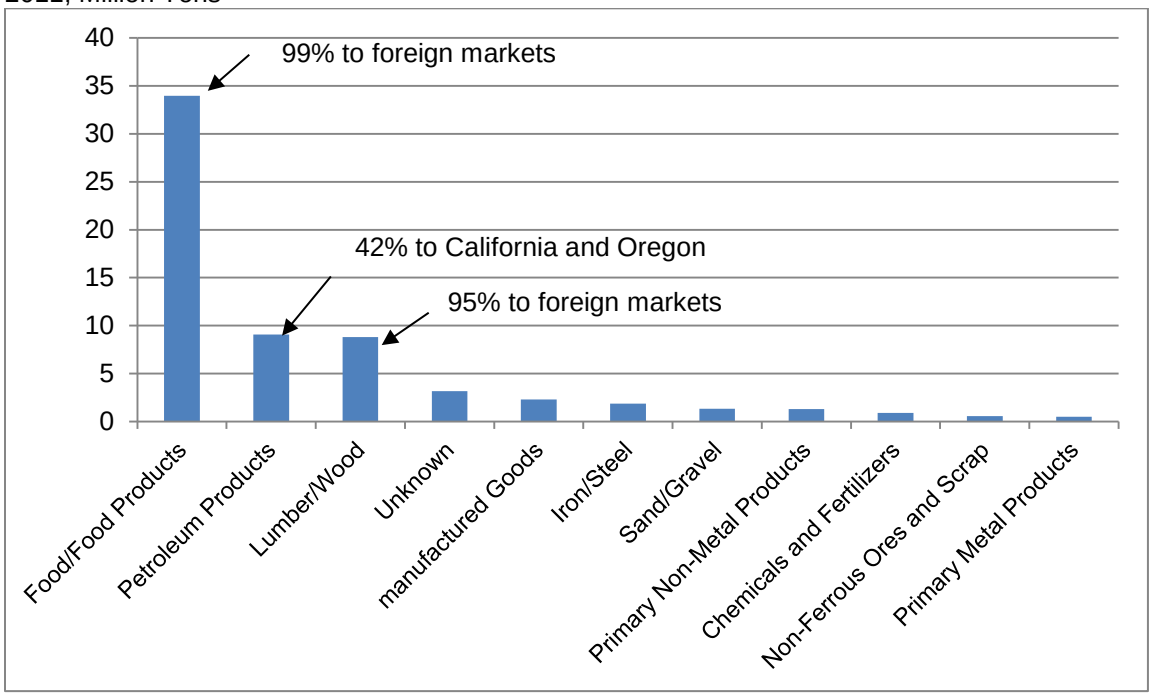
Agricultural Exports: Washington Moves American Products to the Pacific Rim

Non-containerized bulk products are also exported to the Pacific Rim through Washington's Seaports. Pacific Northwest grain and oilseed exports are expected to increase from 20.1 million metric tons in 2010 to 39.1 million metric tons in 2030 under a moderate growth forecast, and expected to reach 53.3 million metric tons in 2030 under the high growth forecast[26].

Exhibit 11 shows that, by weight, food and food products, primarily grain, were the most significant commodities exported through Washington's seaports in 2011. Other important international exports were petroleum products heading down the Pacific coast to Oregon and California, as well as lumber and wood products exporting to foreign markets.

[26] BST Associates. Pacific Northwest Marine Cargo Forecast Update and Rail Capacity Assessment: Final Report. (December 2011). Prepared for Pacific Northwest Rail Coalition. Retrieved as of May 2012 from: http://extra.bellinghamherald.com/pdf/news/portfreightstudy.pdf

Exhibit 11: Food and Food Products Leave Washington State by Water*
2011, Million Tons



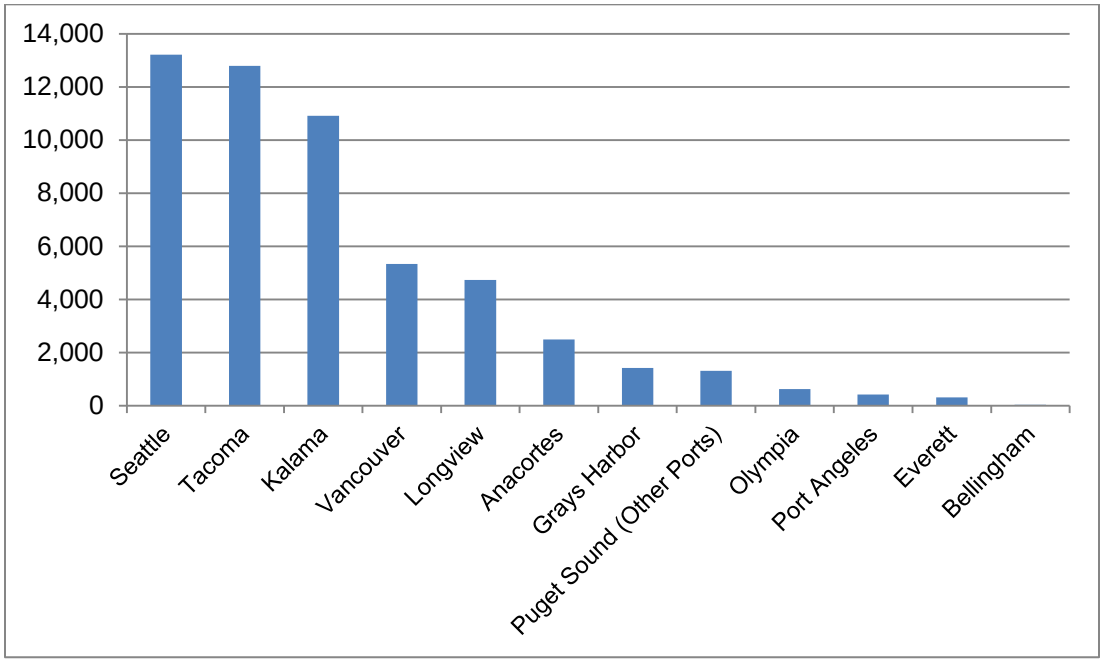
*Excludes goods originating and terminating in Washington.
U.S. Army Corps of Engineers Navigation Data Center - Waterborne Commerce Statistics Center. *2011 Commodity Movements from the Public Domain Database. State to State by Destination and Origin.* Retrieved as of September 2013 from: http://www.navigationdatacenter.us/wcsc/wcsc.htm

Washington's Columbia River Ports Are Gateways for Agricultural Exports

Columbia River seaports, especially the Ports of Vancouver, Kalama, and Longview, play major roles in the movement of exported agricultural products. These ports face competition from the Mississippi River and Gulf Coast ports, although they are less exposed than their Puget Sound counterparts because of the volume of grain that is shipped to these ports by barge.[27] As shown in Exhibit 12, these ports rank relatively high in international waterborne exports, particularly by weight.

[27] BST Associates. *2009 Marine Cargo Forecast: Technical Report Final. (March 23, 2009*). Prepared for the Washington Public Ports Association and the Washington State Department of Transportation. Retrieved as of August 2011 from: http://www.wsdot.wa.gov/NR/rdonlyres/575F0BFF-16FF-4699-9005-32766227B3BE/0/MCF2009FinalReport3232009.pdf

Exhibit 12: Foreign Shipments Leaving Washington's Seaports in 2011
Thousands of Short Tons



U.S. Army Corps of Engineers Navigation Data Center - Waterborne Commerce Statistics Center. *2011 Waterborne Commerce of the United States Waterways and Harbors.* Retrieved as of September 2013 from: http://www.navigationdatacenter.us/wcsc/webpub11/Part4_Ports_tonsbycommCY2011.HTM

Port of Vancouver

The Port of Vancouver has four-mile long waterfront and five marine terminals that provide 13 shipping berths. In 2012 it received 351 vessel calls and handled 4.6 million tons of cargo[28]. The port handled much more exports than imports, with 85 percent of its freight tonnage as exports. Wheat, copper concentrate and scrap steel are among its top export commodities, while steel, windmills, pulp, liquid bulk and automobiles are its top import commodities[29].

The Port of Vancouver's Terminal Two serves as its grain elevator wharf, and is leased by United Grain Corporation. This grain terminal is the largest wheat exporting elevator on the U.S. West Coast and among the most efficient handlers of grain in the world. It exported a total of 2.6 million metric tons of grain products in 2012. The facility consists of a 715-foot dock and a barge dock that allows simultaneous barge off-loading at a rate of 1,088 metric tons per hour, and a vessel-loading rate of 2,177 metric tons per hour. The elevator has a storage capacity of 5 million bushels and is continually being expanded and improved.[30]

The Port of Vancouver is a hub of industrial jobs in Southwest Washington. The port activities support 2,300 direct jobs, and nearly 17,000 jobs in the community. The Port has more than 50 industrial and marine tenants, and more than two million square feet in warehouses for industrial and marine activities at the port. Currently nearly 108 acres are being prepared for development at the port's Centennial Industrial Park[33].

[28] http://www.portvanusa.com/assets/Tonnage-Dec-2012.pdf
[29] Port of Vancouver. 2012 Annual Report. Retrieved as of December 2013 from: http://www.portvanusa.com/assets/POV-2012_AnnualReport.pdf
[30] Port of Vancouver. Retrieved as of December 2013 from: http://www.portvanusa.com/marine/bulk/

Port of Kalama

The seven mile long Port of Kalama handles more bulk exports (e.g. grain) than any other port in the state, with 11.1 million short tons of grain exported in 2011Corn, soybeans, milo, and many grades of wheat are the major export commodities of the port and these products come from many states including Oregon, Washington, Idaho, Montana and North Dakota. The port receives between 90,000 and 1000,000 rail cars and over 250 vessel calls each year.[31]

Port of Longview

In 2012, Longview experienced its fifth consecutive record setting revenue year, grossing more than $33.8 million in operating revenue. During 2012, the port handled 225 vessel calls, and 6.3 million metric tons of cargo, a 186 percent increase over 2011. The growth is largely attributed to the new grain terminal EGT. Top commodities handled by Port of Longview include bulk grains and agricultural products, calcined petroleum coke, logs, steel and wind energy cargo. [32]. The Port of Longview has seven marine berths, of which it operates five. The remaining two berths are operated by Kinder Morgan and Export Grain Terminal (EGT). Dry bulk is the leading cargo, primarily chemicals, minerals, and agricultural products. Three berths are used for exports of agricultural and mineral products only, while three others handle imports and exports of project cargo and dry bulk commodities, steel and logs. The remaining import berth primarily handles salt[33].

EGT invested more than $200 million in Port of Longview to build a grain terminal and completed the construction in fall 2011. The terminal is served by BNSF Railway and UP Railroad mainlines with a dedicated spur to the Port, and can accommodate six 110-car shuttle trains at any time. The export facility handles corn, wheat, soybeans, and DDGs (Dried Distillers Grains) through both barge and rail, and is able to unload 120,000 bushels of grain per hour. The facility exported 4.7 metric tons of bulk cargo in 2012[34].

Port of Grays Harbor

The Port of Grays Harbor continues to show signs of growth and diversification. In 2012, the port's cargo shipments reached 1.8 million metric tons, up 50 percent over 2011. Agricultural Processing Inc opened new storage facilities for dry agricultural products at the Port of Grays Harbor in April 2012, and as a result soybean meal and other dry bulk shipments hit a record of 1.3 million metric tons in 2012. The roll-on/roll-off exports continue to grow and more than 66,500 units of automobile and over-high/over-wide equipment have exported to Pacific Rim countries.

The port completed an $18 million expansion of rail in the marine terminal complex in 2012. This investment positioned the Port to handle a variety of cargos into the future.[35]

Rail and Barge Bring Agricultural Products to the Lower Columbia Ports

Agricultural products such as wheat, corn, and soybeans, from the Midwest and eastern Washington, travel by barge and rail to these Lower Columbia seaports. The majority of commodities destined for Washington

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[31] Port of Kalama. *Fast Facts 2011.* Retrieved as of December 2013 from: http://www.portofkalama.com/news_and_notices

[32] Port of Longview. Port of Longview States Third Largest Port. Retrived December 2013. http://www.portoflongview.com/Portals/0/Documents/Press-Releases/2013/5.9.13%202012%20Record%20Year.pdf

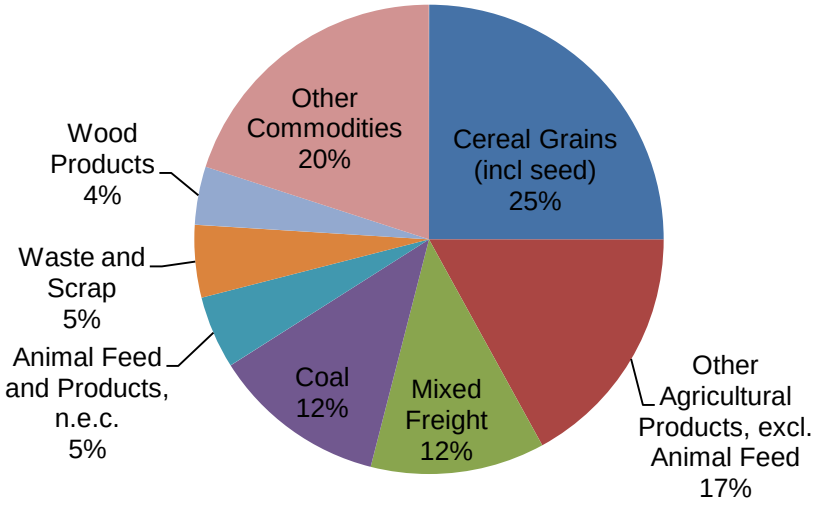
[33] HDR. *Port Master Plan Report. HDR Project Number 144429.* June 14, 2011.

[34] EGT. Longview Export Grain Terminal. http://www.egtgrain.com/facility/
Port Talk.
http://www.portoflongview.com/Portals/0/Documents/Document-Library/Newsletters/Feb%20Port%20Talk.pdf

[35] Port of Grays Harbor. *2013 January Newsletter.* Retrieved as of December 2013 from: http://www.portofgraysharbor.com/downloads/newsletters/PGH_Newsletter_2013-1.pdf

State, based on railroad waybills, are agricultural products. These commodities by tonnage are shown in Exhibit 13.

Exhibit 13: Top Rail Commodities Originated and/or Terminated in Washington State by Tonnage, 2010



Washington State Rail Plan Public Review Draft. September 30, 2013. http://www.wsdot.wa.gov/rail/staterailplan.htm

Short-line railroads increasingly connect to trucks and the Columbia/Snake River system, usually through terminals and ports that allow goods to be transferred between rail and other modes, such as container ships or trucks. These connections provide shippers with decreased costs and greater flexibility to meet customer requirements. The Washington Grain Train moves wheat from the Palouse region of Washington to a grain elevator on the Columbia River, where it then moves by barge from Wallula to one of the lower Columbia River ports for export[36]. In 2012 the Grain Train program transported more than 188,000 tons of Washington-grown wheat, barley, peas and lentils to market.[37]

The Columbia River Barge System Supports U.S. Agriculture

The river system is the freight lifeline for the inland Northwest and the Midwest, connecting upriver ports with lower Columbia River export load centers. Barge traffic along the Columbia and Snake Rivers brings grain and other bulk goods downriver to lower Columbia River ports. 4.7 million tons of wheat was moved down the Columbia-Snake River system by barges, accounting for 74% of the total downstream shipments. More than 35 different commodities move up and down the river system, with about three times as much downstream as upstream (Exhibit 14).[38]

[36] Washington State Rail Plan Public Review Draft. September 30, 2013. http://www.wsdot.wa.gov/rail/staterailplan.htm
[37] GNB Edition 49, March 31, 2013. http://wsdot.wa.gov/publications/fulltext/graynotebook/Mar13.pdf#page=51
[38] Simmons, Sara and Ken Casavant. FPTI Research Report #1. "Historical Waterborne Commerce on the Columbia-Snake River System: Commodity Movements Up and Down River, 1991-2010." November 2010.

Exhibit 14: Barge Traffic on the Columbia-Snake River System, 2010

Columbia-Snake River System	
Downstream	Tons
Wheat	4,750,234
Forest Products (Lumber, Logs & Woodchips)	811,240
Other	402,361
Sand, Gravel, Stone; Limestone Flux & Calcereous Stone; Phosphate Rock	376,607
Rye, Barley, Rice, Sorghum & Oats	2,240
Total Shipments (tons)	6,342,682
Upstream	Tons
Distillate, Residual & Other Fuel Oils	946,151
Gasoline, Jet Fuel & Kerosene	732,747
Waste Material (Garbage, Landfill, Sewage Sludge & Waste Water)	238,062
Other	122,309
Fertilizer (Nitrogenous, Potassic, Phosphoric)	45,460
Total Shipments (tons)	2,084,729

Simmons, Sara and Casavant, Ken. *"Historical Waterborne Commerce on the Columbia-Snake River System: Commodity Movements Up and Down River, 1991-2010."* November 2010. FPTI Research Report #1.

Washington Supports Freight on North-South Corridors

As Washington State serves as a hub between Asia and the U.S., the state also moves freight to and from the West Coast, Canada, and Alaska.

The U.S.-Canadian Border Is a Major Freight Gateway

Canada has a long history as a significant U.S. trading partner, and Canadian trade has a strong impact in the state. In 2012 Canadian goods valued at more than $13.8 billion entered the U.S. economy through Washington, and U.S. goods valued at $8.4 billion entered Canada through Washington State.[39]

With the establishment of NAFTA, this trading relationship has expanded. In Washington, this increase in trade activity has historically affected truck rather than rail traffic volumes. In 2012, 22.5 percent of the weight of Washington surface trade imports from Canada was transported by truck, 22.3 percent by rail, and 55.2% by pipeline[40]. 605,607 trucks entered Washington from Canada in 2012. This represents 89 percent of the recent high of 682,000 entries in 2006; however, the 2012 truck crossings increased 12 percent over 2011[41].

Rail Crossings at the U.S.-Canadian Border

[39] U.S. Census Bureau, Foreign Trade Statistics. *State Imports and Exports for Washington.* Retrieved as of December 2013 from: http://www.census.gov/foreign-trade/statistics/state/data/index.html

[40] U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). *North American Transborder Freight Data: Value to Weight Ratio Data.* Retrieved as of December 2013 from http://transborder.bts.gov/programs/international/transborder/TBDR_VWR.html

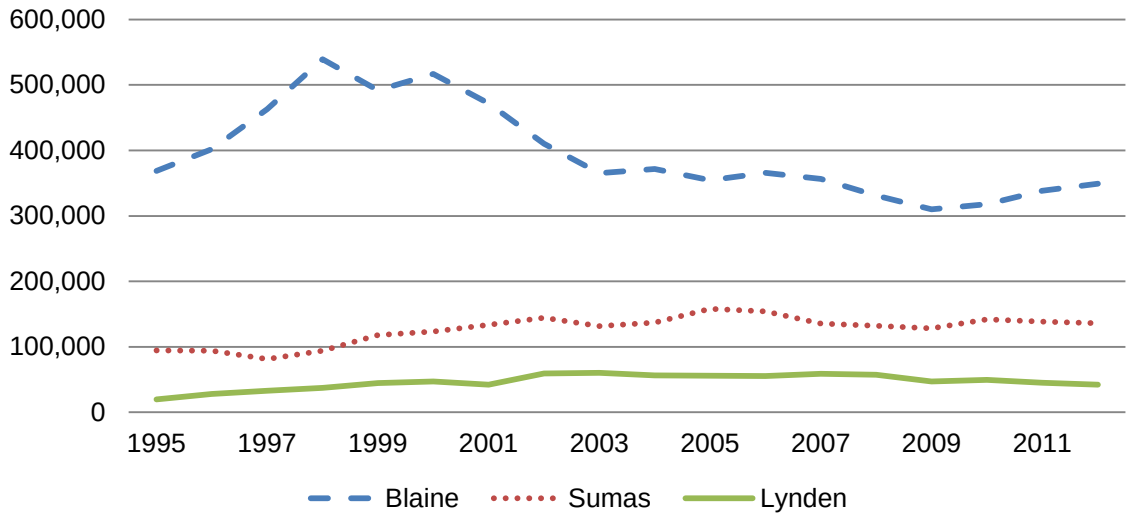
[41] U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). *Border Crossing/Entry Data: Time Series Analysis.* Retrieved as of December 2013 from: http://www.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCTSA.html [42] U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). *Border Crossing/Entry Data: Time Series Analysis.* Retrieved as of December 2013 from: http://www.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCTSA.html

From 1995 to 2006, the number of trains entering Washington from Canada remained relatively constant at about 3,000 per year. However, the train crossings dropped to 1,999 in 2007 and remained at this level through 2009. The total number of trains entering the state increased 13 percent from 2,409 in 2010 to 2,716 in 2011, and increased 13 percent again to 3,076 in 2012. This increase is likely due to recent economic improvements.[42]

The Blaine Border Crossing Handles a High Volume of Truck Traffic

Exhibits 15 and 16 show that most NAFTA traffic is west of the Cascades near the I-5 corridor, at the border crossings of Blaine, Sumas, and Lynden. As shown, in 2012 about 349,000 truck trips entered Washington from Canada through Blaine, and almost 136,000 trucks entered the state through Sumas. The border at Lynden ranked third highest in incoming truck crossing volume, followed by Oroville and Point Roberts.

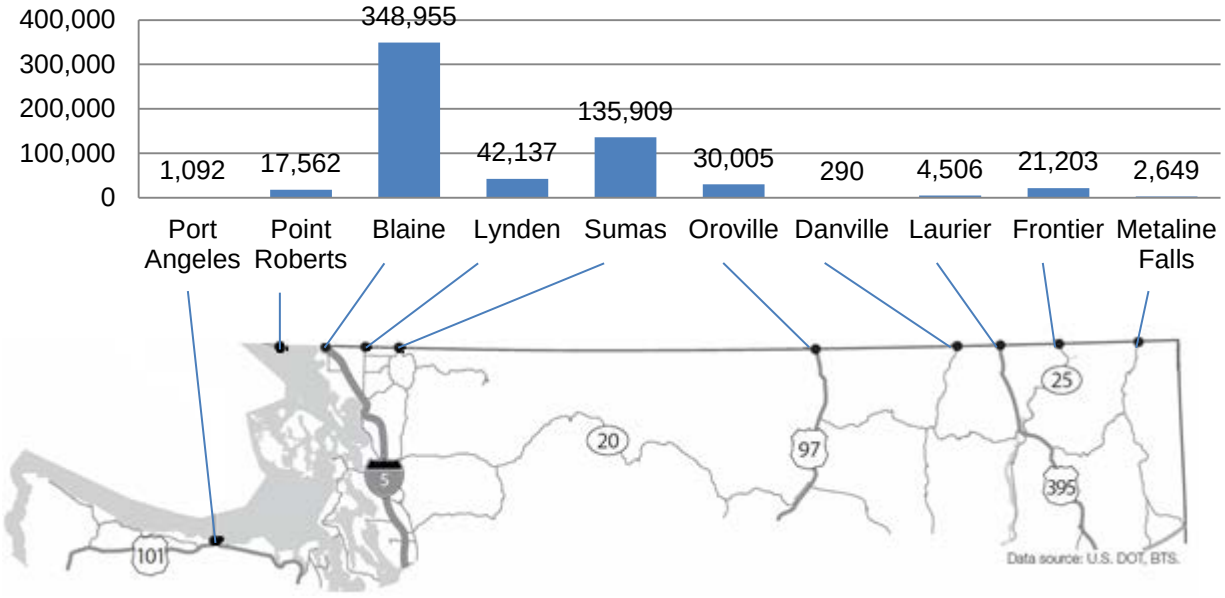
Exhibit 15: Trucks Entering Washington State from Canada, 1995-2012
Number of Trucks



U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). *Border Crossing/Entry Data: Time Series Analysis.* Retrieved as of December 2013 from:
http://www.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCTSA.html

[42] U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). *Border Crossing/Entry Data: Time Series Analysis.* Retrieved as of December 2013 from:
http://www.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCTSA.html

Exhibit 16: Trucks Entering Washington from Canada, 2012



U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). *Border Crossing/Entry Data: Time Series Analysis.* Retrieved as of December 2013 from:
http://www.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCTSA.html

As shown in Exhibit 17, the border crossing at Blaine ranks sixth among the 75 U.S. - Canadian crossings in terms of merchandise value transported. The exhibit also shows that in 2011, the Blaine border station ranked fourth in the U.S. by number of incoming truck crossings, with 338,570 total truck crossings in that year.

Exhibit 17: Blaine's Border Crossing Ranks in the Top Six for Value and Top Four for Volume of Crossings Among Land Ports Along the U.S. – Canadian Border in 2012

Rank, by Value	Land Ports	Value (billion $)
1	Detroit, MI	131.0
2	Buffalo-Niagara Falls, NY	83.0
3	Port Huron, MI	81.1
4	Pembina, ND	24.9
5	Champlain-Rouses Pt., NY	22.4
6	Blaine, WA	20.2

Rank, by Trucks	Land Ports	Number of Crossings
1	Detroit, MI	1,541,150
2	Buffalo-Niagara Falls, NY	940,221
3	Port Huron, MI	691,348
4	Blaine, WA	348,955
5	Champlain-Rouses Pt., NY	280,925
6	Pembina, ND	214,047

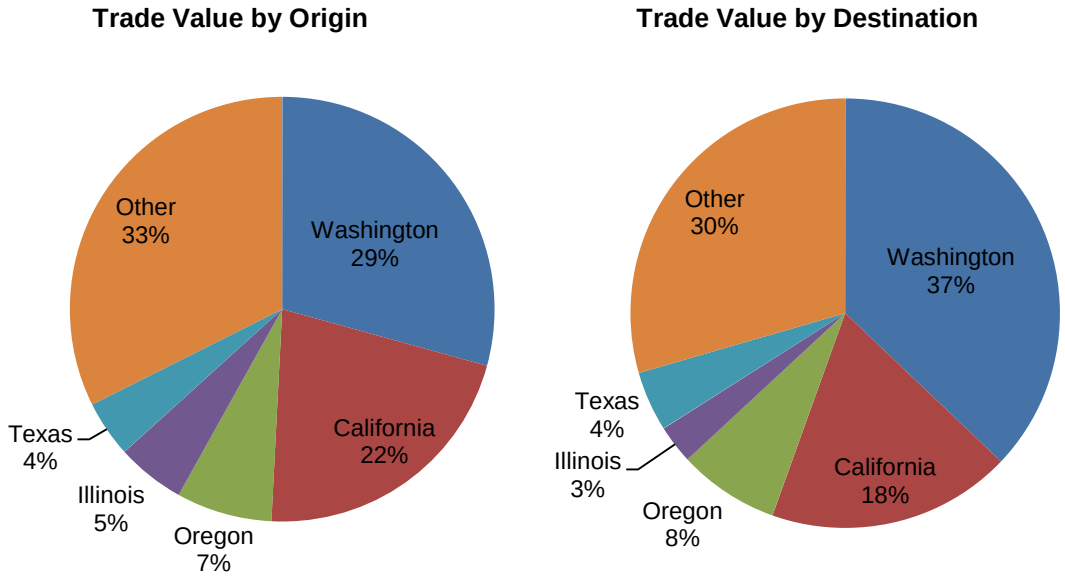
U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). *North American Transborder Freight Data: Quick Search.* Retrieved as of December 2013 from:
http://transborder.bts.gov/programs/international/transborder/TBDR_QuickSearch.html
Border Crossing/Entry Data: Time Series Analysis. Retrieved as of December 2013 from:
http://www.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCTSA.html

Washington's Border Links Canadian Trade With Other U.S. States

In 2012 an annual value of $11.6 billion moved north on I-5 to Canada through the Blaine Crossing on truck. Another $5.1 billion moved south from Canada through the same crossing. Only about 29 percent of this traffic originated from, or 37 percent terminated in Washington State (Exhibit 18). The rest is passing through, to, and from other states; namely, California and Oregon.

The highest value commodities moved by trucks through Cascade Gateway were manufacturing goods, foods, farm products and wood. The manufacturing goods accounted for 61 percent of the total export value and 45 percent of the total import value through the gateway in 2012. The highest value of commodities exported northbound to Canada through Washington State by surface modes were machinery and parts, vehicles, electrical machinery and related parts, followed by mineral fuels and products, accounting for a combined 41 percent of the total export value through all ports to Canada. Other exports accounted for less than five percent each, but comprise 59 percent of the total, displaying the large diversity of exports travelling north. The greatest commodities imported, by value, from Canada through Washington by surface modes were mineral fuels and oils and products, wood, and machinery and parts, accounting for 52 percent of the total import value.[43]

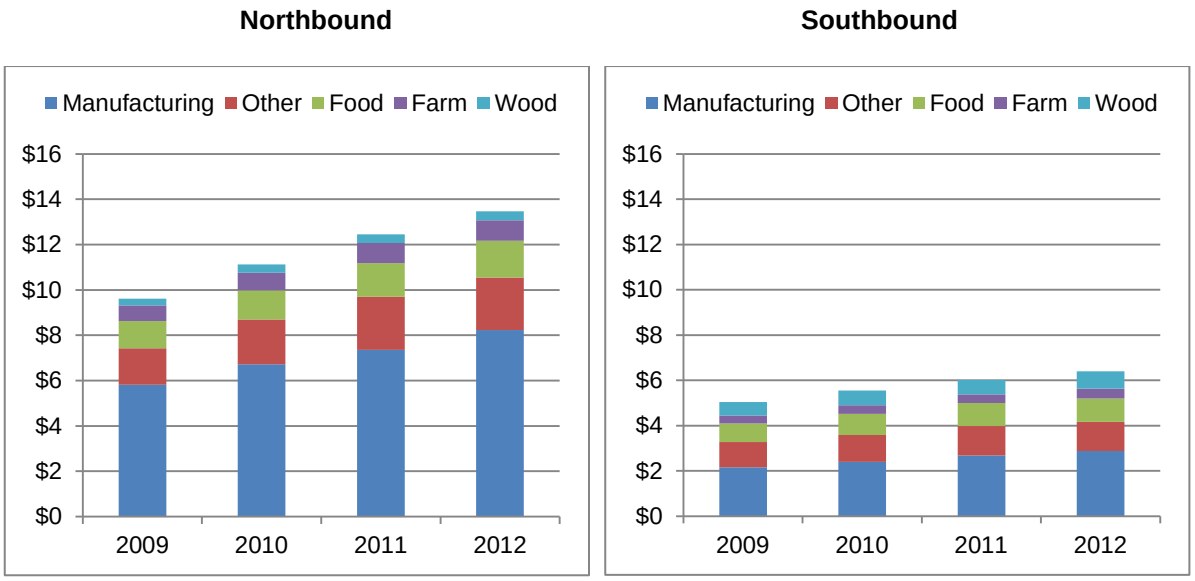
Exhibit 18: Truck Trade Value through I-5 Border (Blaine Crossing) by Origin and Destination, 2012



U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). North American Transborder Freight Data, including Port, Commodity, or State Origin/Destination. Retrieved as of December 2013 from: http://transborder.bts.gov/programs/international/transborder/TBDR_QuickSearchPC.html

[43] U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). *North American Transborder Freight Data - Query Commodity Trade Data by Port at Country Level* Retrieved as of December 2013 from: http://www.bts.gov/programs/international/transborder/TBDR_QAPC07.html

Exhibit 19: Commodities Transported Cross-Border at the Cascade Gateway by Truck: North-South Commodities Comparison, 2009-2012 (in Billions of Dollars)



International Mobility & Trade Corridor Project. 2013 Resource Manual. Retrieved as of December 2013 from: http://theimtc.com/wp-content/uploads/2013OnlineResourceManual.pdf

Washington-Canadian Border Delays, Congestion, and Security Issues

Trade across the U.S.-Canadian border changed in the wake of the 9/11 terrorist attacks. Evidence suggests that heightened security measures have increased the costs of freight movement across the border.[44] Heightened security measures in addition to increasing vehicle traffic have necessitated changes at the border to minimize the impacts.

In 2008, WSDOT completed a significantly improved Pacific Highway (SR-543) route through Blaine, to the Canadian border. The revamped passage included a reconstruction, lowering and repaving of the highway from Boblett Street to the U.S. Canadian border. The improvements also include a new truck lane to the east side of the Duty Free Store and lines up with the commercial inspection booths. Freight movement ease and congestion relief were key benefits sought from this project. Prior to the improvements, it had been estimated that $22 million in operating costs were lost annually due to border crossing delays at the Blaine crossing.

The U.S. Customs and Border Protection (CBP) and Canada Border Services Agency (CBSA) have implemented the bilateral Free and Secure Trade (FAST) Program. The program aims to increase the integrity of supply chain security and efficiency by offering expedited clearance to carriers and importers enrolled in the Customs Trade Partnership Against Terrorism (C-TPAT) or Canada's Partner's in Protection (PIP).[45] At Blaine border crossing, state and provincial transportation agencies invested in the construction of highway lanes dedicated to FAST trucks, but to date there has been light use of these lanes. Only 23 percent of southbound trucks and just 2 percent of northbound trucks used the FAST lanes in 2009. Of the southbound FAST traffic, 73 percent of the trucks were empty. Border Policy Research Institute at

[44] Globerman, S., and Storer, P. 2009. *The Effects of 9/11 on Canadian-U.S. Trade: An update through 2008.* Metropolitan Policy Program at The Brookings Institute. Retrieved as of December 2011 from: http://www.thetbwg.org/downloads/Effects_of_911_on_Canada_US_Trade.pdf .

[45] U.S. Customs and Border Protection. *Free and Secure Trade (FAST).* Retrieved as of December 2011 from: http://www.cbp.gov/linkhandler/cgov/trade/cargo_security/ctpat/fast/us_canada/fast_fact.ctt/fast_fact.pdf .

Western Washington University worked with Whatcom Council of Governments to conduct a pilot project in spring 2011 to determine whether a reconfiguration of operations at the Port of Entry (POE) would lead to improved southbound freight mobility. In the pre-pilot configuration, one of Blain's three commercial booths has been used to serve trucks that participate in FAST program. The remaining two booths have been used to process standard trucks. During the pilot test, all three booths were used to process a mingled stream of FAST and standard trucks. The new configuration substantially reduced the overall average wait for standard trucks from 49.2 minutes to 11.8 minutes. The pilot configuration increased the wait time for FAST truck from 3.9 minutes to 11.8 minutes. The pilot configuration yielded a 71 percent reduction in aggregate wait time. The pilot configuration has been deployed permanently by U.S. Customs and Border Protection for southbound truck traffic entering the U.S.[46]

For the northbound truck traffic at Blain POE, the average wait time for standard trucks was 7.1 minutes in summer 2011, which is much less than the pre-pilot average wait time of 49 minutes in the southbound direction. The average wait time varied over the course of the day and had a midday peak, climbing to over 12 minutes at noon. The northbound FAST highway lane is very lightly used compared to standard booths[47].

Freight Movement along the North-South Highway Corridors

Interstate 5 Freight Movements

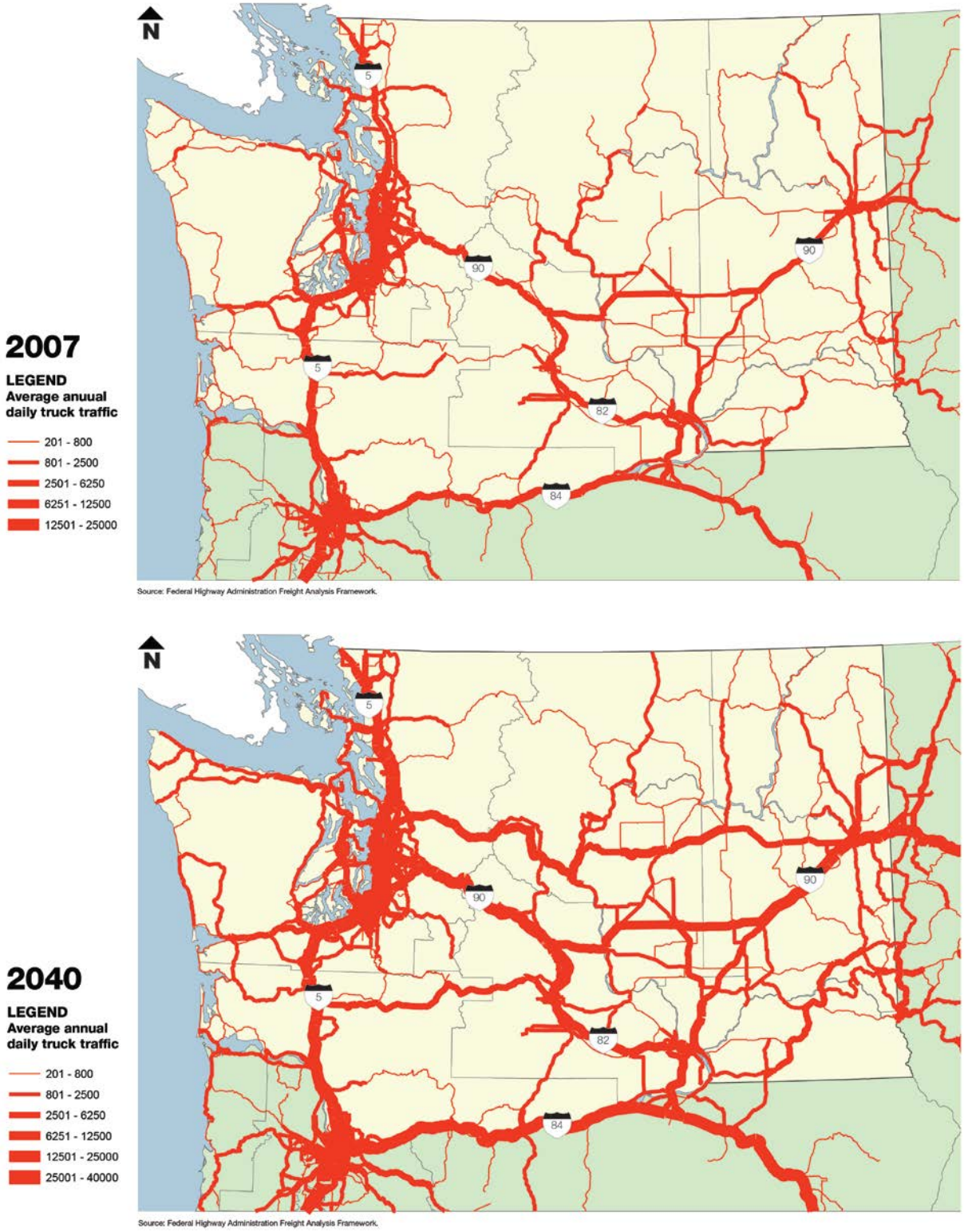
The I-5 corridor is the critical north-south interstate corridor supporting U.S. trade with Asia and links marine and air cargo port complexes with essential state warehouse districts, industrial lands and other intermodal transportation hubs. The U.S military depends on the I-5 corridor for logistical support of national defense in the Pacific region. Joint Base Lewis-McChord on the I-5 corridor is the only Power Projection Platform on the West Coast. In the event of a major conflict, military traffic will surge through I-5 in Central Puget Sound.

I-5 serves Washington's major population centers, and corridor performance is affected by the congestion associated with rapid population growth. In 2012, the average daily truck traffic at I-5 Columbia River Crossing was 6,200 vehicles, the average daily truck traffic on I-5 through downtown Seattle was 17,000 vehicles, and near the Canadian Border crossing at SR 543 Interchange, the average daily truck traffic was 2,600[48]. Truck traffic is expected to increase substantially in the future, about 122 percent between 2007 and 2040 according to the FHWA Freight Analysis Framework (FAF3).

The I-5 Corridor serves nine intermodal rail yards, where BNSF and Union Pacific railroads connect with freight trucks and ports. In the I-5 corridor a rail line runs the length of the state from the Canadian border through Bellingham, Everett, Seattle, and Tacoma to Vancouver and Portland. Rail absorbs some of the traffic growth from congested highways. Because most rail shipments are going long distances, investment in new rail capacity may not moderate growth in truck traffic—most of which is associated with short- and medium-distance trips—on the I-5 corridor.

[46] Border Policy Research Institute. 2011. Testing a Reconfiguration of FAST at the Blain POE. Border Policy Brief, Volume 6, No.2.
[47] Border Policy Research Institute. 2011. Field Observations of Northbound Truck Traffic at Pacific Highway. Retrieved as of June 2012 from: http://www.wwu.edu/bpri/files/2011_Oct_NB_Pac_Hwy_Report_No_14.pdf
[48] WSDOT. Washington State Freight and Goods Transportation System 2013 Update.

Exhibit 20: Estimated Annual Daily Truck Traffic in Washington, 2007 and 2040



Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations. *Freight Analysis Framework, version 3.1.2, 2011*. Retrieved as of November 2011 from: http://ops.fhwa.dot.gov/freight/freight_analysis/faf/faf3/netwkdbflow/index.htm

Other Important North-South Truck Corridors in Washington State

Highway 395 is a congressionally designated NHS High Priority Corridor. In total, the highway runs from Laurier at the U.S.-Canadian border, south through Spokane where it then runs concurrently with I-90 west for 61 miles before again turning south towards Pasco and on into Eastern Oregon and California.[49] In 2012, the average daily truck traffic carried by US 395 is 220 vehicles near Canadian Border, 1,745 vehicles at US 2 in Spokane, and 3,300 vehicles merging onto I-82 in Benton County. Although Highway 395 carries a much smaller volume of through trucks than I-5, it is important for the regional natural resource industry.

US 97 is also a strategic freight corridor and a designated NAFTA freight corridor. In 2012, SR 97 carried 710 average annual daily trucks near Canadian border, 820 daily trucks at I-90 interchange, and 1,700 daily trucks through Washington/Oregon state line[50]. The highest value commodities moved by northbound trucks through Canadian border via US 97 were vehicles and parts, machinery and mechanical appliances, and plastics.

Washington's Freight System Connects Alaska with the Continental United States and Points Beyond

The value and volume of freight moved between Puget Sound seaports and Alaska makes this one of the nation's most important routes for domestic waterborne commerce with Alaska.

By weight, the most significant commodity carried to Washington State from Alaska is crude oil. Oil travels south from Alaska onboard tankers through the inland waterway, and is offloaded at refineries in Cherry Point, Ferndale, March Point, and Tacoma. In 2011 Washington received 16.1 million tons of crude oil from Alaska by water, constituting 95 percent of all freight coming into Washington State from Alaska by water and 82 percent of Washington's total domestic, waterborne trade with Alaska.[51]

According to the 2011 Marine Cargo Forecast, the relatively flat volume of Alaskan crude petroleum that landed in Washington State in previous years will begin to decrease as Alaskan production drops. The decline in domestic waterborne volumes from Alaska would be made up through a combination of waterborne foreign receipts and imports by pipeline. The refineries in the region are also expected to begin receiving crude oil by rail from North Dakota, which may impact waterborne volumes.[52]

In turn, consumer products and supplies leave Washington seaports for Alaskan markets. Almost 29 percent of waterborne cargo tonnage entering Alaska originated from Washington State in 2011.

Also in 2011, Washington's seaports sent more than 2.6 million tons of goods to Alaska. Manufactured goods constituted over 51 percent of this weight, or 1.3 million tons. In 2012 trade with Alaska made up over 8 percent of the Port of Tacoma's total trade value—$3 billion. Only China, Japan and South Korea and Taiwan had higher trading value through Port of Tacoma.[53]

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[49] WilburSmith Associates. *Inland Pacific Hub Multimodal Infrastructure Report, Final (May, 2010).* Retrieved as of October 2011 from: http://www.inlandpacifichub.org/documents/2.5%20Tech%20Memo%201/Technical%20Memorandum_1_final.pdf

[50] WSDOT. Washington State Freight and Goods Transportation System 2011 Update.

[51] U.S. Army Corps of Engineers Navigation Data Center - Waterborne Commerce Statistics Center. *2010 Commodity Movements from the Public Domain Database. State to State by Destination and Origin.* Retrieved as of May 2012 from: www.iwr.usace.army.mil/ndc/wcsc/wcsc.htm

[52] BST Associates. *2011 Marine Cargo Forecast: Technical Report.* December 2011.

[53] Port of Tacoma. *Facts and Stats: 2010 at a Glance.* Retrieved as of December 2011 from: http://www.portoftacoma.com/stats

Washington's Airports Are Gateways for High-Value and Time-Sensitive Goods

Between 1985 and 2000, world air cargo grew at an annual rate of 7.3 percent. Washington State has kept pace with the world market. Between 1985 and 2000, total air cargo volume at Seattle-Tacoma International Airport (Sea-Tac) and Boeing Field grew by 180 percent (an average annual growth rate of seven percent).[54] From 2000 to 2012, air freight moving through Sea-Tac has decreased by 36 percent. In 2010, air cargo handled at Washington airports totaled 1,350,534 tons (measured in plane plus cargo weight). Despite there being more than 20 airports in the state that can handle cargo, activity is highly concentrated at three Washington airports: about 51 percent of all air freight was handled at Sea-Tac International Airport, about 31 percent was handled at Boeing Field/King County International Airport, and about 18 percent was handled at Spokane International Airport.[55]

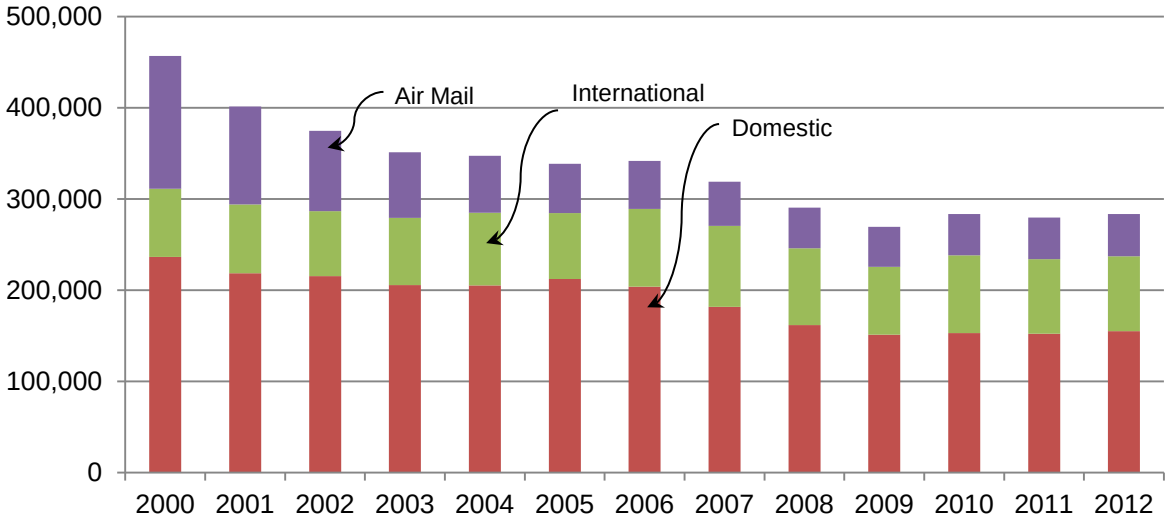
The Majority of Air Cargo Moves Through Sea-Tac

Sea-Tac ranks 21st in the U.S. by cargo volume in 2012. Total cargo passing through the airport in 2012 was over 283,500 metric tons, comprised of 155,170 tons of domestic freight, 82,041 tons of international freight, and 46,289 tons of air mail.

Exhibit 21 shows the history and trends for Sea-Tac's air cargo activity from 2000 through 2012. The last decade has seen a gradual decline in air freight moving through Sea-Tac International Airport. Since 2000, the volume of air mail fell significantly: 145,539 metric tons in 2000 compared to 46,289 in 2012. International freight volumes have remained stable as domestic freight volumes have declined, with 236,527 metric tons in 2000 compared to 155,170 in 2012.

Exhibit 21: Air Cargo Through Sea-Tac International Airport

Total Sea-Tac air freight, by category
In metric tons, 2000 - 2012

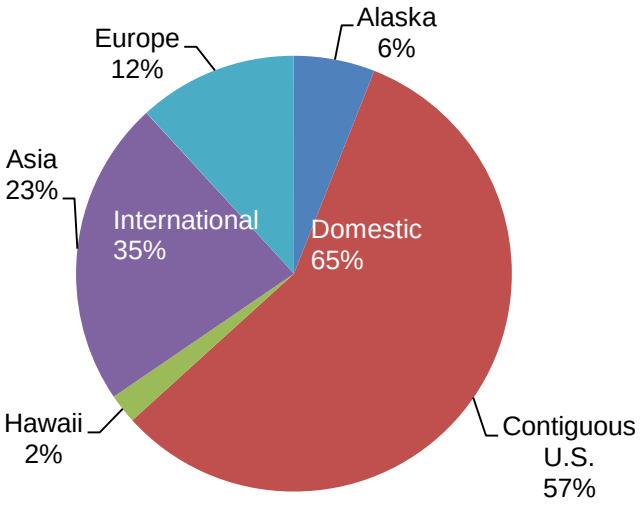


Data source: Port of Seattle.
Note: Data as reported to Port of Seattle by the airlines.

[54] Puget Sound Regional Council. *Regional Air Cargo Strategy Final Report.* (October 2006): Page IV-5.
[55] Federal Aviation Administration (FAA). *Qualifying Cargo Airports, Rank Order, and Percent Change from 2011.* (December 2013).
Federal Aviation Administration (FAA). *Qualifying Cargo Airports, Rank Order, CY2000.* (October 2001).

Exhibit 22 shows the split of air freight volume between U.S. and international destinations at Sea-Tac in 2010. As the exhibit reflects, 65 percent of air freight is domestic, and just 35 percent is bound for or arrives from Europe or Asia.

Exhibit 22: Seattle-Tacoma International Airport Air Freight 2012
Percent Based on Tons



Port of Seattle. 2012 Seattle-Tacoma International Airport Activity Report. Page 23. As report to Port of Seattle by the Airlines. Retrieved as of December 2013 from:
http://www.portseattle.org/About/Publications/Statistics/Airport-Statistics/Documents/2012-Airport-Activity-Report.pdf

King County International Airport/Boeing Field Air Cargo

Though readily overlooked in relation to Sea-Tac International when considering air passenger travel, Boeing Field holds its own in importance to freight movement in Washington. Boeing Field landed over 395,964 tons of cargo in 2012. This landed weight ranks Boeing Field only ten spots behind Sea-Tac nationally, at 29th.[56] Among the leading exports making their way out of Boeing Field are cherries, seafood, and fishing industry support materials, with about $3 million worth of cherries exported overseas. Seafood and electronics are the top import commodities.[57] Freight movement and other airport businesses have been estimated to generate $6.3 billion of direct economic impact and $2.8 indirect/induced economic impact regionally, and supported 18,408 direct jobs as well as 18,128 indirect/induced jobs in 2012.[58]

[56] Federal Aviation Administration (FAA). *Qualifying Cargo Airports, Rank Order, and Percent Change from 2011.* (December 2013).
[57] Transportation Issues Daily. *What do iPads and Seafood Have In Common? (*June 3, 2011). Retrieved as of December 2011 from: http://www.transportationissuesdaily.com/what-do-ipads-seafood-have-in-common/ .
[58] Washington State Department of Transportation. 2012 Aviation Economic Impact Study. Appendix C: Individual Airport Profiles. http://www.wsdot.wa.gov/aviation/waeconomicstudy.htm

Made in Washington: Freight Transportation Serves Washington State's Own Producers

Washington State has built strong and distinct regional economies based on industry and agriculture. These regional economies and their manufacturing, agriculture, construction, and forestry components depend, in turn, on an effective and efficient freight transportation system.

Our state's manufacturers and farmers rely on the freight system to ship Washington-made products to local customers, to large domestic markets in California and the East Coast, and worldwide. Washington producers generate wealth and jobs in every region of the state.

This chapter is organized by the state's major regions as shown in the map on the following page. Seven regions are profiled:

- **Southeast Washington**: home to major wheat production and an agricultural export center.
- **Columbia Basin and North Central Washington**: center for agricultural products including potatoes, apples, onions, and hay; wine grape growing and wine production; and timber harvesting.
- **Central Puget Sound**: a manufacturing center for Boeing aircraft and thousands of other mid-market manufacturers, with strong construction and maritime sectors.
- **Northeast Region**: the manufacturing and commerce center for the east side of the state.
- **Vancouver and Southwest Washington**: connected economically with the Portland, Oregon area, and connected from a transportation perspective by the Columbia River Bridge system and the Ports of Vancouver and Portland.
- **Northwest Washington**: with a focus on the U.S.-Canadian border connection.
- **Coastal Counties**: home to forestry and manufacturing products transport, including lumber production and exporting, as well as plywood and value-added wood products.

Exhibit 23: Washington State Regional Economies

Overview of the State's Production Economies

Agri-business, a key industry in the state, supports family farmers, food processors, and other agricultural businesses. In 2012 Washington State's agricultural business employed approximately 95,442[59] people, contributing up to $3.6 billion in state gross business income[60]. Food manufacturing contributed another $11.5 billion in state gross business income along with 34,608 more jobs. The transportation network is especially important for Washington's agriculture industry, since the state produces about three times as much food as it consumes, and is separated by long distances from the majority of the nation's consumers. In 2011Washington ranked third in the U.S. in value of food and agriculture exported, with more than $15 billion moving through the ports[61].

Manufacturing is rebounding in Washington State. In 2012 manufacturing Gross Business Revenues in Washington were $155.6 billion, which was 24 percent of the total State Gross Business Income and up 16.6 percent from 2007's nearly $133.3 billion[62]. In 2012, the sector employed 277,361 workers (9.6 percent of all jobs) and paid 12.8 percent of total wages in Washington. Average wages in manufacturing were $69,306 in 2012. Several manufacturing sub-sectors paid even more, including transportation equipment manufacturing with an average wage above $92,000. Value-added wood and paper products

[59] Washington State Employment Security Department. Quarterly Census of Employment and Wages, 2012 Annual Averages. Retrieved as of December 2013, https://fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/quarterly-census-of-employment-and-wages

[60] Washington State Department of Revenue. Quarterly Business Reviews. Calendar Year 2012. http://dor.wa.gov/content/aboutus/statisticsandreports/stats_qbr.aspx

[61] Washington State Department of Agriculture. Agriculture: A cornerstone of Washington's Economy. http://agr.wa.gov/AgInWA/

[62] Washington State Department of Revenue. Quarterly Business Reviews. Calendar Year 2012. http://dor.wa.gov/content/aboutus/statisticsandreports/stats_qbr.aspx

produced $14.1 billion of Washington's Gross Business Revenues in 2012.[63]

In their publication of personal income statistics, the Bureau of Economic Analysis (BEA) defines a set of "high wage jobs" as those in industries that have higher average earnings per job than the national average, which is calculated by dividing total earnings by the total number of jobs. Between 2003 and 2007, the percentage of jobs in "high wage" industries in Washington had been declining at a slowing pace. This trend finally changed in 2008 and again in 2009 before declining slightly in 2010 and again improving this past year. The percentage of jobs in "high wage" industries increased from 51.2 percent in 2010 to 51.8 percent in 2011. Despite the relatively strong increase for Washington, the state's rank dropped from 9th to 13th in 2011.[64]

Southeast Washington Sells Wheat to the World

Washington wheat growers produce five types of wheat: soft white, hard red winter, hard red spring, hard white and durum. In 2012 Washington ranked fifth nationally in wheat production (146.3 million bushels grown on 2.1 million acres), after Kansas, North Dakota, Montana, and Oklahoma.

Exhibit 24: Grain Elevator

Seventy-first percent of all wheat grown in Washington came from eight southeast Washington counties—Adams, Asotin, Columbia, Franklin, Garfield, Lincoln, Walla Walla, and Whitman—in 2012. Grant and Douglas Counties grew 12 percent of the total.[65] Whitman County has been the nation's top wheat producer every year since 1978. Despite the physical growing of wheat being concentrated to a few counties, the ripple effects of wheat production are felt throughout the state in the form of jobs and revenue in food processing, transportation, as well as wholesale and retail industries. Wheat's production value approached $1,139 million in 2012, making it the third highest yielding crop for the state by value. [66]

Over 52 percent of total US wheat was exported in 2012. Washington is one of the nation's leading wheat-exporting states, with 85 to 90 percent of its production exported each year. Harvested wheat is taken by farmers' grain trucks to on-farm storage or nearby commercial grain elevators. After the wheat is sold, it is transferred by truck to regional rail- or barge-loading facilities. Over 60 percent of Washington's wheat exports ultimately travel by barge from ports along the 400-mile Snake-Columbia river system to Portland. About 36 percent of the wheat is transported by rail to coastal grain terminals. From these seaport terminals, grain is loaded onto ocean freighters and exported to nations around the world. [67]

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[63] Washington State Department of Revenue. *Statistics and Reports, Gross Business Income*. Retrieved October 2011 from: http://dor.wa.gov/content/aboutus/statisticsandreports/TID/StatisticsReports.aspx?query=gbinaics

[64] Economic Review and Forecast Council (ERFC). *Washington State Economic Climate Study. December 2012, Volume XVII.* Retrieved December 2013 from: http://www.erfc.wa.gov/publications/documents/climate2012.pdf

[65] United States Department of Agriculture: Washington Agricultural Statistics Service. 2011 Washington Annual Agricultural Bulletin. Retrieved as of June 2012 from: http://www.nass.usda.gov/Statistics_by_State/Washington/Publications/Annual_Statistical_Bulletin/annual2011.pdf

[66] Washington Grain Commission. *Washington Wheat Facts 2012-2013.* Retrieved as of December 2013 from: http://www.wawg.org/core/files/wawg/uploads/files/2012WF4Web.pdf

[67] Washington Grain Commission. *Washington Wheat Facts 2012-2013.* Retrieved as of December 2013 from: http://www.wawg.org/core/files/wawg/uploads/files/2012WF4Web

Effective and efficient in-state transportation—from field to ship waiting at a Columbia River port—determines whether eastern Washington wheat farmers can compete internationally. Global wheat prices typically include delivery to port, so every cent of in-state transportation cost reduces farmers' profit by an equivalent amount. Washington State wheat growers get a big boost from our state's low-cost multimodal system that allows them to deliver commodity goods on demand to global markets.

Recent extended lock outages along the Columbia River System provided ample opportunity to evaluate the importance of the river system to wheat movement. The scheduled maintenance outage was conducted between December 2010 and March 2011 and eliminated barge traffic on much of the upper Columbia River and the entirety of the Snake River system. Additionally, the outage placed increased demands on other modes of transportation. Between 1991 and 2010 downriver tonnage of commodities exceeded 139 million tons. Over this period, wheat comprised about 70 percent, or 96 million tons of the total 139 million tons, of commodities transported downriver.

During the months of January and February of the three-year period leading up to the lock outage, wheat movement constituted in excess of 80 percent of the tonnage moving down river. [68]

In the months leading up to the lock outage, researchers with the Freight Policy Transportation Institute (FPTI) at Washington State University conducted a survey of wheat elevators in the Pacific Northwest. Of the elevators surveyed in the southeast Washington region, 97.5 percent moved their wheat by truck-barge, 1.5 percent by rail and one percent by truck. These eight elevators processed more than a third of all Pacific Northwest wheat. Elevators in Northern Washington, generally north of I-90, handled another third of the wheat; however, these elevators typically move their wheat by rail, 71 percent, with only 15 percent moving by truck-barge. Exhibit 24 below elucidates the variation in transportation costs in the two Washington regions. Northern Washington wheat firms pay $0.52 per bushel for trucking, $0.57 per bushel for truck-barge and $0.54 per bushel for rail. Southern Washington wheat firms pay $1.12 per bushel to truck wheat, $0.47 per bushel to barge wheat and $0.55 to rail wheat. [69]

Exhibit 25: Transportation Rates by Wheat Elevator Firms

Region	Average Rate in Cents per Bushel (Lower Columbia Terminals)		
	Direct Truck to Final Market	Truck-Barge	Rail
Eastern Oregon	$0.50	$0.29	$0.58
Northern Idaho	$1.50	$0.58	$0.73
Southern Idaho	$0.71	$0.86	$0.83
Northern Washington	$0.52	$0.57	$0.54
Southern Washington	$1.22	$0.47	$0.55
Pacific Northwest	$0.89	$0.55	$0.65

Simmons, Sara and Ken Casavant. FPTI Research Report #2. "Industry Preparations for the Columbia-Snake River Extended Lock Outage, July – December 2010." February 2011.

During the lock outage, transportation adjustments had to be made by all parties involved in the movement of wheat and other commodities up and down the river system. Class I rail operators increased the number of weekly trains, mostly the number of trains moving west to accommodate wheat. Wheat producers and

[68] Simmons, Sara and Ken Casavant. FPTI Research Report #1. "Historical Waterborne Commerce on the Columbia-Snake River System: Commodity Movements Up and Down River, 1991-2010." November 2010.
[69] Simmons, Sara and Ken Casavant. FPTI Research Report #2. "Industry Preparations for the Columbia-Snake River Extended Lock Outage, July – December 2010." February 2011.

state commissions spread the word of the disruption and prepared for the changes by increasing movement prior to the lock outage as well as increasing storage capacity. Movement of wheat through the barge system in the months leading up to the outage was 15 percent higher than average. The high prices of wheat at this time made the choice to move more wheat sooner, a relatively easy choice for many producers.[70]

According to industry interviews conducted by FPTI researchers, wheat shipments that normally moved by barge transportation under normal conditions were moved by truck and rail during the lock outage. With several 110 railcar loading facilities in the Pacific Northwest including those located in eastern Washington shippers planned to take on high volumes of wheat during the lock outage. Ritzville Warehouse Company, a grain elevator in Washington expected three times the normal winter business during the lock closure. These railcar loading facilities have access to hundreds of miles of track and elevators, making this mode efficient and affordable, more so than direct trucking, for traditional barge customers. Southern Washington elevator firms typically moving 35 percent of the wheat between December and March, moved only 4 percent of the wheat during the outage, a 95 percent decrease, reflecting their great dependence on the barge system.[71]

The Columbia Basin and North Central Washington: Agricultural Growing and Processing Center

In 2012, 141,550 jobs in the Columbia Basin and North Central Washington regions were directly dependent on the efficiency of our freight system: 63,477 in agriculture and forestry, 20,317 in manufacturing (processed food and other sectors), 6,305 in transportation, warehousing, and utilities, 41,012 in wholesale or retail trade, and 10,439 in construction.[72] This region is a national center of apple, potato, onion, hay, wine, and lumber production.

Washington State, the second largest potato producing state in the country[73], produced 9.76 billion pounds of potatoes on 160,000 acres in 2012, for an average of 59,500 pounds per acre. The industry harvested $734 million in potatoes, representing the state's third largest agricultural crop. These sales produced over $4.6 billion in total value for the State's economy.[74]

According to the Washington Potato Commission, Washington-based processors turn nearly 87 percent of the annual potato yield into value-added products, increasing the value of the crop nearly six-fold. Nine out of every ten of the state's potatoes are marketed outside of Washington; exports to overseas market account for a significant portion of sales. Potatoes contributed to the State's economy with over $593 million of our value-added potatoes being exported annually through State ports.[75]

In the 2012-2013 crop year, over 40.5 million boxes of Washington State apples, each weighing about 42 pounds, were harvested and exported to more than 60 countries around the world. These exports annually

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[70] Simmons, Sara and Ken Casavant. FPTI Research Report #2. "Industry Preparations for the Columbia-Snake River Extended Lock Outage, July – December 2010." February 2011.
[71] Simmons, Sara and Ken Casavant. FPTI Research Report #9. "Industry Reactions to the Columbia-Snake River Extended Lock Outage, December 2010-March2011." June 2011.
[72] Washington State Employment Security Department. Quarterly Census of Employment and Wages: 2012 Annual Averages. Retrieved as of December 2013 from: https://fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/quarterly-census-of-employment-and-wages Values include Benton, Chelan, Douglas, Grant, Kittitas, Klickitat, Okanogan, and Yakima Counties.
[73] The Washington State Potato Commision. Washington State Potatoes and the Economy. Retrieved as of June 2012 from: http://www.potatoes.com/industryinformation.cfm
[74] Washington State Potato Commission. *Spud Facts 2013.*
[75] Washington State Potato Commission. *Spud Facts 2013.*

account for about 30 percent of the state's apple harvest and primarily come out of north central Washington and the Columbia Basin.[76] In 2012 Washington State produced a total of 3.25 million tons of apples. Washington State consistently ranks number one nationally in apple production, and grew 71.7 percent of all U.S. apples in 2012. Apples topped the list of all Washington State agricultural products with the value of production nearly $2.25 billion, representing 22.3 percent of total agricultural value in 2012.[77]

Exhibit 26: Loading a log truck

With more than 750 wineries and over 350 wine grape growers on 43,000 acres, Washington was the second largest premium wine producer in the United States in 2012. The retail value of production was $1.47 billion, with more than $8.6 billion total economic impact on Washington State and $14.9 billion total economic impact on U.S. economy in 2010/2011. The wine industry supported 27,455 wine-related jobs in Washington, and 68,719 nationwide. Washington has thirteen recognized American Viticulture Areas (AVA): Yakima Valley, Walla Walla Valley, Columbia Valley, Puget Sound, Red Mountain, Columbia Gorge, Horse Heaven Hills, Wahluke Slope, Rattlesnake Hills, Snipes Mountain, Lake Chelan, Naches Heights, and Ancient Lakes of Columbia Valley. The Columbia Valley is Washington's largest viticultural region and makes up 99 percent of the state's total acreage of wine grape producers. Large scale wine production is concentrated in Benton, Grant and Yakima counties, accounting for 74 percent of the state's total production[78]. Shipments of Washington wine go to all 50 states and more than 40 countries; 12 million cases were shipped in 2012 from a record harvest of 188,000 tons.[79]

Timber sales from tribal lands, such as those owned by the Confederated Tribes of the Colville Reservation and the Yakama Nation, have become an important industry in eastern Washington. Despite a large majority of the State's timber harvest occurring in western counties, just over 393 million board feet was harvested from eastern Washington private, state and federal lands in 2012. Stevens, Klickitat, and Pend Oreille Counties were the highest producers in the Columbia Basin and North Central Washington region, accounting for 64 percent of the total harvest from eastern counties.[80]

Central Puget Sound: Manufacturing, Construction, and Maritime Center

In 2012 620,173 jobs in Central Puget Sound directly depended on the freight system to produce and ship goods: 188,350 in manufacturing, 280,785 wholesale trade, 60,038 transportation/utilities, 84,786

[76] Washington Apple Commission. *International.* Retrieved as of December 2013 from: http://www.bestapples.com/international/index.aspx

[77] USDA-NASS. *2013 Washington Annual Agricultural Bulletin.* Retrieved as of December 2013 from: http://www.nass.usda.gov/Statistics_by_State/Washington/Publications/Annual_Statistical_Bulletin/annual2013.pdf

[78] Stonebridge Research: Economic Impact of Washington Wine, April 2012. Prepared for Washington State Wine Commission.

[79] Washington Wine Commission. *State Facts.* Retrieved as of December 2013 from: http://www.washingtonwine.org/wine-101/state-facts/

[80] Washington Department of Natural Resources. *Washington Timber Harvest 2012.* Retrieved as of December 2013 from: http://www.dnr.wa.gov/BusinessPermits/Topics/EconomicReports/Pages/obe_washington_timber_harvest_reports.aspx

in construction, and 6,214 in agriculture. [81]

The Boeing Company, employing 84,400 statewide in August 2013, is Washington's largest manufacturer. Boeing Commercial supported $70 billion in revenues to the state economy from delivery of 601 airplanes in 2012. The 777 program alone contributes $20.1 billion in economic activity, generates 56,600 jobs, and yields $132.9 million in state tax revenues annually[82]. A total of 2,800 Boeing suppliers and vendors are located in Washington, and in 2010 Boeing purchased from Washington suppliers and vendors totaled nearly $3.36 billion[83].

Boeing's manufacturing supply chain covers the region, state, nation, and the globe. Its exports, though generally flown directly overseas from Boeing's assembly plants, lift Washington State from an 'average' exporting state to one of the highest rate of export value per citizen in the country. Boeing's customers span more than 90 countries, producing total revenue of $81.7 billion in 2012[84]. In 2012, the Boeing Commercial delivered 601 airplanes to customers, a growth of 139 airplanes since 2010.

To manage such a production, Boeing maintains established manufacturing, service and technology partnerships around the world through contracts with 22,000 suppliers and partners. Exhibit 27 shows the distribution of aerospace suppliers by county and activity in Washington State.

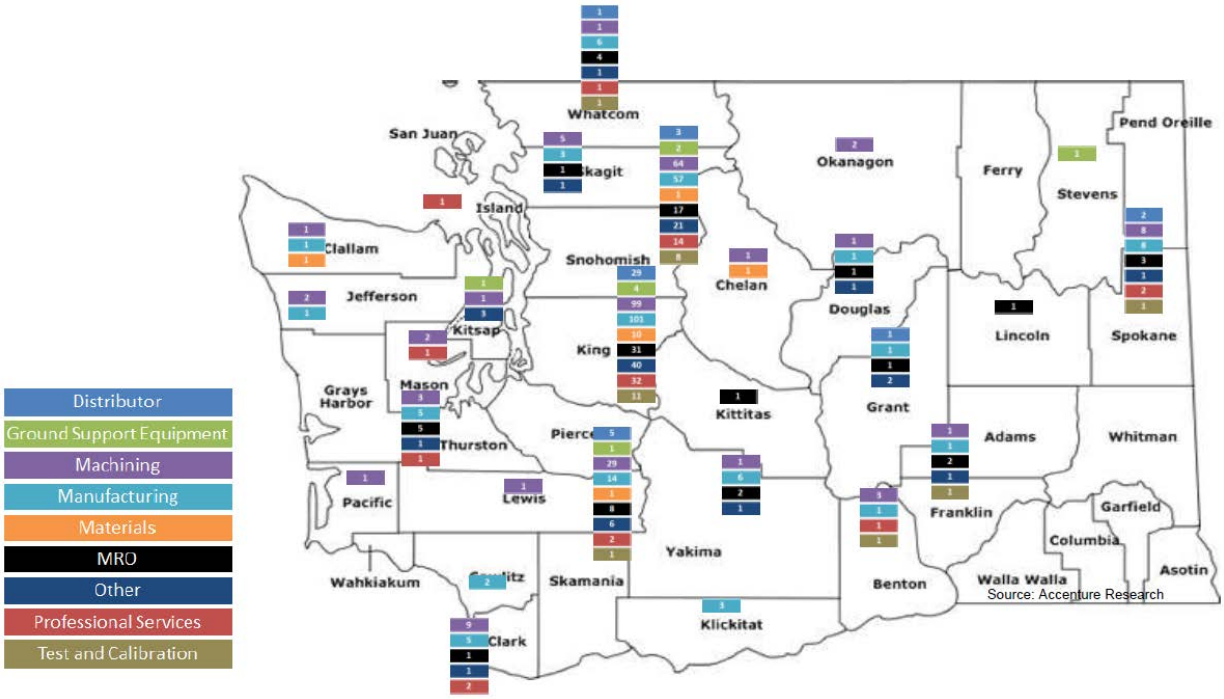
[81] Washington State Employment Security Department. Quarterly Census of Employment and Wages: 2012 Annual Averages. Retrieved as of December 2013 from: https://fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/quarterly-census-of-employment-and-wages Values include Island, King, Kitsap, Pierce, Snohomish, and Thurston Counties.

[82] The impact of the Aerospace Industry in Washington State. Retrieved December 2013 from http://www.psrc.org/assets/10415/Boeing777X-FMRT20131206.pdf

[83] Washington Aerospace Partnership. Aerospace competitiveness Study. November 15, 2011. Retrieved June 2012 from http://www.washington-aerospace.com/study/Washington%20State%20Aerospace%20Partnership%20Competitiveness%20Report%20FINAL.pdf

[84] Boeing News Release. Retrieved December 2013 from: http://www.boeing.com/assets/pdf/news/releases/2013/q1/130130_nr.pdf

Exhibit 27: Washington Aerospace Suppliers – by County and Activity



Source: Washington Aerospace Partnership. Aerospace competitiveness Study. November 15, 2011. Retrieved June 2012 from http://www.washington-aerospace.com/study/Washington%20State%20Aerospace%20Partnership%20Competitiveness%20Report%20FINAL.pdf

Boeing is greatly dependent on the central Puget Sound transportation system. Within their site services division alone, the company manages and maintains over 5,400 assets including everything from SUVs and limos, to buses and vans in support of product-buying customers and events. Passenger services in 2008 accounted for 4.6 million miles in support of freight movement between Boeing sites, pick-up service to/from local suppliers, airport transfer of freight, and aircraft fueling operations. These freight service fleets include semis, vans, trailers, fueling and straight trucks and specialized equipment.[85] According to Boeing, congestion is the greatest problem that must be taken into consideration for fleet support services. For a 75 mile trip from Frederickson to Everett, anywhere from 1.5 to 3 hours can be experienced.

The Central Puget Sound region also includes thousands of mid-size manufacturers that receive raw materials and ship finished goods to market. Aerospace subcontractors machine and bend high-tech metals; processed food companies package cookie and muffin mix, mints, and vitamins; various manufacturers mix printers inks and coatings, and form energy-efficient windows and composite decking for homes. In 2012, 2,160 manufacturing firms were doing business in King County, 749 in Snohomish County, and 561 in Pierce County.[86]

[85] Boeing Company. Presentation to the Regional Freight Mobility Roundtable (June 20, 2009).
[86] Washington State Employment Security Department. Quarterly Census of Employment and Wages: 2012 Annual Averages. Retrieved as of December 2013 from: https://fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/quarterly-census-of-employment-and-wages

Central Puget Sound Maritime Cluster

Building on Washington's natural advantages: proximity to some of the world's most productive fisheries, rich history of timber production, deep water ports, fresh water berths, and supported by a multi-modal freight system, Washington's maritime cluster employed more than 57,700 people directly in the state, and was responsible for $15.2 billion in gross business income in 2012. The maritime industry in Washington State generated a total of $30 billion in direct, indirect and induced revenues in 2012 and a total impact of 148, 000 Washington jobs. The 2,090 maritime businesses statewide fall into five core subsectors: Passenger Water Transportation; Boat and Ship Building, Repair, and Maintenance; Maritime Logistics and Shipping; Fishing and Seafood Products; and Maritime Support Services. Fishing and Seafood Processing accounted for nearly 60% of total revenues, and Maritime Logistics and Shipping was the second largest contributor, at nearly 25% of total revenues[87].

The largest concentration of Maritime activities is within the Central Puget Sound region. Approximately 41% of all direct Maritime employment is located in King County, with another 24% in Kitsap and 8% in Pierce.

Seattle: Home of the North Pacific Fishing Fleet

Four of the top ten largest seafood companies in North America are headquartered in Central Puget Sound, with combined revenues of $3.0 billion in 2011, according to Seafood Business Magazine. These companies include Tri Marine International, which reported in excess of a billion in sales. Tri Marine International of Bellevue, Wash., is a vertically integrated tuna company that supplies some of the biggest tuna canners in the world. It has a global a global network of fishing boats, processing plants and refrigerated carriers at or near productive fishing grounds[88].

Fish products exported out of the Seattle District accounted for roughly 40 percent of the Pacific Region's $4.0 billion in exports in 2012.[89] Anywhere from 200 to 270 fishing and processing vessels may be berthed at Fisherman's Terminal in a particular month. In 2012 the commercial fisheries landings at Washington State brought 0.21 million pounds of fish with a total value of $ 275.6 million[90].

Before every fishing season, vessel owners repair and restock their boats with fuel, groceries, bait, and fishing gear that comes by truck in the local distribution system. Upon their return, the catch is typically trucked to a cold storage facility, trucked to a secondary processing center, trucked to another cold storage facility, and then trucked to its final destination. Exhibit 28 shows the location of Seattle maritime establishments.

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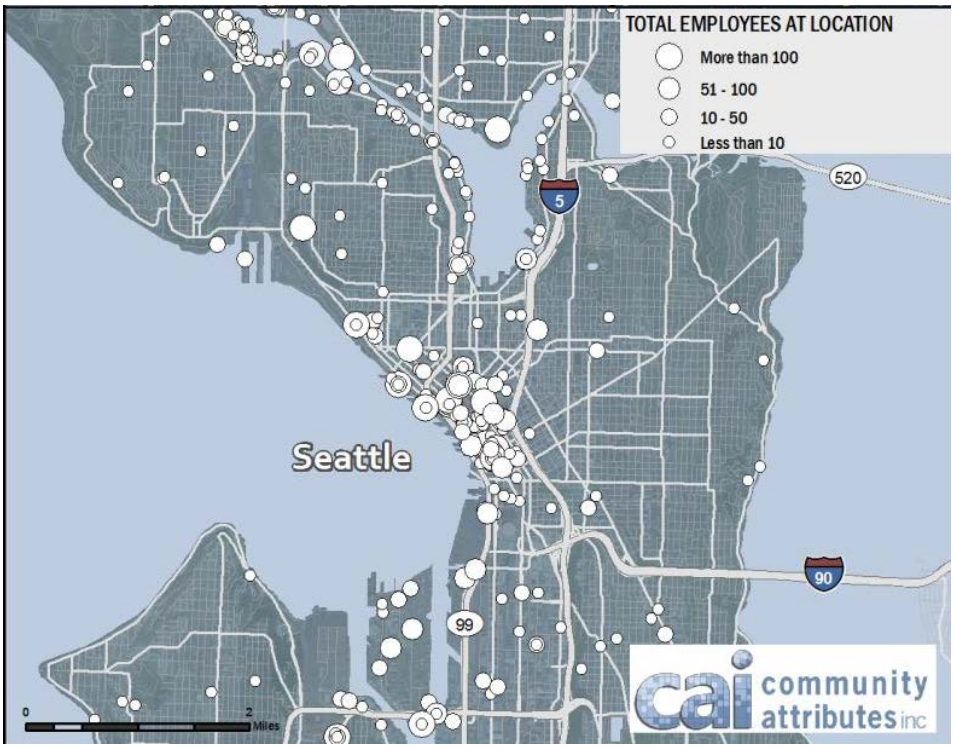
[87] Washington State Maritime Cluster. Economic Development Council of Seattle and King County. November 2013. Retrieved from: http://edc-seaking.org/wp-content/uploads/2013/11/CAI.WA-Maritime-Cluster-Study.2013-1120.pdf

[88] The Top 20 North merican seafood supplier' 2011 sales near $11 billion. Seafood Business. Retrieved January 2014 from: http://www.seafoodbusiness.com/articledetail.aspx?id=15408

[89] NOAA Fisheries: Office of Science and Technology. *Annual Trade Data by Product through U.S. Customs Districts.* Retrieved as of December 2013 from: http://www.st.nmfs.noaa.gov/st1/trade/annual_data/TradeDataAnnualDistrictAllProducts.html .

[90] NOAA Office of Science and Technology. *Annual Commercial Landing Statistics.* Retrieved as of January 2014 from: http://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/annual-landings/index

Exhibit 28: Maritime Establishments in Seattle, 2012



Source: Community Attributes; Washington State Employment Security Department (2013); Hoovers (2013).

The Alaskan Way Viaduct is the most direct connection between the fleet based in Ballard/ Interbay and marine services located in the Duwamish manufacturing industrial center. Seismically vulnerable and approaching the end of its useful life, the Alaskan Way Viaduct (SR 99) has been slated for replacement. A major portion of the reconstruction will be the creation of a bored tunnel under downtown Seattle that then reconnects to the street grid at either end. The viaduct along Seattle's waterfront will be removed; however, operation of SR 99 will remain viable throughout the tunnel creation until completion in 2016.[91]

Northeast Region: Eastside Center of Manufacturing and Commerce

In 2012, 67,039 jobs in the Northeast region are directly dependent on the freight system: 16,071 in manufacturing, 35,649 in wholesale and retail trade, 9,068 in construction, 5,364 in transportation and warehousing, and 887 in the agricultural, forestry, and fishing sector. The regional health care center receives vital supplies via the I-90 corridor.[92]

Spokane County serves as the regional hub for health care and specialized health services, retail, education, business and industry, and cultural activities in Inland Northwest. To the east of the City Spokane in Orchard Park and Liberty Lake, a high technology manufacturing cluster has developed. Other

[91] WSDOT. *SR 99 – Tunnel Project.* Retrieved as of December 2011 from: http://www.wsdot.wa.gov/Projects/SR99/Tunnel/ .

[92] Washington State Employment Security Department. Quarterly Census of Employment and Wages: 2012 Annual Averages. Retrieved as of December 2013 from: https://fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/quarterly-census-of-employment-and-wages Values include Ferry, Spokane, Stevens, and Pend Oreille.

manufacturing firms have concentrated east near Liberty Lake and to the west near US 2 and I-90.

Spokane has a strong manufacturing industry and approximately 16,000 jobs are held at 600 manufacturing businesses in the Spokane Region, including companies focused on aluminum casting, metal products for the semiconductor industry, pharmaceutical products and devices for the medical industry. The aerospace industry is a growing manufacturing sector in Spokane with more than 80 manufacturers, suppliers, distributors, and service organizations providing products to the industry.

Transportation and warehousing sector is an increasingly important element of the economic growth of the Spokane region. Key businesses such as Spokane international Airport and Spokane Business & Industrial Park continue to foster growth through the development of commercial property and bring in new companies to take advantage of well-connected multimodal transportation system. Recent decisions by companies such as Caterpillar Inc. to locate a new 500,000 square foot logistics and distribution center in Spokane and the continued growth of aviation and related transportation cluster indicates ongoing new investment and job creation for this sector[93].

Tri-Counties (Ferry, Stevens, and Pend Oreille) are located in the rural area of North Eastern Washington State and have an economic history closely tied to the land. Agriculture, forestry and mining are what brought many people to the area. However, the region has transitioned to an economic base led by the services industry sector, as seen by sector's increasing importance with respect to employment and income shares. Historic job losses in the timber and wood products industry combined with more stricter federal and state regulations of logging and resource industries has resulted in more recent closures and downsizing[94].

Vancouver: Southwest Washington's Metropolitan Area

In the Southwest region 71,243 jobs depend on the freight system: 21,187 in manufacturing, 30,670 wholesale/retail trade, 11,101 construction, 5,290 transportation/warehousing, and 2,995 agriculture.[95]

Clark County's (438,287 population, 2012[96]) economy is integrally linked with that of the larger Portland-Vancouver metropolitan (2.29 million population, 2012[97]) area. Downtown Vancouver and Portland are just nine miles apart, yet separated by the Columbia River. The Vancouver/Portland metro region is connected by two bridges over the Columbia River on I-5 and I-205, while comparable metro areas such as Kansas City (pop. 2.34 million) has ten bridges and Cincinnati (pop. 2.14 million) has seven river bridges.

The ports along the Columbia River in Clark County are dominated by dry-bulk and break-bulk exports and

[93] Spokane Area Workforce Development Council. Workforce Data & Tools: Targeted Industries. Retrieved January 2014 from: http://www.wdcspokane.com/targeted-industries

[94] Tri-County Economic Development District. Tri-County Economic Development District Comprehensive Economic Development Strategy, 2013-2017. June 2013.

[95] Washington State Employment Security Department. Quarterly Census of Employment and Wages: 2012 Annual Averages. Retrieved as of December 2013 from: https://fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/quarterly-census-of-employment-and-wages Includes Clark, Cowlitz, Lewis, and Skamania Counties.

[96] U.S. Census Bureau. *State and County QuickFacts, 2012.* Retrieved as of January 2014 from: http://quickfacts.census.gov/qfd/states/53/53011.html

[97] U.S. Census Bureau. *State and County QuickFacts, 2012.* Retrieved as of January 2014 from: http://quickfacts.census.gov/qfd/index.html . The Portland Vancouver Metropolitan area includes the Oregon Counties of: Clackamas, Columbia, Multnomah, Washington, and Yamhill; and the Washington Counties of Clark and Skamania.

are a significant intermodal point for truck, rail and barge. Congestion, travel-time reliability and need for additional capacity have been identified as key issues for truckers in the county. Additional concerns for rail include congestion, port access and mainline capacity.

Beginning in 2007, the Port of Vancouver began a ten year concerted effort to create jobs and generate revenue by investing in freight rail infrastructure. The West Vancouver Freight Access (WFVA) project aims to reduce freight movement inhibitors not only within the port, but also along the BNSF Railway and UP Railroad mainlines. The project expects to reduce delays in rail traffic by as much as 40 percent. To date, the project has completed a unit-train facility at the newly developed Terminal 5, as well as rail improvement near the city of Vancouver's waterfront redevelopment. The completion of these projects is anticipated to yield 1,000 new, long term jobs. In the interim, 1,900 jobs are involved in the construction of the projects.[98]

Most of the freight-related jobs in Clark County are located within five miles of the Columbia River, nearly 30 percent in the urbanized area of Clark County in the vicinity of I-5, I-205, and the Columbia River. There are also pockets north and south of this area which are major centers of freight-related employment. Clark County's freight dependent sectors have a direct impact of over 66,000 jobs, producing an income of $3.2 billion. When including indirect and induced effects, these sectors impact over 130,000 jobs. Southwest Washington hosts several freight intensive industries. Five sectors account for half of the freight movement in the Portland-Vancouver area. These sectors are petroleum products, minerals, food and beverages, wood products, and grain. The majority of freight moving in Clark County—55.2 percent by ton—is carried by truck. The remainder moves by ocean (18.3 percent), rail (17.3 percent), barge (7.0 percent), pipeline (2.0 percent), and air (0.1 percent). The most heavily traveled truck routes by shippers and carriers in Clark County are I-5, I-205, Mill Plain, Fourth Plain, SR 14, and I-84. Interstate bridges are very critical and used by 90 percent of shippers and 100 percent of motor carriers.[99]

Northwest Washington

In 2012, 52,970 jobs in northwest Washington depend on the freight system: 13,850 in manufacturing, 21,296 wholesale and retail trade, 8,118 in construction, 3,484 in the transportation/utilities sector, and 6,222 in agriculture.[100]

Washington's 158 million cubic feet of public refrigerated warehouse space ranks seventh in the nation.[101] Bellingham Cold Storage (BCS) is the largest portside cold storage facility on the West Coast and the largest cold storage in Washington State, with 0.55 million square feet of cold storage space and three dedicated chill warehouses and three dry storage warehouses.. BCS has a 1000-foot deep-water dock and 200-foot fishing vessel dock. Additionally, BCS maintains 50 truck loading bays and 9 railcar bays[102].

Northwest Washington not only has a strong domestic manufacturing sector, it has unique transport issues related to the Canadian – U.S. border. Between 1994 and 2000, U.S. trade with Canada increased from $243

[98] Port of Vancouver. *West Vancouver Freight Access Project.* Retrieved as of December 2011 from: http://www.portvanusa.com/industrial-property/west-vancouver-freight-access-project .
[99] Southwest Washington Regional Transportation Council. *Clark County Freight Mobility Study, Summary report. (December 2010).* Retrieved as of November 2011 from: http://www.rtc.wa.gov/studies/freight/ .
[100] Washington State Employment Security Department. Quarterly Census of Employment and Wages: 2012 Annual Averages. Retrieved as of December 2013 from: https://fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/quarterly-census-of-employment-and-wages. Includes San Juan, Skagit, and Whatcom Counties.
[101] USDA. *Capacity of Refrigerated Warehouses 2011 Summary, (January 2012).* Retrieved as of November 2011 from: http://usda.mannlib.cornell.edu/usda/current/CapaRefrWa/CapaRefrWa-01-28-2010.pdf
[102] Bellingham Cold Storage. Retrieved January 2014 from: http://www.bellcold.com/services/

billion to $406 billion, an average annual growth rate of 8.9 percent. Trade continued to increase through 2008, reaching $596 billion before falling back to $430 billion in 2009 and $525 billion in 2010, increased to $596 billion in 2011, and topped $616 million in 2012.[103] Truck traffic across the Washington – British Columbia border through Cascade Gateways has continued to grow since 2002. In 2002 trade via truck was valued at $11.1 billion. This trade mode increased to $18.3 billion in 2008, dropping back to $14.6 in 2009, and topped $19.9 billion in 2012.[104]

Coastal Counties: Forestry and Manufacturing

In 2012, 23,878 jobs in Jefferson, Clallam, Grays Harbor, Mason, Pacific, and Wahkiakum Counties were in freight-dependent industries: 7,061 in manufacturing, 2,852 in construction, 1,154 in the transportation and utilities sector, 2,497 in agriculture and forestry, and 10,314 wholesale/retail trade.[105] Fifty-four percent of Mason County's total manufacturing employment was in the forest products sector in 2012, as was 44 percent in Grays Harbor County.[106]

Of Washington's 43 million acres, approximately 21 million are forested[107]. Over 90 percent of Pacific County is in forestland. Over 88 percent of Grays Harbor County's land is in renewable forests; timber harvests in the two counties combine annually to produce over 500 million board feet. The whole Coastal Counties region produced about 1 billion board feet in 2012.[108]

Resource-based industries, such as forestry and agriculture, rely heavily on county roads to move product to highways and on to market. Much of the log truck operations in Washington is characterized by small, independent operators.

Forty-three percent of Washington's forests are privately owned; 31 percent of these lands are managed by the forest products industry for timber production. These lands account for 79 percent of the timber harvested in the state in 2012; federal timber harvests currently account for only three percent of Washington's annual harvest of approximately 2.7 billion board feet.

The forest industry in Washington is the second largest in the nation, behind Oregon, with about ten percent of U.S. forestry employment. Employment in forest products industries declined in both Washington, by 300 jobs, and Oregon, by 900 jobs, in 2011 from 2010 numbers. Employment in forest products industries in Washington has steadily declined in the 21st century. In 2000, 49,000 jobs were supported by lumber and wood products as well as paper and allied products. In 2011, employment has dropped to roughly 25,800.

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[103] BTS. *North American Transborder freight Data.* Retrieved as of January 2014 from: http://www.bts.gov/programs/international/transborder/TBDR_QA.html . Data aggregated on all U.S. States, all Ports, and all Modes.

[104] BTS. *North American Transborder freight Data.* Retrieved as of January 2014 from: http://www.bts.gov/programs/international/transborder/TBDR_QA.html . Data aggregated at the state level by truck.

[105] Washington State Employment Security Department. Quarterly Census of Employment and Wages: 2012 Annual Averages. Retrieved as of December 2013 from: https://fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/quarterly-census-of-employment-and-wages.

[106] U.S. Census Bureau. *2011 County Business Patterns (NAICS).* Retrieved as of January 2014 from: http://censtats.census.gov/cgi-bin/cbpnaic/cbpdetl.pl .

[107] Washington's Forests, Timber Supply, and Forest-related Industries. Retrieved as of June 2012 from: http://www.dnr.wa.gov/Publications/em_fwfeconomiclow1.pdf

[108] Washington Department of Natural Resources. *Washington Timber Harvest 2012.* Retrieved as of January 2014 from: http://www.dnr.wa.gov/BusinessPermits/Topics/EconomicReports/Pages/obe_washington_timber_harvest_reports.aspx

During the last decade, Washington lumber production has declined from nearly 4.2 billion board feet in 2000, to about 2.7 billion in 2011. Washington maintains about 10 percent of the nation's total softwood lumber production. Over 11 billion board feet of softwood lumber was harvested in the Western United States in 2011, 26 billion nationwide. Softwood lumber exports from the Seattle and Columbia-Snake customs districts has been increasing steadily since 2006. The two districts exported 675 million board feet in 2011, compared to 568 million board feet in 2010. The average value of lumber exports in the two districts increased from $642 in 2010 to $668 in 2011.

Large volumes of lumber imports coming from Canada and South America affect Washington lumber producers and freight patterns. The Seattle customs district imported 1.1 billion board feet of lumber in 2011, mostly from Canadian production. [109]

In recent years, the state of Washington has demonstrated interest in increased promotion of Green Jobs. In 2009 the state legislature enacted the Evergreen Jobs Act (ESSHB 2227), establishing a goal of 15,000 new green jobs by 2020. Green Jobs specifically refer to those engaged in increasing energy efficiency, producing renewable energy, preventing and reducing environmental pollution, and providing mitigation or cleanup of environmental pollution. In the Legislature's follow up survey to the Jobs Act, the employment security department found that the number of green jobs identified by employers is growing and that green jobs exist in virtually every industry across the state.[110]

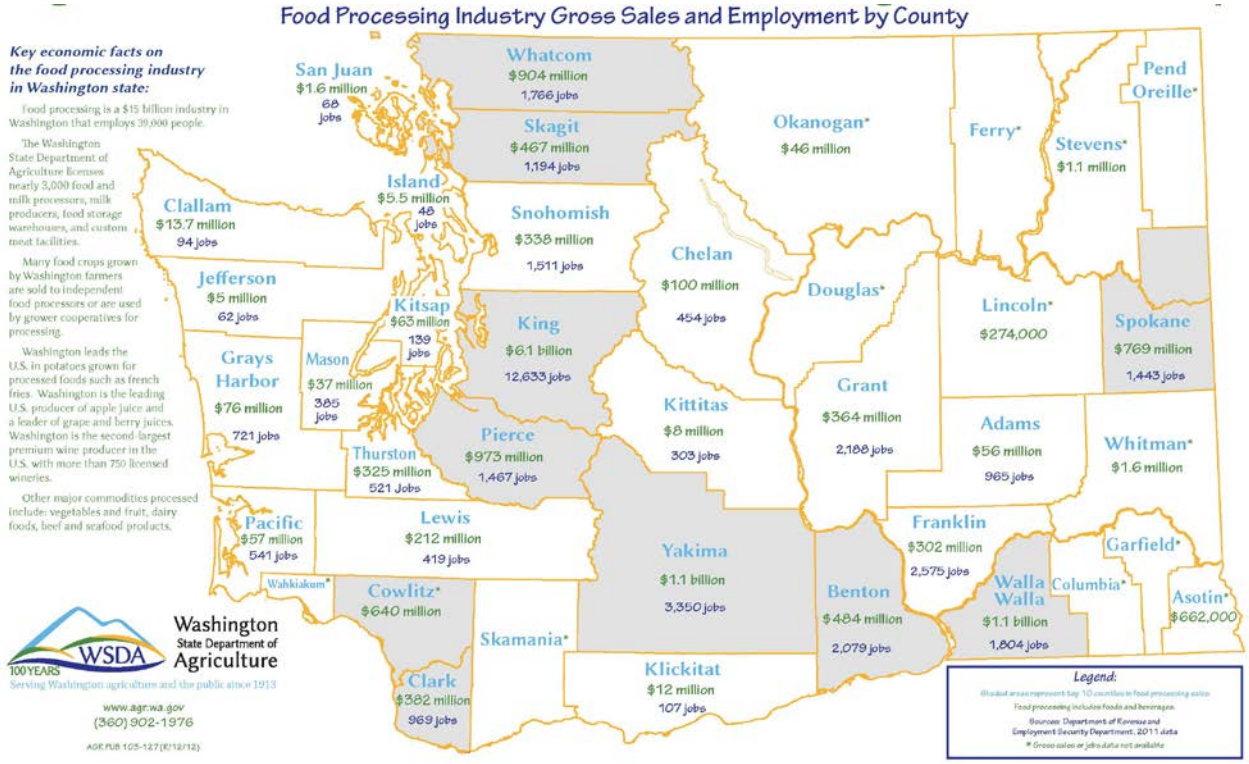
The Coastal Counties are also important for specialty agricultural crops including nursery stock, Christmas trees, cranberries, and aquaculture, as well as milk and cattle production. The region's food processing industry supports over 1,803 jobs generating a total of $188 million in gross sales (Exhibit 29).[111]. All of these products must reach the I-5 corridor for export markets.

[109] USDA – Forest Service. Production, Prices, Employment, and Trade in Northwest Forest Industries, All Quarters 2011. Retrieved as of January 2014 from: http://www.fs.fed.us/pnw/pubs/pnw_rb264.pdf

[110] Washington State department of Commerce. *Evergreen Jobs Initiative: Recovery Act Funds in Washington.* Retrieved as of December 2011 from: http://www.wtb.wa.gov/EvergreenJobsTeam.asp .

[111] Washington State Department of Agriculture. *Agriculture-A Cornerstone of Washington's Economy.* Retrieved as of January 2014 from: http://agr.wa.gov/AgInWa/docs/127-FoodProcessingMap12-12.pdf

Exhibit 29: Food Processing Industry Gross Sales and Employment by County



Data source: Washington State Department of Agriculture. Top Crops & Food Processing Industries. Retrieved as of January 2014 from: http://agr.wa.gov/aginwa/crop_maps.aspx

Delivering Goods To You: Washington's Retail And Wholesale Distribution System

Washington State's freight transportation system distributes the necessities of life and affects the daily life of every person and organization in our state. Retail and wholesale distribution—the last link in the freight system—delivers food, fuel, consumer goods, medicine, and documents to the end user through retail stores, restaurants, offices, grocery stores, gas stations, and hospitals. It plays a critical role in the state economy, not only by providing jobs in the warehousing, distribution, and transport of goods, but by sustaining businesses and services that depend on reliable delivery of goods.

This chapter presents information on recent trends, influences, and challenges experienced in delivering goods to citizens across the state, particularly in urban areas. This chapter is organized into three sections:

- Urban Freight Movement – provides an overview of how goods are delivered in urban areas.
- Delivery of Goods – describes major types of goods distributed to urban areas via Washington roadways.
- Urban Freight Hubs – describes urban freight hubs that are located throughout Washington.

Urban Freight Movement

Urban Areas are Major Producers and Consumers of Goods

Urban populations are not only significant consumers of goods, but they are also crucial to the production and delivery of goods in Washington State. An **urban area** is an area designated by the Census Bureau as having population of five thousand or more within fixed boundaries.[112] Based on the 2000 Census, 82 percent of Washington residents live in urban areas.[113] Residents purchase nearly everything they need—food, clothing, furniture, household goods, automobiles, and fuel—near their homes. The urban areas are also where most of the state's jobs are located, and businesses also use goods, including medical supplies, and transport documents. Nearly everything that Washington State residents and businesses use is delivered to the place of purchase by truck.

What makes Washington State's urban areas unique compared to many around the country is that the final distribution of goods to the consumer is not the only element of the **supply chain** that they support. The urban areas are also home to deep water ports and rail hubs through which raw materials and import goods are transported to manufacturing centers, such as Boeing and Paccar, or directly to distribution centers such as those in Kent, Spokane, and Vancouver. Our urban areas also host a multitude of manufacturing plants that transport goods to other plants, to distribution centers, or out of state.

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[112] The Federal Highway Administration (FHWA) defines 'urban area' as an urbanized area or urban place as designated by the Bureau of the Census having a population of five thousand or more and not within any larger urbanized area, within boundaries to be fixed by responsible state and local officials in cooperation with each other, subject to approval by the Secretary. (FHWA Functional Classification Guidelines, 1989, retrieved as of July 2012 from http://www.fhwa.dot.gov/planning/processes/statewide/related/functional_classification/fc00.cfm)

[113] U.S. Census Bureau, 2000 Census of Population and Housing, Population and Housing Unit Counts PHC-3. Retrieved as of December 2012 from www.census.gov/compendia/statab/2012/tables/12s0029.xls.

Supply Chain

A **supply chain** encompasses all businesses and activities needed to design, make, deliver, and use a product or service. The statewide freight distribution system is a critical component of supply chains through which food, raw materials and merchandise travel from the points where they are produced or arrive in Washington State, to the points where they arrive in homes, businesses and service facilities. It also includes transport of the waste that is disposed of, once those goods have been consumed.

The major freight distribution segments of the urban supply chains are:

Goods are imported to Washington State. Raw materials and finished goods are imported, either from other countries or other states, arriving through our major gateways as described in Chapter 1. Crude oil arrives in Washington via tanker ship and pipeline; it is transported to Washington State refineries to be made into fuel.

Goods are made in Washington State. Other goods are grown or manufactured directly in Washington State and shipped to and between urban centers, as described in Chapter 2.

Goods are transported to distribution centers. Once food and finished merchandise is produced or has arrived in Washington, it is most often transported to a distribution center, where it is processed for delivery to destinations throughout the state. Fuel is transported directly to major airports as well as distribution centers via pipeline, tanker ship or barge. The majority of transport of all other goods to distribution centers occurs by truck.

Goods are transported to consumers. Goods are transported, almost exclusively by truck, from distribution and processing centers to grocery stores, restaurants, retail and wholesale stores, medical and service facilities, and gas stations. With ever increasing use of internet-based retail and services, many goods are also trucked directly to homes and businesses.

Waste from consumed goods is transported to recycling centers and landfills. Consumption of goods generates waste that must be transported for recycling or disposal, including packaging as well as goods that have reached the end of their useful life.

Distribution Centers Consolidate Goods for Delivery

Distribution centers are used to consolidate a variety of goods from different sources, to then be distributed to stores within their service territories. Distribution centers are located where they can provide optimal service at the lowest overall cost. It is critical to a retailer's profitability that goods desired by customers are available in the correct amounts at each store at the time they are needed. In the past, most retailers kept larger inventories on site to replenish stocks. However, customer demands now change so rapidly that retailers do not maintain large inventories; they also do not have the space to store large quantities of the broader cross section of goods that customers now demand. Instead retailers rely on new deliveries to replenish shelves. Therefore, it is critical that goods be received when needed, but not so early that there is no place to display or store them.

One of the primary goals in locating a distribution center is to minimize the expense of transporting freight from a supplier to the center, and from the center to the stores. There are many factors that influence the siting of distribution centers. Logistics and site selection specialists say that businesses want to locate their distribution centers near growing, future markets. Retailers that source international products need access to seaports and intermodal facilities. In addition, daily truck trips must complete their routes and return within 11 hours, as required under the federal Hours of Service rule. Some of the distribution centers may serve multiple states throughout the Pacific Northwest, and are located to reduce overall travel distance within the

market area. Lower land costs, good access to the transportation network, labor force needs, and government incentives have all caused retailers to locate distribution centers at the periphery of urban cores.

Most Goods Distribution Occurs by Truck

Goods arrive in Washington in a number of ways—via ship, barge, rail, airplane, long-haul truck and pipeline—or are produced in-state. However, once these goods have arrived at our state's doorstep, their distribution occurs almost entirely by truck. Pick-up and delivery of freight within an urban region is a fundamental local need. The roadways carrying freight delivery trucks have the same importance to modern life as the pipes and wires that carry clean water, natural gas, electricity, and telecommunications to consumers.

Truck freight distribution is a critical component of the state transportation system, as it produces substantial proportions of all truck trips in metropolitan areas. The majority of freight-related vehicle trips occur via light and medium trucks. As shown on Exhibit 30, the numbers of light and medium trucks licensed in Washington State far outweigh the number of heavy trucks.

Exhibit 30: Licensed Trucks, by Type, in Washington State, 2010

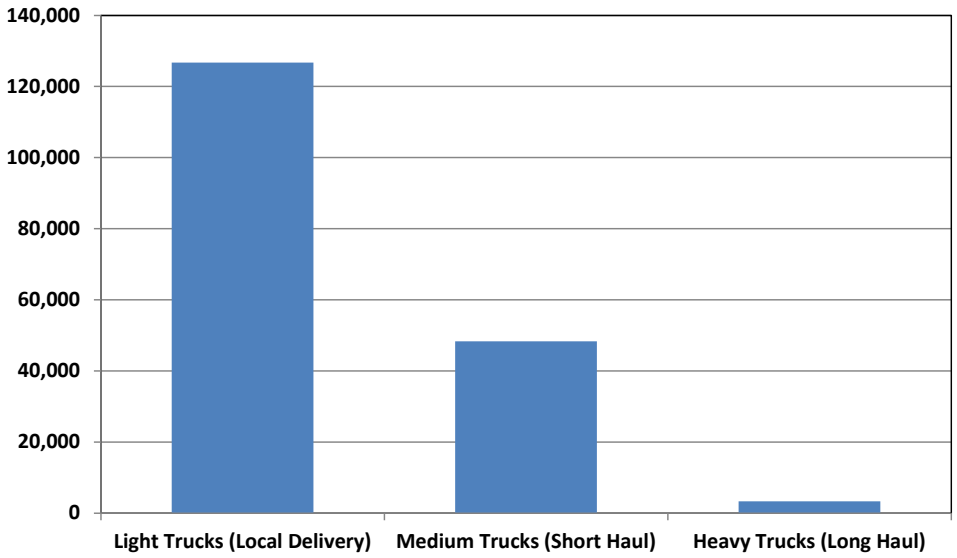

Chart generated from data supplied by the Washington State Department of Licensing, 2012. Truck types reflect counts of vehicles eligible for Gross Weight Fee in 2010.

All freight truck trips actually consist of two trips: one incoming and one outgoing. For deliveries to a distribution center, an empty truck may travel to the pick-up location, load the cargo, and then travel with its load to the distribution center. Likewise, after a truck has dropped off its cargo, it may need to travel empty back to its next pick-up point.

Many deliveries to individual stores consist of less than a full truckload, so several smaller loads are consolidated into one truck. To minimize return trips to the distribution center (known as deadhead trips, since they do not involve a delivery), local or short-haul trips to and from distribution centers are typically made up of multi-stop (or chained) trips, where one truck stops at many businesses, delivering and picking up goods. Because of the Hours of Service Rules and basic transportation routing dynamics, trucks routing from a distribution center will most often disperse in a flower-shaped travel pattern— traveling in a series of connected loops starting from the center. A truck will serve as many stores as possible out of the distribution center in each loop formation, en route away from and back to its home base.

Major factors that have resulted in increasing numbers of freight delivery trucks on Washington roadways include the following:

- Just-in-time distribution trends, combined with increasing restriction of larger trucks in congested urban areas, means the number of small-volume deliveries made by smaller trucks in urban areas will continue to grow.
- Increased traffic congestion reduces the number of stores served in a given time period, so more trucks must be dispatched to meet the daily distribution needs. In turn, more trucks dispatched from a distribution center contribute to increases in congestion.

Delivery of Goods

Major types of goods distributed to urban areas via Washington roadways include food, retail goods, time-critical documents and packages, and fuel; after the goods are consumed, waste is transported to landfills and recycling centers. The following sections describe major types of goods that are delivered through the state, as well as issues related to their effective delivery.

Delivering Food

Most major grocery retailers have their own distribution centers located within Washington State, or in neighboring states. Major grocery distribution centers that serve Washington State include:

- Safeway has distribution warehouses in Auburn, Bellevue, and Spokane.
- Costco in Sumner.
- Supervalu (acquired Albertson's in 2006) in Tacoma
- Associated Grocers in south Seattle, Renton, and Clackamas, Oregon.
- Kroger's (which supplies Fred Meyer & QFC) in Puyallup, Chehalis, and Clackamas, Oregon.
- Walmart in Tacoma, Grandview, Oregon and Hermiston, Oregon.

Large grocery chains such as Albertsons, Safeway, QFC, and Fred Meyer—as well as retail chains such as Walmart, Costco, Walgreens, and Target—have the majority of Washington's market. In the Seattle area, these stores combine for more than 80 percent of the market.[114]

Most grocery stores in Washington State are part of nationwide companies that retail thousands of types of food and household goods. In response to increased consumer demand for a wider variety of food products, retailers are increasing overall store size and shelf space. But back-storage space doesn't generate sales, so modern grocery stores have cut costs by reducing storage space, which requires more frequent deliveries in smaller quantities.

The typical grocery store receives deliveries both to loading docks and to their front doors. Many grocery stores, especially larger national chains, use their own chain's distribution centers. These trucks tend to be larger and use loading docks located at the side or back of a grocery store. All grocery stores also use direct store deliveries in which retailers provide their products directly to the stores. The direct store deliveries tend to be made in smaller trucks that make deliveries through the grocery store's front door, and often place the items directly on the store's shelves.[115]

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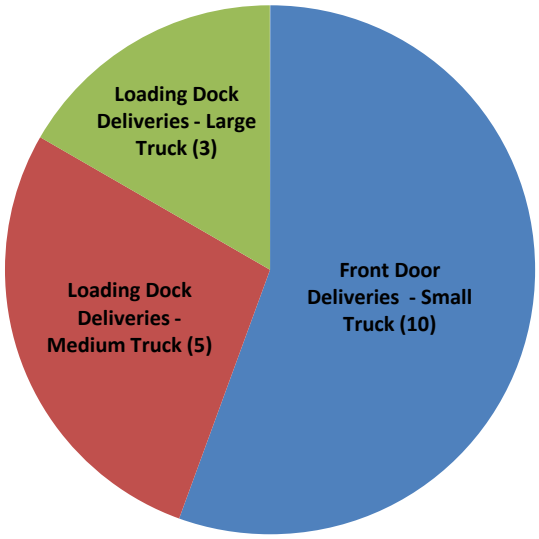
[114]The Packer. *Supermarket Scene Stable, Competitive in Seattle.* July 7, 2011. http://www.thepacker.com/fruit-vegetable-news/know-your-market/Supermarket-scene-stable-competitive-in-Seattle-125150249.html .

[115] McCormack, E., Ta, C., Bassok, A., and Fishkin, E., Truck Trip Generation by Grocery Stores. Research Project Agreement No. 61-7170. Report Prepared for Transportation Northwest and WSDOT, August 2010.

A study of eight grocery stores in the Puget Sound area, which included manual counts of daily truck deliveries, found that the stores received between 11 and 30 daily truck deliveries—an average of 18 deliveries per day. Exhibit 31 shows the breakdown of the average observed trips. Front door deliveries generated an average of about 10 trucks per day. These deliveries were typically made by smaller delivery trucks, bringing fresh items such as bakery goods, flowers, and other specialty items. Loading dock deliveries generated an average of about 8 trucks per day. Of these, an average three deliveries per day were made by heavy truck; the remaining loading dock deliveries were typically made by medium-sized truck. The study identified smaller stores as generating more daily truck trips, attributed at least partially to the typical size of truck making deliveries to the stores. Smaller stores more frequently use direct service delivery that tends to be smaller front door service, necessitating more frequent deliveries.[116]

Exhibit 31: Average Daily Truck Deliveries to Eight Puget Sound Grocery Stores



Source: McCormack, E., Ta, C., Bassok, A., and Fishkin, E., Truck Trip Generation by Grocery Stores. Research Project Agreement No. 61-7170. Report Prepared for Transportation Northwest and WSDOT, August 2010.

The vast majority of all food deliveries occur during daytime hours. Smaller groceries are staffed during daytime hours only, and restricting truck deliveries to night hours would burden these businesses. Larger 24-hour stores receive specialty deliveries from small businesses during the day for the same reason. Even for larger chain stores with vertically integrated operations and 24-hour distribution centers, nighttime deliveries may be restricted because of noise ordinances in residential neighborhoods.

Not only do the grocery stores themselves have specific daytime delivery times, but so to do the distribution centers. For example, the Auburn Safeway distribution center will only receive frozen goods Monday through Friday from 6:00 A.M. to 2:30 P.M., grocery products Sunday through Friday from 3:00 A.M. to 1:00 P.M., meat Sunday through Friday from 3:00 A.M. to 11:30 A.M., perishables Monday through Friday from 5:00 A.M. to 11:30 A.M., and produce daily from 3:00 A.M. until 12:30 P.M.[117]

[116] McCormack et al, August 2010.
[117] Safeway, Inc. *Safeway Supplier Handbook.* Updated March 30, 2011.

Several food distributors in the Seattle area have reported changes to the way they manage their delivery schedules:[118]

- A large food distribution company that operates in the Seattle area has altered their delivery strategies to better avoid road congestion. In the last few years they have begun to start a large portion of their drivers between midnight and 3:30 a.m. so that they arrive in urban centers before peak hour traffic. They are delivering into locked facilities for roughly 25 percent of their customer base.
- A large frozen food processor has also reported altering delivery strategies to avoid congestions by shipping from one of their distribution centers on Saturdays and starting trucks from outbound processing plants at 4:15 a.m. so they reach downtown Seattle to make their deliveries, and are out by 7:00 a.m.

Convenience stores maintain little stock compared to larger grocery stores, but tend to sell larger quantities of items such as beverages and snacks. They may require more frequent deliveries of high-demand items. Many convenience markets also sell fuel, and the frequency of delivery will depend on their market demand and tank storage space. As of 2010, there were almost 600 convenience stores and almost 1,700 gas stations with convenience stores located in Washington.[119]

Delivery of food to grocery stores not only fulfills a basic need for Washington residents, but it also supports major industries within the state. In 2010, the grocery industry's 3,060 food and beverage stores, including grocery stores, convenience stores, specialty food stores, and beverage and liquor stores employed over 60,000 people, accounting for almost 20 percent of total retail trade employment in the state;[120] they generated $13.7 billion in gross business income.[121]

Restaurants receive frequent small volume truck deliveries due to their demand for perishable goods such as fish, meat, cheese, fresh produce, and flowers. The trend to purchase goods direct from local growers and producers, including wine, beer, and spirits, also increases the number of deliveries since these type of goods are transported directly to the restaurant rather than through a distribution center. One of the issues of delivering goods to restaurants, particularly those in dense urban neighborhoods, is the limited availability of curb-side loading space, which must compete with parking and street capacity needs.

As of 2010, there were over 14,000 food and drink service establishments in Washington State, including full service restaurants, snack bars and cafeterias, and drinking establishments, employing almost 192,000 people statewide,[122] generating over $12 billion in gross business income.[123] There were almost 600 convenience stores and almost 1,700 gas stations with convenience stores located in Washington.[124]

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[118] Washington State Department of Transportation, Washington State Freight Mobility Plan interviews, March 2012 – April 2013.

[119] U.S. Census Bureau. *2010 County Business Patterns (NAICS),* NAICS Codes 44512 and 44711. Accessed November 2012 from: http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl.

[120] U.S. Census Bureau. *2010 County Business Patterns (NAICS),* NAICS Code 445. Accessed November 2012 from: http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl.

[121] Washington State Department of Revenue. *Quarterly Business Review Calendar Year 2010, Table 1: Total Gross Business Income,* NAICS Code 445. Accessed November 2012 from: http://dor.wa.gov/content/aboutus/statisticsandreports/tid/statisticsreports.aspx?query=qbrnaics

[122] U.S. Census Bureau. *2010 County Business Patterns (NAICS),* NAICS Code 722. Accessed November 2012 from: http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl.

[123] Washington State Department of Revenue. *Quarterly Business Review Calendar Year 2010, Table 1: Total Gross Business Income,* NAICS Codes 7221-7224. Accessed November 2012 from: http://dor.wa.gov/content/aboutus/statisticsandreports/tid/statisticsreports.aspx?query=qbrnaics

[124] U.S. Census Bureau. *2010 County Business Patterns (NAICS),* NAICS Codes 44512 and 44711. Accessed November 2012 from: http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl.

Delivering Retail Goods

Like major grocery store chains, large retail chains typically have their own distribution centers. For example, a major building material and garden equipment dealer, Home Depot, has more than two dozen stores in Washington. In order to maintain its competitiveness, Home Depot has invested heavily in its distribution network, including new Rapid Deployment Centers designed to complement and in some cases replace their regional distribution centers. The focus of Rapid Deployment Centers is to ensure that stores have all goods always in stock, that inventory is utilized efficiently, and that freight is able to move through the system effectively. The Rapid Deployment Center for the Northwest is located in Salem, Oregon; goods are trucked from this location to Home Depot stores located throughout Washington State.

Target is another large retailer with significant presence in Washington. Target's import warehouses, one of which is located in Lacey, receive overseas shipments from manufacturers and suppliers and in turn disperse the merchandise to their regional distribution centers.[125] Walmart operates one of the largest private distribution operations in the world, with more than 120 regional distribution centers in the United States alone. Walmart's presence in Washington includes 44 supercenters, 12 discount stores, two neighborhood markets, three Sam's Clubs and one distribution center located in Grandview.[126]

In addition to internal distribution networks of the large retailers, manufacturers often rely on independent freight lines. Oak Harbor Freight Lines is a regional less-than-truckload (LTL) carrier serving points throughout California, Idaho, Nevada, Oregon, and Washington. Headquartered in Auburn, they operate a fleet of trucks from 33 terminals throughout their service area, including eight in Washington. Oak Harbor picks up, consolidates, and distributes freight for manufacturers, wholesalers, and retailers, including the Gap stores and many regional manufacturers. To best accommodate customer hours of service, Oak Harbor schedules pickups between 6:00 A.M. and 6:00 P.M. To ease flow into and out of their distribution centers, Oak Harbor sites their facilities within one mile of a freeway with no stoplights between the site and the freeway on-ramp.[127]

In 2010, Washington State ranked 17th nationwide in retail trade employment with almost 22,000 retail establishments. Retail trade employed over 303,600 people and wholesale trade employed over 119,700. While food and beverage stores are the largest category of employer in the Washington State retail trade industry, other retail sectors that rely heavily on efficient distribution systems are also major employers. Some of the other larger retail sectors include general merchandise stores, clothing stores, motor vehicle and parts dealers, and building material and garden equipment dealers.[128] Overall, retail and wholesale trade generated about $116 billion and $119 billion in gross business income, respectively.[129]

Delivering High Value Materials with Precision Timing

High value, time-critical materials—including business documents and packages, cash in armored cars, health care supplies, and medicines —must move quickly through the freight distribution system. The rise of internet shopping has also resulted in increasing use of carriers to deliver retail goods directly to homes and businesses.

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[125] Target. *Target Distribution Centers.* Accessed November 2012 from: http://pressroom.target.com/pr/news/target-distribution-centers.aspx

[126] Walmart. *State Information: Washington Community Impact.* Accessed November 2012 from: http://corporate.walmart.com/our-story/locations/united-states#/united-states/washington.

[127] Oak Harbor Freight Lines, Inc. Accessed November 2012 from: http://www.oakh.com/ .

[128] U.S. Census Bureau. *2010 County Business Patterns (NAICS),* NAICS Code 44. Accessed November 2012 from: http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl

[129] Washington State Department of Revenue. *Quarterly Business Review Calendar Year 2010, Table 1: Total Gross Business Income,* NAICS Codes 44 and 45. Accessed November 2012 from: http://dor.wa.gov/content/aboutus/statisticsandreports/tid/statisticsreports.aspx?query=qbrnaics

FedEx and UPS are the world's two largest providers of integrated air and ground transportation services.[130] Both companies possess highly developed, large scale information technology networks using real-time information, and are highly reliant on intramodal (e.g., from a larger long-haul truck to a smaller delivery truck) and intermodal (e.g., from plane to truck) connections to move their freight efficiently and ensure on-time delivery. While some companies may consider relocating out-of-state if Washington's transportation systems degrade, these delivery companies do not have that option. They must provide fast and reliable service under all conditions. FedEx and UPS drivers don't go home until every package is delivered. Hospital patients can't wait for medicine deliveries. Washington's modern service economy depends on speed of these deliveries through the freight transportation system.

Delivery companies such as FedEx and UPS operate on a hub and spoke system. The drivers travel around each city by truck, picking up and delivering packages. Packages are picked up during the day, and returned to the processing centers labeled and ready to go. The packages are then flown or trucked to a primary hub, where they are unloaded and sorted according to destination. In addition to main hubs, the companies may have overlay hubs where packages are split between those to be delivered in the hubs' surrounding region and those destined for other regions. Operation in each hub is highly mechanized to sort packages quickly and accurately. In a matter of a few hours, packages are sorted and loaded back into containers, and then put on trucks and aircraft to their final destinations.

The first and last miles of package pick-up and delivery occur by truck. For longer distances, planes from local airports are sometimes used. FedEx makes use of smaller airports throughout Washington, from where they are routed to their Seattle FedEx hub, and then flown out to other regional hubs where they are again placed on trucks to be delivered. In a similar fashion, UPS picks up and delivers packages in its standard brown delivery trucks. These packages are often coming from or going to sorting centers. Packages then leave sorting centers in feeder vans on their way to other sorting centers, hubs and the airport. Package delivery companies are highly affected by congestion that may inhibit their ability to connect modes and trucks. These carriers perform many of their deliveries during the normal business operating hours of their customers, often making it necessary to travel at peak travel times on the roadways.

According to the Wall Street Journal, FedEx and UPS carry 10 percent of US gross domestic product and 3.5 percent of global domestic product.[131] In addition to the Washington jobs directly generated by these and other delivery companies, their services are vital to the operation of modern businesses. As businesses continuously strive to maximize their own efficiency and competitiveness, they have come to depend on precision delivery as a source of innovation and value-added service. The demand for on-time delivery has been increasing for all sectors. Recent customer interviews have revealed:[132]

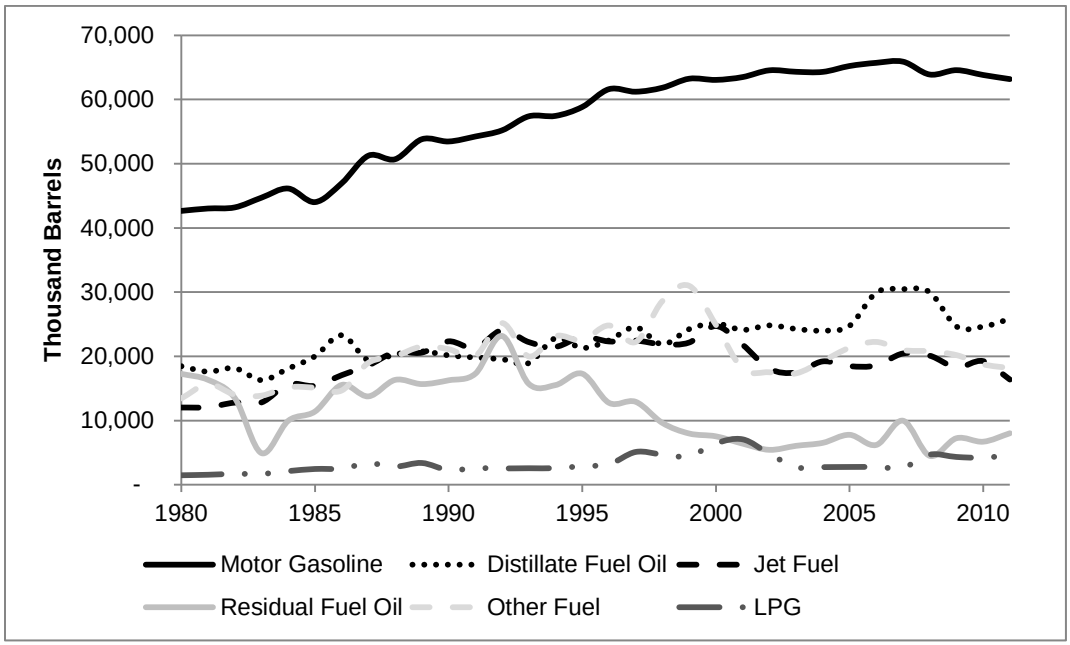
- A video game company located in the Seattle area relies on one hour delivery windows to satisfy customer needs. Quick turnarounds times have become increasingly important due to market preferences.
- A large pharmaceutical and medical equipment company in the greater Seattle area reports being very dependent on precision delivery to maintain a competitive advantage. Keeping a 30 minute on-time delivery window allows their customers to keep less inventory on-hand and maintain profitability.

[130] Bowen, John T., A Spatial Analysis of FedEx and UPS: Hubs, Spokes and Network Structure, Journal of Transport Geography 24 (2012) 419-431.
[131] Levitz, J., FedEx looks to 777s for an Edge. The Wall Street Journal, July 14, 2010.
[132] Washington State Department of Transportation, Washington State Freight Mobility Plan interviews, March 2012 – April 2013.

Delivery and Supply of Fuel is a Crucial Element of Distribution in Washington State

The volume of petroleum fuel consumed in Washington is on the rise. As shown in Exhibit 32, motor gasoline consumption has been steadily increasing over the past 30 years, with only a slight dip in that trend in the last four years. In 2011 Washington households and businesses consumed 15.7 million gallons of finished petroleum products per day, up 29 percent from 1980 and making the state's consumption fifteenth in the United States. Gasoline consumption was 7.3 million gallons per day and jet fuel consumption was 1.9 million gallons per day.[133] Washington's jet fuel consumption is among the highest in the nation, due in part to several large Air Force and Navy installations.

Exhibit 32: Petroleum Consumption is Increasing in Washington State



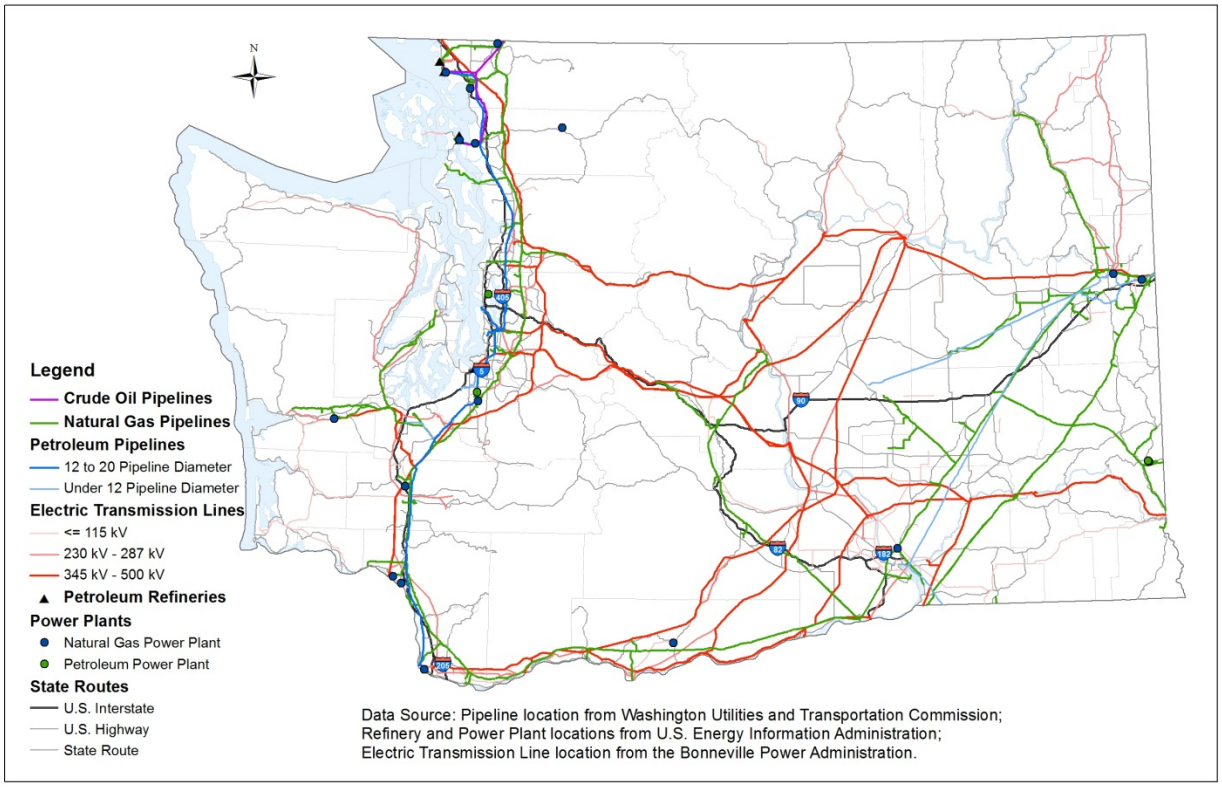
Energy Information Administration. *Energy Consumption Estimates for Major Energy Sources in Physical Units, 1960-2011, Washington.*
http://www.eia.gov/state/seds/seds-data-complete.cfm?sid=US#Consumption

Fuel travels to Washington's refineries by oil tanker, and from the refineries through pipelines and trucks to gas stations, homes, and airports. Washington's petroleum refineries received nearly 562,000 barrels per day of crude oil and other feedstock inputs in 2011. In 2011, 73 percent of crude oil came into the refineries by water, and the majority of this (55 percent of the crude oil total, nearly 295 thousand barrels per day) came from Alaska. However, because Alaskan production is in decline, Washington's refineries are becoming increasingly dependent on crude oil imports from Canada and other countries. Other origins of waterborne crude oil included Russia, Oman, California and Canada. Almost all of the remaining 27 percent crude oil (114.6 thousand barrels per day) came through Trans Mountain Pipeline from Alberta, Canada[134]. Crude oil moves on this line through Sumas, Washington to the refineries at Anacortes, and Cherry Point and Ferndale (Exhibit 33).

[133] U.S. Energy Information Administration (EIA). *SEDS State Energy Data System: Table C2, Energy Consumption Estimates for Major Energy Sources in Physical Units, 2009.* Retrieved as of December 2011 from: http://www.eia.gov/state/seds/hf.jsp?incfile=sep_sum/plain_html/sum_use_tot.html . Petroleum consumption was measured in barrels in the original data source. It is converted into gallons based on 1 barrel of oil = 42 US gallons.

[134] Washington Research Council. The Economic Contribution of Washington State's Petroleum Refining Industry in 2011. August 2012. http://www.researchcouncil.org/docs/PDF/WRCEconomics/2012RefineryReportFinal82312.pdf

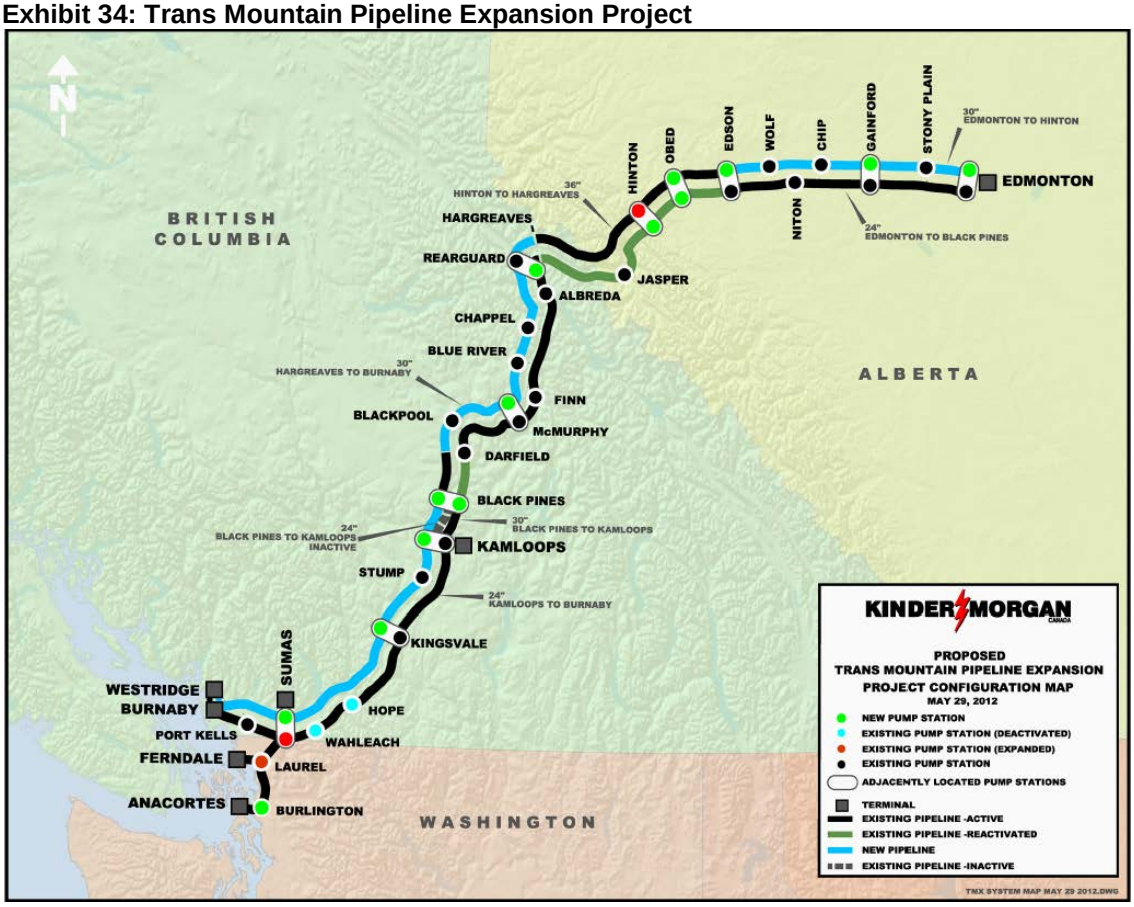
Exhibit 33: Energy Corridors in Washington State



Trans Mountain is planning to expand its pipeline system by twining the existing pipeline between Strathcona County Alberta to Burnaby, British Columbia to increase capacity from 300,000 to 890,000 barrels per day. New pump stations will be added along the route, and the number of storage tanks will also be increased (Exhibit 34). Construction could begin as early as 2016 if the regulatory application process is successful[135].

[135] Kinder Morgan. http://www.kindermorgan.com/business/canada/tmx_expansion.cfm. Retrieved by May 2013.

Exhibit 34: Trans Mountain Pipeline Expansion Project



Washington's Oil Refineries Produce Much of the State's Fuel Needs and Demand Is Growing

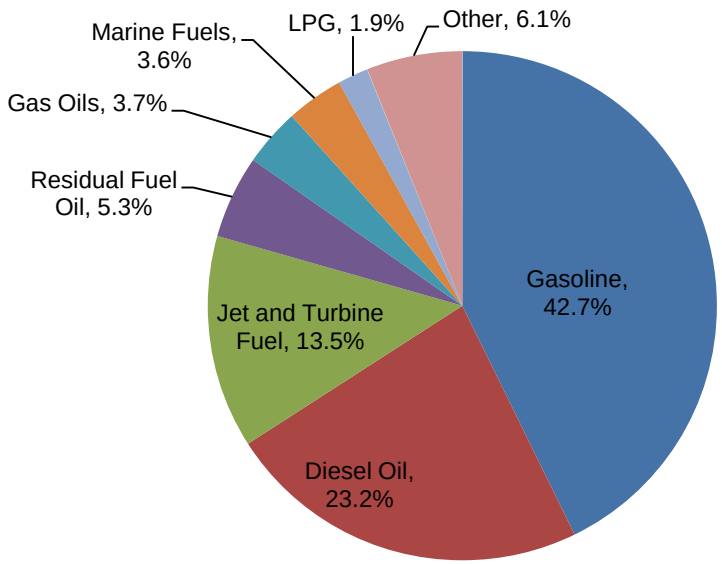
Despite having no indigenous crude oil production, Washington is a major refining center for the Pacific Northwest markets and ranked sixth in U.S. in crude oil refining capacity in 2011. Washington's five refineries provide 3.6 percent of the United States' refining capacity (Table 1)[136]. With Washington State accounting for 2.0 percent of national petroleum consumption, instate refineries produce quantities more than sufficient for Washington's needs[137].

Washington's refineries produced 576,000 barrels per day and more than a dozen different products in 2011. Gasoline, at nearly 246,200 barrels per day in 2011, is the largest product category, accounting for 43 percent of the total production. Diesel oil and jet fuel are the next largest at 23 percent and 14 percent, respectively (See Exhibit 35).

[136] U.S. Energy Information Administration (EIA). Potential Impacts of Reductions in Refinery Activity on Northeast Petroleum Product Markets, May 2012. http://www.eia.gov/analysis/petroleum/nerefining/update/pdf/neprodmkts.pdf.

[137] U.S. Energy Information Administration (EIA). State Energy Data System 1960–2010 Estimates. http://www.eia.gov/state/seds/seds-data-complete.cfm?sid=US#Consumption

Exhibit 35: 2011 Washington Petroleum Production by Products (Volume in Barrels)



In 2011, 51 percent of Washington refined products was consumed within the state; 35 percent of total product was sold and delivered to other states; and the remaining 13 percent was exported to foreign countries. In 2011, the $3.6 billion of petroleum products exported from the state amounted to 5.6 percent of Washington's foreign exports. The top export country is Canada, accounting for 52 percent of the dollar value of petroleum product exports, followed by Mexico, Chile, Singapore, Australia, Guatemala and South Korea[138].

Exhibit 36: Washington Refineries

Firm	Year constructed	Location	Major Products	Capacity (barrels/day)
BP Cherry Point (formerly ARCO)	1971	Whatcom County, northwest of Ferndale	Gasoline, diesel oil, jet fuel, calcinated coke	234,000
Phillips 66 Ferndale (formerly ConocoPhillips Tosco, BP Oil and Mobil Oil)	Mid-1950s by General Petroleum	Whatcom County, west of Ferndale	Gasoline, diesel oil, jet fuel, liquid petroleum, residual fuel oil	107,500
Shell Oil (formerly Equilon Enterprises and Texaco)	1957	Skagit County, five miles east of Anacortes	Gasoline, diesel oil, jet fuel, propane, coke, sulfur	146,000
Tesoro (formerly Tesoro Northwest and Shell Oil)	1955	Skagit County, on March Point	Gasoline, diesel oil, turbine & jet fuel, liquid petroleum gas, residual fuel oil	125,000
U.S. Oil	1957	Pierce County, Tacoma Tideflats	Gasoline, diesel oil, jet fuel, marine fuel, gas oils, emulsified & road asphalt	42,000

Source: Washington Research Council. The economic contribution of Washington State's Petroleum Refining Industry in 2011.

[138] Washington Research Council. The Economic Contribution of Washington State's Petroleum Refining Industry in 2011. August 2012. http://www.researchcouncil.org/docs/PDF/WRCEconomics/2012RefineryReportFinal82312.pdf

Washington's Pipelines Transport Fuel across the State

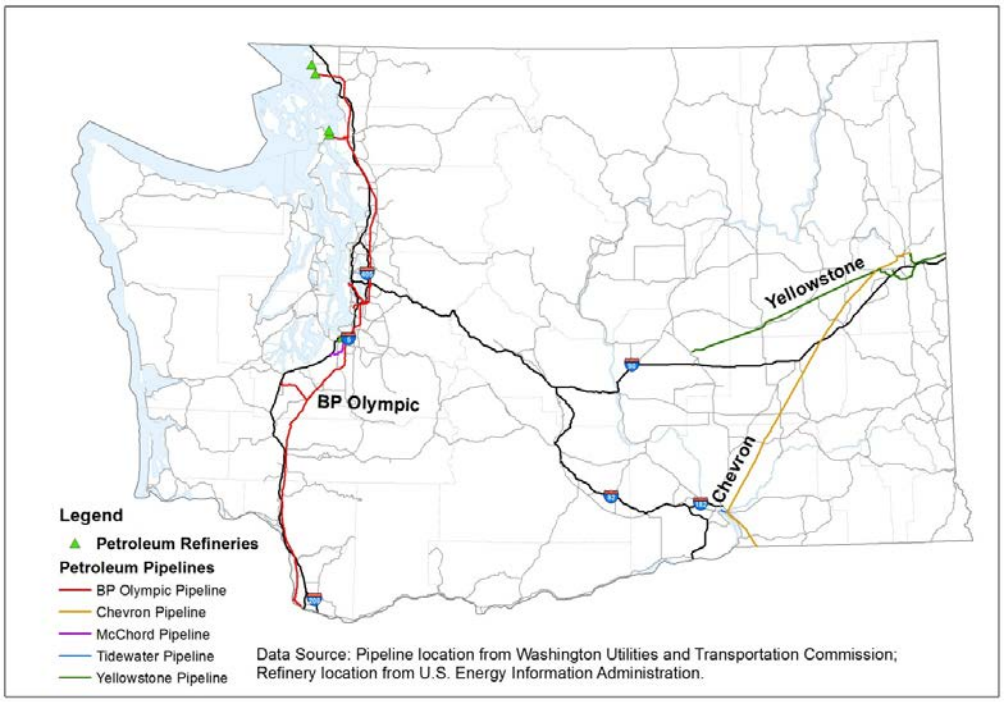
Once refined into gasoline, diesel and jet fuel products, 49.1 percent of all products fuel is shipped by pipeline, primarily south to Seattle and Tacoma markets and to Portland, 39.7 percent is shipped by barge and tanker to Portland and other destinations along the Columbia River as well as to foreign customers, with the remaining 11.7 percent going out by truck or rail. The tidewater barge facility in Vancouver, Washington is also a major pipeline terminal and is used to load barges with refined petroleum products for shipment upriver to Pasco.

Pipelines are the most cost efficient method of transporting petroleum products. In 2009, pipelines accounted for 63.3 percent of all petroleum products transported in the U.S., up from 55.6 percent in 1990.[139] Four of Washington's refineries distribute 300,000 barrels per day of product south via the Olympic Pipe Line, which extends along a 299-mile corridor paralleling Interstate 5 from Blaine, Washington to Portland, Oregon. Smaller pipelines branch off of the Olympic Pipeline, including spurs to Sea-Tac Airport, Olympia, and Vancouver. In total, the system includes of 400 miles of pipe, 10 delivery sites 9 pumping stations and 23 terminals.[140]

The Chevron and Yellowstone Pipelines distribute oil and fuel products to eastern Washington. The Chevron Pipeline runs between Salt Lake City and Pasco, with an extension connecting Spokane to Pasco. Refined product is currently transported from a Utah refinery to Boise and Pasco. Chevron also delivers military jet fuel to Fairchild Air Base.

The Yellowstone Pipeline runs from Billings, Montana to Spokane and Moses Lake. The Pipeline supplies about 34 percent of all consumer gasoline and diesel fuel to the Spokane market. The capacity of the Yellowstone into Spokane is roughly 42,000 barrels per day. In 2012 the pipeline carried 24,125 barrels per day from Thompson Falls to Spokane[141].

Exhibit 37: Petroleum Pipelines in Washington State



[139] Association of Oil Pipe Lines (AOPL). (February 2012). Retrieved as of May 2013 from: http://www.aopl.org/pdf/AOPL_Shift_Report_Press_Release_Feb_7_20121.pdf

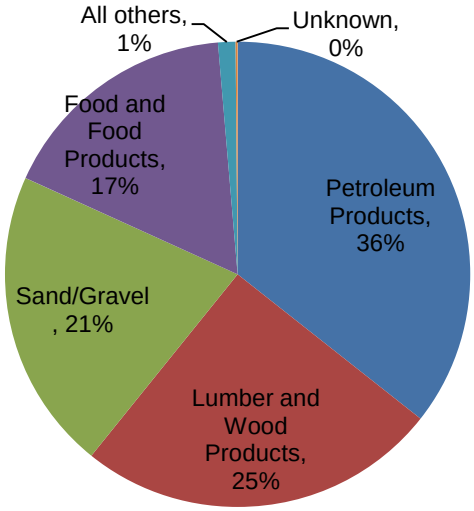
[140] British Petroleum Pipelines. *Product Assets: Olympic Pipeline.* Retrieved as of December 2011 from: http://www.bppipelines.com/Asset_olympic.html .

[141] Phillips 66. "Yellowstone Pipeline Capacity Inquiry". E-mail message, May 2013

Off the Pipeline: Barges and Tankers

Fuel that does not move by pipeline gets to Washington distribution centers by barge or small tanker, at about double the cost of pipeline transport. In 2012, 3,220 tanker-barge loads and 450 tank shiploads of oil moved through Puget Sound, and 33 tank ships bound for Washington ports entered the Columbia River.[142]

Exhibit 38: Intrastate Waterborne Cargo Movements in Washington State, 2011



By Tonnage, Total = 8.8 Million tons
U.S. Army Corps of Engineers Navigation Data Center – Waterborne Commerce Statistics Center, 2011 Commodity Movements from Public Domain Database by State, http://www.navigationdatacenter.us/wcsc/pdf/pdstcm11.pdf

From Pipeline to Regional Distribution Centers: The Final Trip from Pipeline to Market Is Made by Truck

Most fuel is delivered from distribution centers by truck to gas stations. In 2011 there were 1,914 gas stations in Washington State[143]. The quantity of fuel sold at each facility varies greatly. A small neighborhood gas station might receive one truckload of fuel each week. Larger facilities, such as Costco chain, may receive one or two fuel trucks each day.

Fuel deliveries to local markets are made from distribution centers located at the five refineries or at major storage depots, including: Harbor Island in Seattle, Renton, Tukwila, Tumwater, Tacoma, Anacortes, Ferndale, Vancouver, Moses Lake, Pasco, and Spokane. The number and storage capacity of the state's fuel distribution centers has decreased substantially in recent years, due to environmental concerns and new regulations. Limited storage capacity means that these facilities are heavily reliant on pipelines to supply fuel just in time for delivery.

[142] Washington State Department of Ecology – Spill Prevention, Preparedness, and Response Program. *Vessel Entries and Transits for Washington Waters VEAT 2012.* WDOE Publication13-08-001. (March 2013). Retrieved as of November 2011 from: https://fortress.wa.gov/ecy/publications/SummaryPages/1308001.html

[143] U.S. Census Bureau. 2011 County Business Patterns (NAICS): Washington State by Industry Code. Retrieved as of May 2013 from: http://censtats.census.gov/cgi-bin/cbpnaic/cbpdetl.pl Industry code 447, "Gasoline Station".

Future Trends of Energy: Washington is the potential Export Platform for Coal and Crude Oil from Power River Basin and Bakken oil field

Coal consumption for electricity generation dropped about 12 percent between 2008 and 2011 in US[144]. As American demand has dropped and Asian steam coal market is growing rapidly, U.S. coal producers and suppliers are looking to expand steam coal production from mines and origins in the Power River Basin (PRB) in Montana and Wyoming and export significant coal volumes to Asian markets through proposed Pacific Northwest export coal terminals. Washington is the potential export gateway for coal from PRB, and two U.S. Pacific Northwest export terminals are being considered and currently in the formal permitting process, including Gateway Pacific Terminal at Cherry Point and Millemium Bulk Logistics at Longview, Washington. The projected annual coal volume exported through two proposed facilities will reach 55 million tons by 2017, and 100 million tons by 2022. Such enormous amount of demand for coal exports will result in explosion in railroad coal movements in Washington State[145].

The boom in North Dakota's Bakken oil field is driving the crude oil flow to Washington State, providing lower priced domestic crude to Washington refineries. Washington State refiners and terminal operators have been investing in terminals to receive oil from the Bakken and Western Canada, and 13 crude oil facilities are proposed to build/expanded in Cherry Point and Anacortes refineries, Port of Tacoma, Port of Grays Harbor, Port of Longview, and Port of Vancouver. Due to the lack of pipeline capacity, crude oil will be moved by rail to Washington state crude oil facilities, adding tremendous amount of demand on railroad system[146].

Transporting Waste

The final step in Washington State's freight delivery system is the transport of the waste that is generated when goods are consumed. Used products may re-enter the supply chain when they are recycled; everything else is disposed of as waste.

As shown on Exhibit 39, solid waste generation in Washington increased steadily through 2005, but then decreased through 2009. Some of this reduction was caused by the downturn in the state's economy and construction activities. The other factor is the recycling rate of municipal solid waste which rose steadily during that time, from 33 percent in 1999 to 49 percent in 2010.

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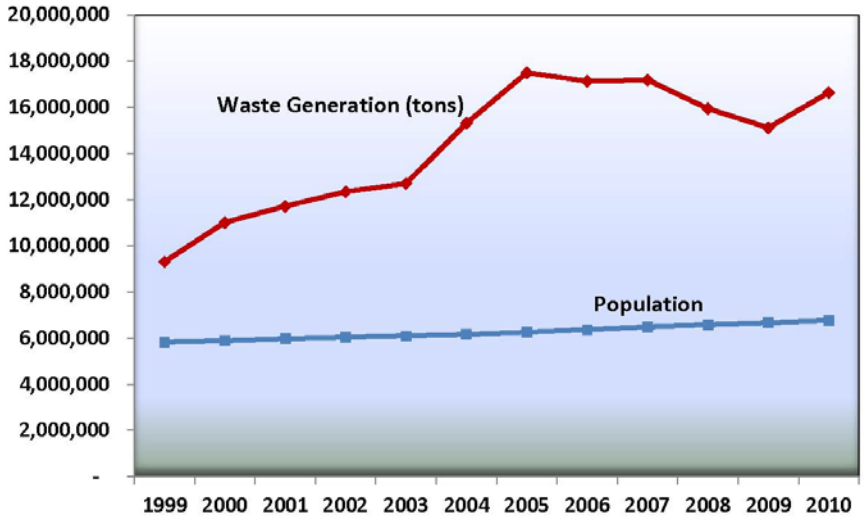
[144] Power River Basin Coal Demand Down, but Foreign Markets Beckon. http://trib.com/business/energy/powder-river-basin-coal-demand-down-but-foreign-markets-beckon/article_5d74e095-1de8-5fac-aae4-98d0c0133c34.html Retrieved by May 2013

[145] Heavy Traffic Ahead**:** Rail Impacts of Powder River Basin Coal to Asia by Way of Pacific Northwest Terminals. Report prepared for Western Organization of Resource Councils. July 2012. **http://www.heavytrafficahead.org/index.html** Retrieved by May 2013

[146] Crude Loves Rock'n'Rail – West Coast Destinations. RBN Energy LLC. April 2013. http://www.rbnenergy.com/crude-loves-rock-n-rail-west-coast-destinations. Retrieved by May 2013

Exhibit 39: Solid Waste Generation and Population Growth in Washington



Source: Washington State Department of Ecology, Waste 2 Resources Program. Solid Waste in Washington State 20th Annual Status Report, December 2011.

The Roosevelt Regional Landfill (owned by Rabanco) in Klickitat County and Oregon's regional landfills have become primary disposal sites for most of the state. Garbage trucks pick up solid waste on Washington's streets and truck it to transfer stations where it is consolidated and loaded into larger trucks. Finally, the waste is transferred to rail cars destined for the Roosevelt landfill, located in Central Washington along the Columbia Gorge mainline.

In 2010, 1.7 million tons of Washington solid waste was exported to Oregon landfills by rail. Eleven Washington counties and the City of Seattle sent the majority of their solid waste out of state, mostly by rail to the Columbia Ridge Landfill. Local landfill closures and favorable long-haul rate contracts contributed to the increasing number of counties that send most or even all of their municipal solid waste out of state. Washington exported about five times as much waste to Oregon, as was imported to Washington.[147]

Urban Freight Hubs

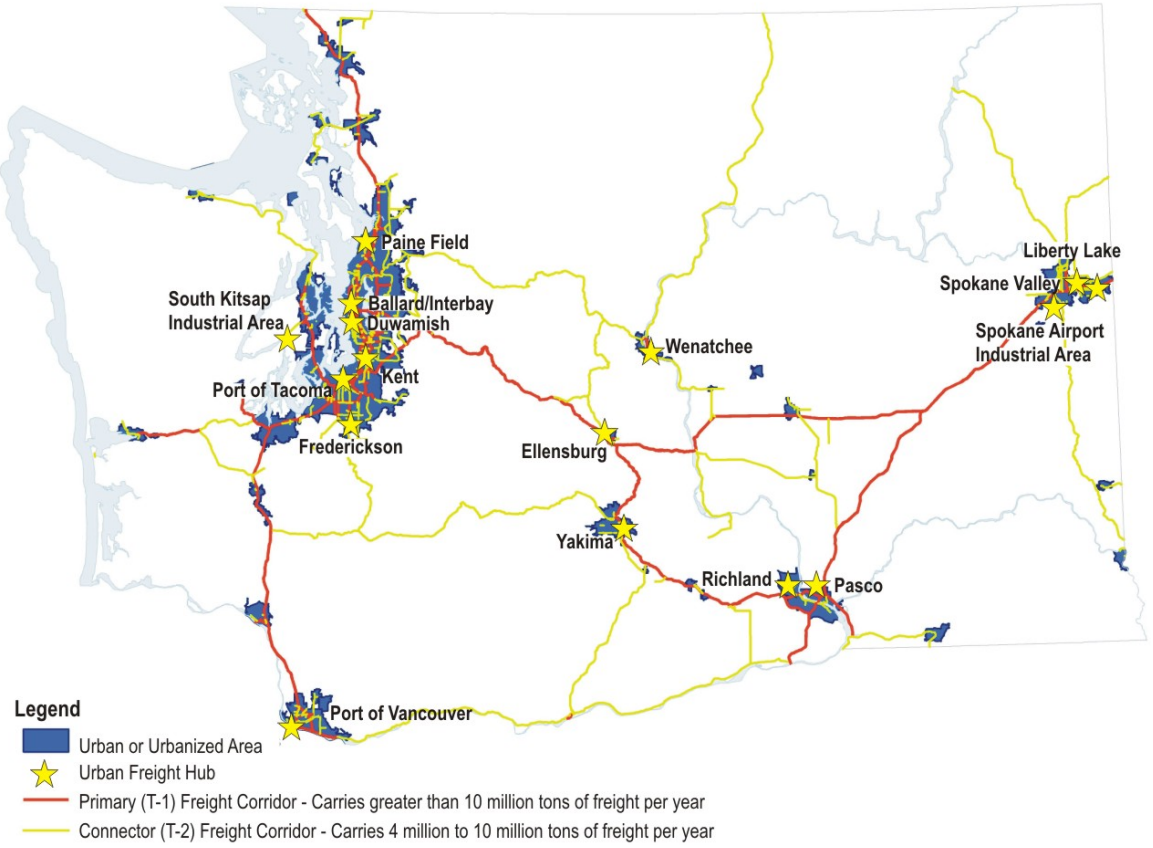
As described earlier, urban areas are those areas within fixed boundaries that have population of five thousand or more residents. **Urban freight hubs** are places located within urban areas in which freight production and distribution activities are concentrated; they are areas where distribution centers are most likely to be located, and can also serve as centers for the manufacturing and production of goods. Because they serve as launching points for the distribution of goods, they are also characterized by having direct access to the statewide transportation network. All urban freight hubs are located close to the state highway system; some also serve as connections between the highway system and air, rail, or marine facilities.

Exhibit 40 shows urban freight hubs located in the State of Washington. These areas include marine ports, major airports, intermodal rail yards, and/or are areas that serve as major distribution centers or manufacturing centers. All of the state's urban freight hubs are located adjacent to highways classified as T-1 (meaning that they carry more than 10 million tons of freight tonnage per year) or as T-2 (meaning that

[147] Washington State Department of Ecology, Waste 2 Resources Program. *Solid Waste in Washington State, 20th Annual Status Report. (*December 2011). Publication #11-07-039. Accessed November 2012 from: http://www.ecy.wa.gov/programs/swfa/solidwastedata/report.asp

they carry 4 million to 10 million tons of freight per year). These highways are classified by the Freight Goods Transportation System (FGTS) according to the annual gross freight tonnage they carry.[148]

Exhibit 40: Urban Freight Hubs



Source: Washington State Department of Transportation and Heffron Transportation, Inc. 2013.

Urban freight hubs have been identified based on the following:

- Within the four-county region of King, Pierce, Snohomish and Kitsap Counties, in which about 55 percent of the state's population reside,[149] urban freight hubs are identified as those areas specifically designated by the Puget Sound Regional Council (PSRC) as Manufacturing/Industrial Centers (MICs). MICs are existing employment areas with intensive, concentrated manufacturing and industrial land uses that cannot be easily mixed with other activities. They are characterized as areas of large contiguous blocks served by the region's major transportation infrastructure, including roads, rail, and port facilities. These centers have generally developed an urban form suitable for outdoor storage and facilities, with large spaces for the assembly of goods.[150] There are other urban areas in the Puget Sound region that have manufacturing and distribution facilities, but the MICs are the areas where the most intensive uses have been designated.

[148] Washington State Department of Transportation, Freight and Goods Transportation, accessed December 2012, http://www.wsdot.wa.gov/Freight/FGTS/default.htm.
[149] U.S. Census Bureau, 2011 population estimate for Washington State by county, accessed December 2012, http://quickfacts.census.gov/qfd/states/53000lk.html.
[150] Puget Sound Regional Council, VISION 2040, 2009. http://www.psrc.org/growth/vision2040/pub/vision2040-document/

- Outside of the PSRC four-county planning area, urban freight hubs are identified based on the local jurisdictions' adopted comprehensive plans. These places are located within urban areas (population greater than 5,000) and have been identified by the cities in which they are located as industrial areas with existing and planned future land use that focuses on the production and/or distribution of goods.

Urban freight hubs generally include a mix of manufacturing and distribution uses, but some may be especially strong in one function or another. Some freight hubs, such as the Ports of Seattle and Tacoma, serve as gateways for goods arriving in Washington from national or international destinations. Other freight hubs, such as the Liberty Lake area east of Spokane and the Frederickson MIC in Pierce County, are areas where goods are manufactured locally, some of which are sold in-state. Still others, such as the Kent MIC which is located centrally between Seattle and Tacoma, are areas where many distribution centers are located. All of these hubs are characterized by their proximity to urban populations as well as their proximity to the statewide highway system. A significant portion of deliveries into and out of these hubs serve the stores, businesses and homes in the larger urban areas in which they are located. Their success depends upon good access to the region's transportation system and the ability to reliably travel throughout that system.

Puget Sound Area Hubs

As described above, the major urban freight hubs in the Puget Sound area are those locations that have been designated as MICs by the PSRC. Areas designated as MICs include:

- **Duwamish** is one of the largest and most intensely developed manufacturing/industrial areas in the Pacific Northwest. Covering nearly 5,000 acres, the Duwamish MIC represents 84 percent of the industrial lands within Seattle, and includes the Port of Seattle's marine container terminals. Comprised of some 4,138 acres of marine and industrial lands, it is a unique regional resource and economic engine.[151]
- The **North Tukwila** MIC adjoins the Duwamish MIC to the south; this area is characterized by light to heavy manufacturing uses, and includes the south third of King County International Airport/Boeing Field. The Boeing Company is a major employer, occupying some 750 acres (58 percent of the entire center). The Duwamish River winds through the North Tukwila center, providing businesses with water access.[152]
- Also in Seattle, the **Ballard/Interbay** MIC extends about three miles from the northwest corner of downtown Seattle to Ballard. This center includes some of the city's most productive working waterfront, wharfs, and shipyards. Salmon Bay is home to "Fisherman's Terminal," one of the largest commercial fishing terminals in the northwest, also supports intense marine-related industrial and manufacturing uses. There is also a rail yard in Interbay that is used for sorting and classification, but has no intermodal transfer functions. At the south end of the center, Smith Cove on Elliott Bay is home to Terminal 91 (a large general cargo terminal complex) and Pier 86 (a Port of Seattle export grain terminal).[153]
- The **Paine Field/Boeing Everett** MIC is home to large scale manufacturing and industrial activities. With approximately 33,000 jobs, it includes the world's largest manufacturing building and Snohomish County's major airport. It is also one of three areas where the Boeing Company's major aircraft production capability is focused (the other areas are Boeing Field and Renton Airport).[154]

[151] Puget Sound Regional Council, Urban Centers Report, Duwamish Manufacturing/Industrial Center, 2002.
[152] Puget Sound Regional Council, Urban Centers Report, North Tukwila Manufacturing/Industrial Center, 2002.
[153] Puget Sound Regional Council, Urban Centers Report, Ballard/Interbay Manufacturing/Industrial Center, 2002.
[154] Puget Sound Regional Council, Urban Centers Report, Paine Field/Boeing Everett Manufacturing/Industrial Center, 2002.

- The **Frederickson** MIC is the largest single industrial development site in the Puget Sound area that is zoned for heavy manufacturing and has industrial capacity utilities and infrastructure in place. The center comprises 2,837 acres, much of which is undeveloped. The Frederickson MIC is one of the principal industrial centers of Pierce County; support for its continued development is considered essential to the creation of a jobs-based economy in Pierce County. The county has made significant investments in the center's infrastructure, and plans to continue this investment in the future.[155]
- The **South Kitsap Industrial Ar**ea is approximately 3,400 acres adjacent to the southern tip of the City of Bremerton. It includes the Bremerton National Airport, and an array of industrial uses. This area has extensive vacant lands and has been identified as having high potential for industrial and other high intensity uses.[156]
- Other MICs include the **Port of Tacoma**, a major container port, and includes a wide mix of industrial uses, including cargo terminals, manufacturers, warehouses, repair facilities, and rail yards, and the **Kent** MIC, a major manufacturing and distribution center. These two hubs are described in more detail in the following chapter under Case Study #1.

Port of Vancouver Hub

Located in Vancouver, Washington, the Port of Vancouver is a regional logistics load center for the transportation network of the Pacific Northwest. Situated at the terminus of the Columbia River's deep draft channel, the port provides a gateway to the river-barge ports of eastern Oregon and Washington and northern Idaho. It is the transfer and switching center for four major railroad lines serving North America: BNSF, Union Pacific, Canadian National and Canadian Pacific Railroads. The port is located within two miles of I-5 and 10 miles of I-84, and is served by many local and interstate trucking lines. Manufacturing and processing activities in Vancouver include electronics, high technology, steel, aluminum, paper composites and others.[157]

Central Washington Hubs

The freight hub in Ellensburg primarily processes, packages and distributes fruit and other Washington agricultural products, while freight hubs in Wenatchee, Yakima, Richland and Pasco include a mix of agricultural processing, manufacturing and distribution. Freight hubs are located in areas that have all been designated in their respective cities' comprehensive plans with industrial zoning. These areas include a variety of existing industrial uses and have been identified for future growth in industrial development that includes manufacturing and distribution. For example, the City of Richland has a large industrial area on the north side of the city, which includes the 200-acre Horn Rapids Business Center, the 750-acre Horn Rapids Industrial Park, the Port of Benton Manufacturing Mall, and Tri-Cities Science and Technology Park. This area is located just north of the Richland Airport, and is directly served by rail and SR 240.[158]

Spokane Area Hubs

In the Spokane area, freight hubs include the manufacturing area of Liberty Lake, with industrial uses such as electronics, high tech, and assembly manufacturing, and the West Spokane/Spokane Valley industrial area which includes a major intermodal rail facility and a mix of manufacturing and distribution centers. These areas are described in more detail in the following chapter under Case Study #3. The industrial area located south of the Spokane International Airport has also emerged as a freight hub, serving a mix of

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[155] Puget Sound Regional Council, Urban Centers Report, Frederickson Manufacturing/Industrial Center, 2002.
[156] City of Bremerton, Annexation – South Kitsap Industrial Area (SKIA) Overview, Accessed November 2012 from: http://www.ci.bremerton.wa.us/display.php?id=977.
[157] Port of Vancouver USA, Overview of Marine Terminals and Industrial Property. Accessed November 2012 from: http://www.portvanusa.com/.
[158] City of Richland, Economic Development Office, Available Sites and Buildings, Accessed November 2012 from: http://ci.richland.wa.us/index.aspx?NID=396.

industrial uses. All of these areas have direct access to the state highway system through their proximity to I-90, as well as other state highways such as SR 290.

Urban Goods Movement Case Studies

Connectivity of urban freight hubs to each other, as well as to the urban populations that they serve, is critical for efficient delivery of goods to homes, businesses, and medical and other service facilities. Traffic congestion on these roadways not only affects the reliability of the delivery of goods, but can also have major economic impacts.

The Truck Performance Measure program analyzes the performance of the Washington State highway and local road network using truck travel data measured by Global Positioning System (GPS) devices. WSDOT tracks the speed and location of over 6,000 trucks per day. Each observation reflects a truck trip between a defined starting point (origin) and ending point (destination). The GPS device records the truck's location in five- to 15-minute intervals, documenting where the truck's trips begin, where it ends, its travel time, and the route that it travels. From these data, average travel speed for the length of each trip can also be derived. For each recorded trip, the truck's origin and destination has been geocoded to transportation analysis zones defined by the corresponding region's planning organization (such as the PSRC in the Puget Sound area, or the Spokane Regional Transportation Council [SRTC] in the Spokane area); the data from multiple zone-to-zone trips can then be compiled to evaluate the overall performance of roadway corridors between destinations and to support system-wide transportation modeling.[159] The GPS device also records the truck's location at regular intervals during the trip, which also allows some analysis of the route used.

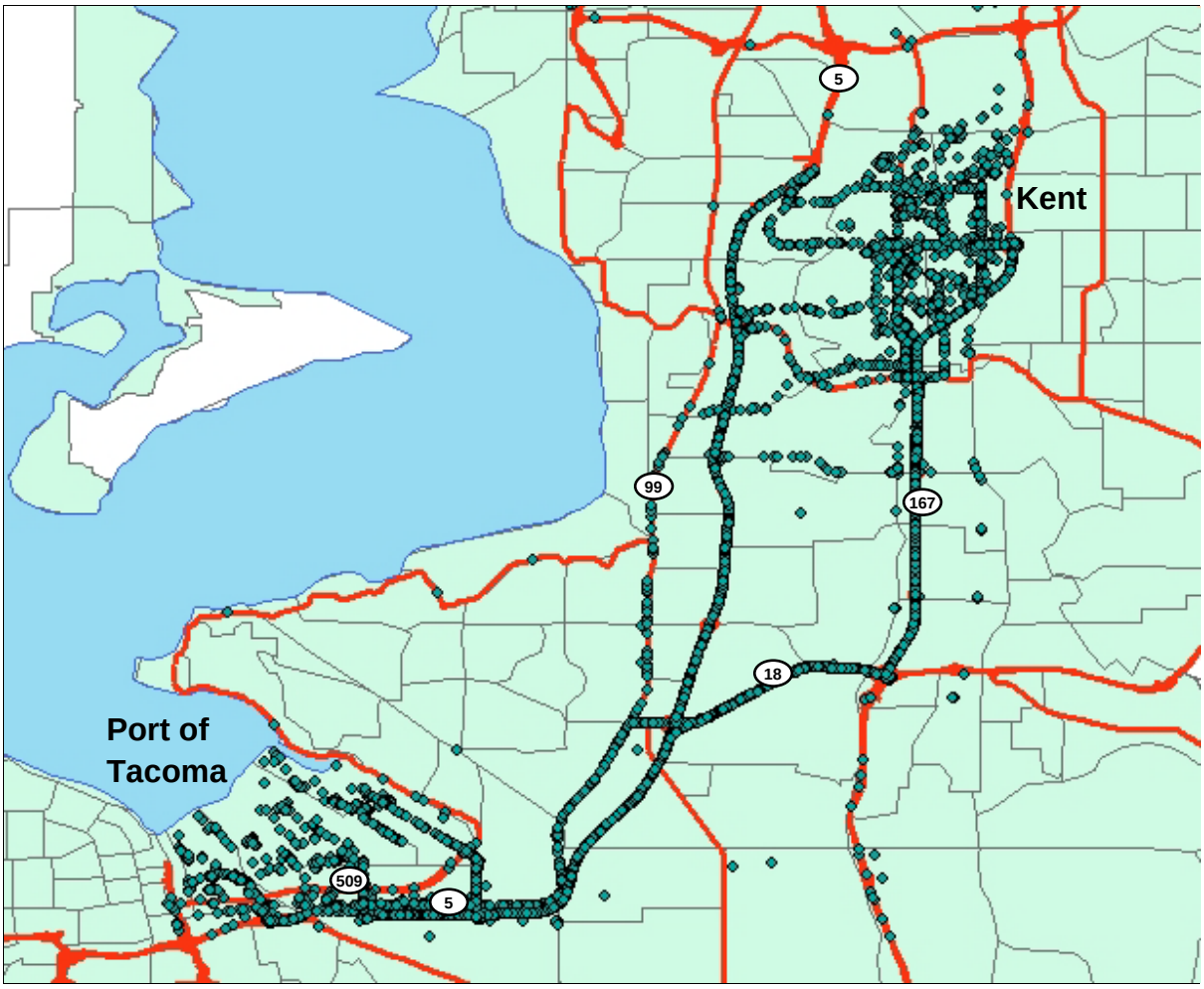
This chapter presents three case studies that illustrate one use for the data generated by the Truck Performance Measure program. Because trucks may use multiple routes in urban areas to reach their destinations, WSDOT is evaluating the performance of zone-to-zone urban truck travel. WSDOT analyzed zone-to-zone truck speed performance, from September 1, 2011, through August 31, 2012. Data were used to evaluate travel routes, times and speeds between freight hubs and to consumer centers the urban freight transportation system. In the future WSDOT will use this baseline data to evaluate trends in zone-to-zone truck travel in major urban centers. Increases in the numbers of trucks observed will also increase the reliability of the conclusions that can be drawn regarding system-wide roadway performance, because average results will be less influenced by any unusual incidents that affect one truck's operation during an observed trip.

Case Study #1: Port of Tacoma to the Kent Industrial Area

This case study analyzes the zone-to-zone performance from a major gateway for import and export goods, the Port of Tacoma, to the distribution and manufacturing centers in the Kent MIC. The Kent MIC zones were analyzed because they have a high concentration of distribution centers and other industrial uses, so observed truck trips are most likely related to these uses. The Truck Performance Measure GPS data included over 700 observations of trucks that made the trip from the Port of Tacoma to the Kent MIC (with each observation beginning its trip at the Port of Tacoma and ending its trip in Kent). Exhibit 41 shows the routes traveled by the trucks that were observed.

[159] McCormack, Ed and Wenjuan Zhao, GPS Truck Data Performance Measures Program in Washington State, Washington State Transportation Center (TRAC), University of Washington, prepared for the Washington State Department of Transportation, June 2011.

Exhibit 41: Observed Truck Travel Routes – Port of Tacoma to Kent Industrial Area



Source: Washington State Department of Transportation, November 2012. Each dot on the map represents the position of a truck when it communicated through its GPS transponder.

Land Use Characteristics

The Port of Tacoma is home to a wide mix of industrial uses, including cargo terminals, manufacturers, warehouses, repair facilities, rail yards and others. This port is specially equipped to handle containerized cargo, which is a system of freight transport using standardized containers that can be loaded and transported onto container ships, railroad cars and trucks. Some of the largest container and other cargo terminals in this area are owned by the Port, but there are also numerous private facilities that transfer cargo to and from ships and barges. The Port also owns terminals serving grain exports, automobile imports, breakbulk cargoes (cargo packed in units such as boxes, bales, drums and others, but not containerized), and heavy-lift cargoes (oversized cargo that is not standardized, and is typically transported and lifted or installed into place). In 2012, the Port handled over 1.7 million TEUs (twenty-foot equivalent units)[160] and almost 6 million tons of non-containerized goods.[161]

The City of Kent is located midway between the cities of Seattle and Tacoma. It is the sixth largest city in Washington with a population of nearly 115,000. Kent is home to over 4,500 businesses and over 78,000

[160] A TEU is a measure of container cargo. A forty-foot container represents two TEUs.
[161] Port of Tacoma, About the Port and Cargo Volumes. http://www.portoftacoma.com Accessed February 2013.

jobs. The Kent MIC is located in the Kent Valley just north of downtown Kent. The Kent MIC (covering about 3.7 square miles) contains the eastern half of the Kent North Valley Industrial Area. It is planned and zoned for more intense development than the rest of the larger Kent industrial area. Current land use in the Kent MIC is predominantly warehousing (about 57 percent), with industrial use comprising 13 percent and commercial uses accounting for another 7 percent. The remaining 23 percent of the center contains a mix of open space, office, residential, government/military, and vacant areas.[162]

Truck Trip Characteristics

The Kent industrial area is located about 20 miles from the Port of Tacoma. The times of day that trucks travel to and from the Port are constrained by the gate hours at each Port gate. Gate hours vary greatly from terminal to terminal, and depend on the clients they serve and labor costs associated with operating a nighttime gate. Some terminals will open a night gate when a ship is in port just to move a high number of containers to an off-dock intermodal yard or to a specific high-volume customer. Otherwise most gates are only open during daytime business hours.

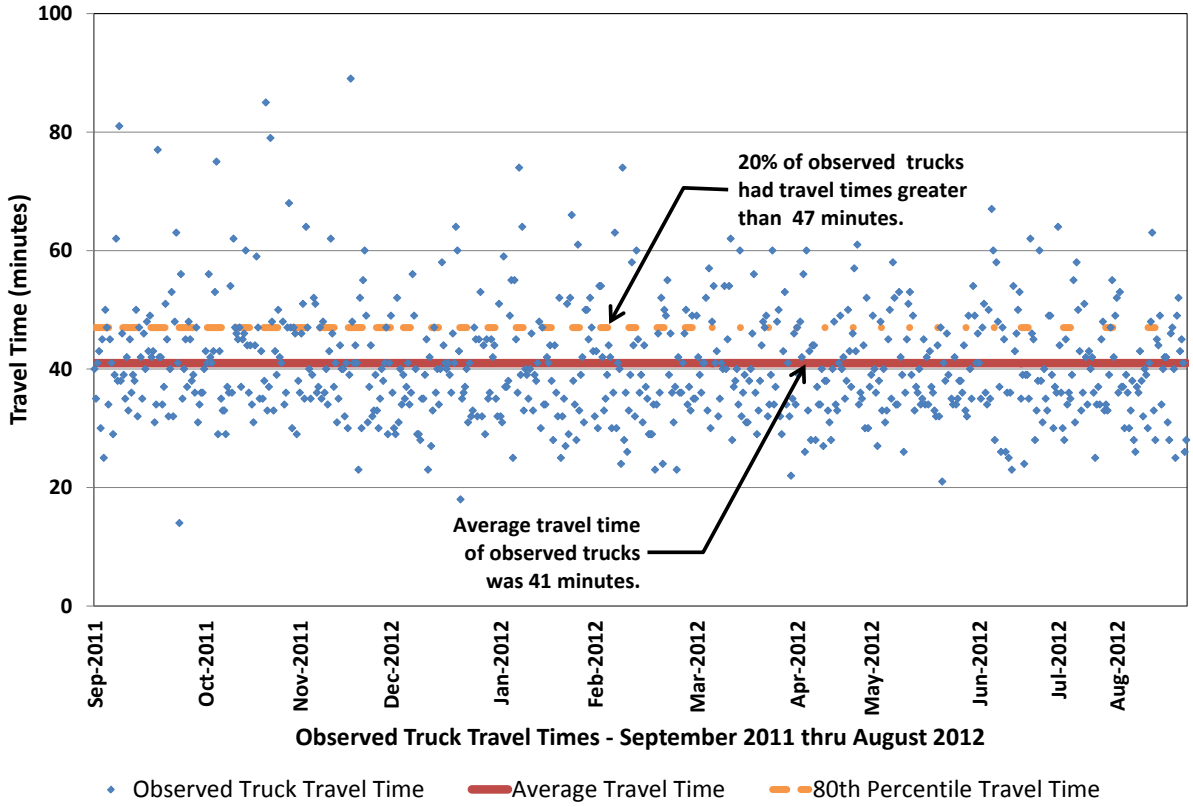
As shown on Exhibit 41, truck drivers chose many routes from the Port of Tacoma to Kent, including different combinations of SR 509, I-5, SR 99, SR 18, SR 167, and local roadways. The route that a driver chooses will depend on their specific origins and destinations within the larger areas, the size of the truck (e.g. very large trucks are more likely to stay on highways and major roads that are designed to accommodate them, while smaller trucks have more options to use local roads), topography, and the relative congestion on the roadways. Since drivers make these trips regularly, they will choose the route that that their experience tells them will minimize their travel time. Real time traffic reports provided via radio broadcasts, web sites (such as WSDOT's "Traffic Cameras" website),[163] and highway variable message signs can also help drivers choose the fastest route on a given day.

Exhibit 42 shows the time that each observed truck took to travel from the Port of Tacoma to Kent, regardless of the travel route used. As shown, the travel times for the approximate 20-mile trip varied greatly, with the lowest around 20 minutes and the highest at almost 90 minutes. The majority of trips took between about 25 and 55 minutes, with an average travel time of 41 minutes. The 80th percentile travel time was 47 minutes, meaning that 80 percent of truck trips had a travel time of 47 minutes or lower, and 20 percent had a travel time that was higher. The high variability of the data indicates that overall, truck travel time between the Port of Tacoma and the Kent Industrial Area is not very reliable overall; a trip that takes 25 minutes on one day, may take over 60 minutes on another day.

[162] Puget Sound Regional Council, 2002 Regional Growth Centers Report: Kent Manufacturing Industrial Center. http://www.psrc.org/growth/centers Accessed November 2012.

[163] Washington State Department of Transportation, Washington State Traffic Cameras, http://www.wsdot.com/traffic/cameras/default.aspx

Exhibit 42: Observed Truck Travel Times – Port of Tacoma to Kent Industrial Area

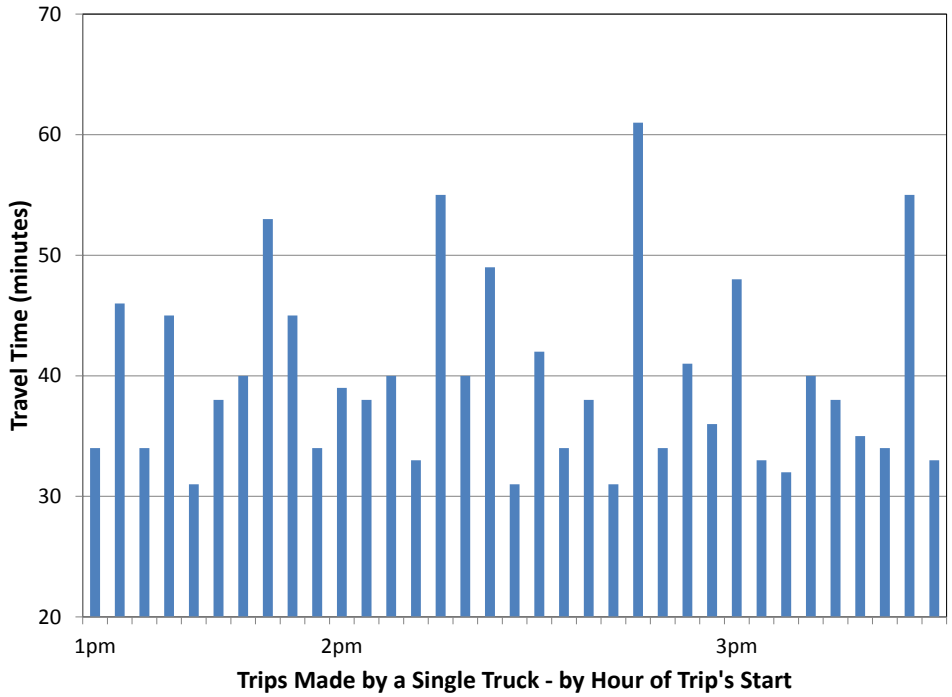


Source: Washington State Department of Transportation, Heffron Transportation Inc. November 2012.

Exhibit 43 shows the travel time variability of **one truck** that made the trip from the Port of Tacoma to the Kent MIC 35 times during the one year study period. Data does not allow WSDOT to determine the truck equipment or type of commodity the truck is carrying. Because of this, just one truck was tracked because it is more likely to be making the same type of trip between the two destinations; this allowed for control of variables such as difference in trip chaining or customer needs that can affect the travel time, to the extent possible. In this example the truck traveled the two zones from 1:00 P.M. to 4:00 P.M. As shown, the afternoon travel times for this truck varied greatly from day to day, with the shortest trip made in 31 minutes and the longest in 61 minutes. The exhibit shows that the variability in travel time did not coincide with the time of day. The same trip departing at about the same time on two consecutive days could have very different travel times.

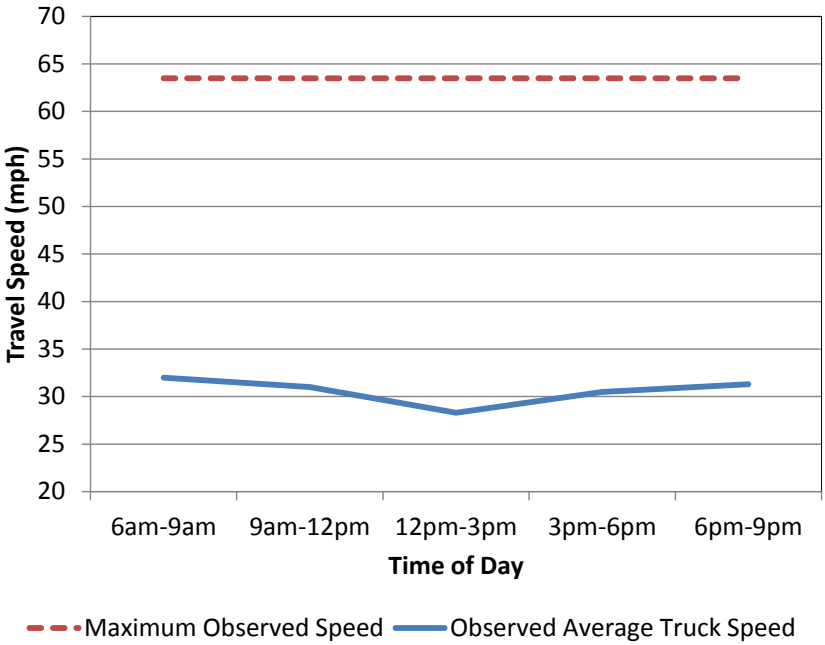
Exhibit 44 shows the average travel speed by time of day for all of the measured truck trips shown previously on Exhibit 42. The figure shows that average travel time of the observed trips between the Port of Tacoma and the Kent MIC did not vary greatly throughout the day. This also indicates that the variability in travel time between these two areas did not correlate to certain periods of the day.

Exhibit 43: Variance in Travel Time for Multiple Trips by One Truck – from the Port of Tacoma to the Kent Industrial Area



Source: Washington State Department of Transportation, Heffron Transportation Inc. November 2012. Data reflect the travel times for one truck that made the trip from the Port of Tacoma to the Kent MIC 35 times during the year-long study period.

Exhibit 44: Average Truck Speed by Time of Day – Port of Tacoma to Kent Industrial Area



Source: Washington State Department of Transportation, Heffron Transportation Inc. November 2012.

Conclusions

Analysis of the Performance Data for the observed trucks traveling from the Port of Tacoma to Kent indicated the following:

- Drivers chose many different routes from the Port of Tacoma to Kent, including different combinations of SR 509, I-5, SR 99, SR 18, SR 167, and local roadways. Since drivers tend to make these trips regularly, they will choose the route that that their experience tells them will minimize their travel time, and the data indicate that drivers choose numerous different routes to try to reduce travel time between these two destinations.
- The travel times for the approximate 20-mile trip varied greatly, with the lowest around 20 minutes and the highest at almost 90 minutes. The majority of trips took between about 25 and 55 minutes, with an average travel time of 41 minutes.
- The average travel speed from 6:00 A.M. through 9:00 P.M. was relatively steady, ranging between about 28 and 32 miles per hour (mph) throughout the day. This indicates that the variability in travel time did not correlate to certain periods of the day. Instead, travel times along the routes between the Port of Tacoma and Kent tended to vary within the same periods each day.

Low average travel speeds and unreliable travel times resulting from traffic congestion pose challenges to Port of Tacoma shippers, truckers who deliver the goods, and manufacturers and distribution centers in Kent that receive the goods, all of whom depend on reliable delivery. If travel speeds are slow, this can affect the price of goods because it costs more to transport them. It can also affect the competitiveness of the Port, if shippers can reduce costs by choosing a different gateway.

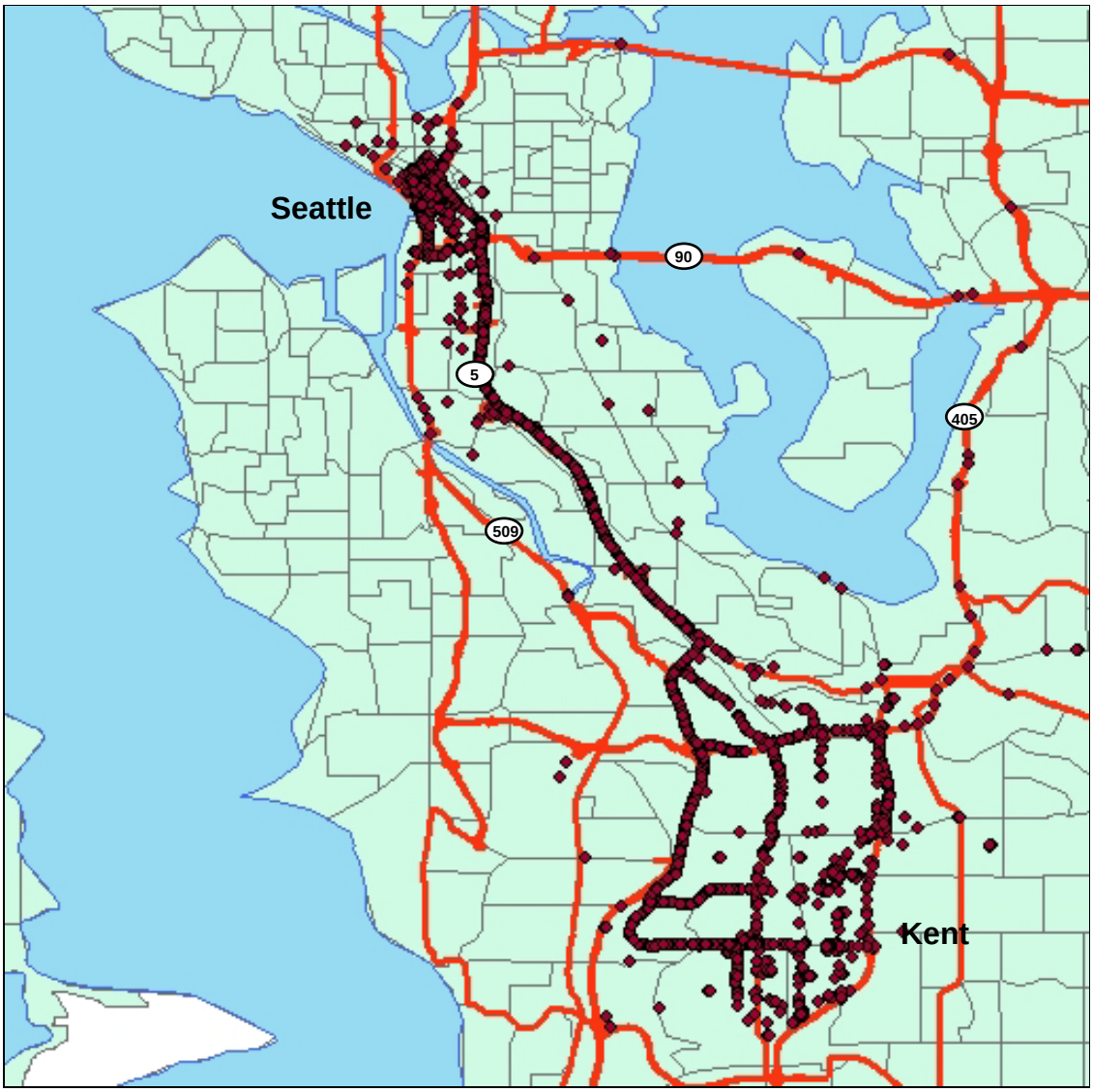
Transportation improvements that reduce travel times and improve reliability between our state's ports and manufacturing/distribution centers have a ripple effect through the state's economy. Not only do they directly affect the cost of goods by reducing the resources needed to transport those goods, but they increase the competitiveness of the ports and other gateways where goods arrive, and of the manufacturing and distribution centers that create and deliver those goods, all of which are major job producers within the state.

Case Study #2: Kent Industrial Area to Downtown Seattle

This case study reflects trips from distribution and manufacturing centers in Kent to downtown Seattle, an area with the densest population and employment in Washington, and a high demand for deliveries.

The Truck Performance Measure GPS data included almost 600 observations of trucks that made the trip from the Kent MIC to downtown Seattle commercial business district (CBD) (with each observation beginning its trip in Kent and ending in Seattle). Exhibit 45 shows the routes traveled by the trucks that were observed.

Exhibit 45: Observed Truck Travel Routes – Kent Industrial Area to Downtown Seattle



Source: Washington State Department of Transportation, November 2012. Each dot on the map represents the position of a truck when it communicated through its GPS transponder.

Land Use Characteristics

As described in the previous case study, the Kent MIC is a major manufacturing and distribution center, the largest in the region. Goods arrive at its distribution centers from all over the world, to be delivered throughout the region.

Downtown Seattle is a major destination for goods delivered from Kent facilities. Downtown Seattle covers 952 acres, and includes over 17,800 households, the City's historic central business and retail districts, along with over a third (more than 147,800) of the city's jobs.[164]

[164] City of Seattle, Presentation to Growth Management Policy Board, Seattle Urban Centers, 2009. Retrieved November 2012 from: http://www.psrc.org/growth/centers/regional-growth-center-presentations/

Truck Trip Characteristics

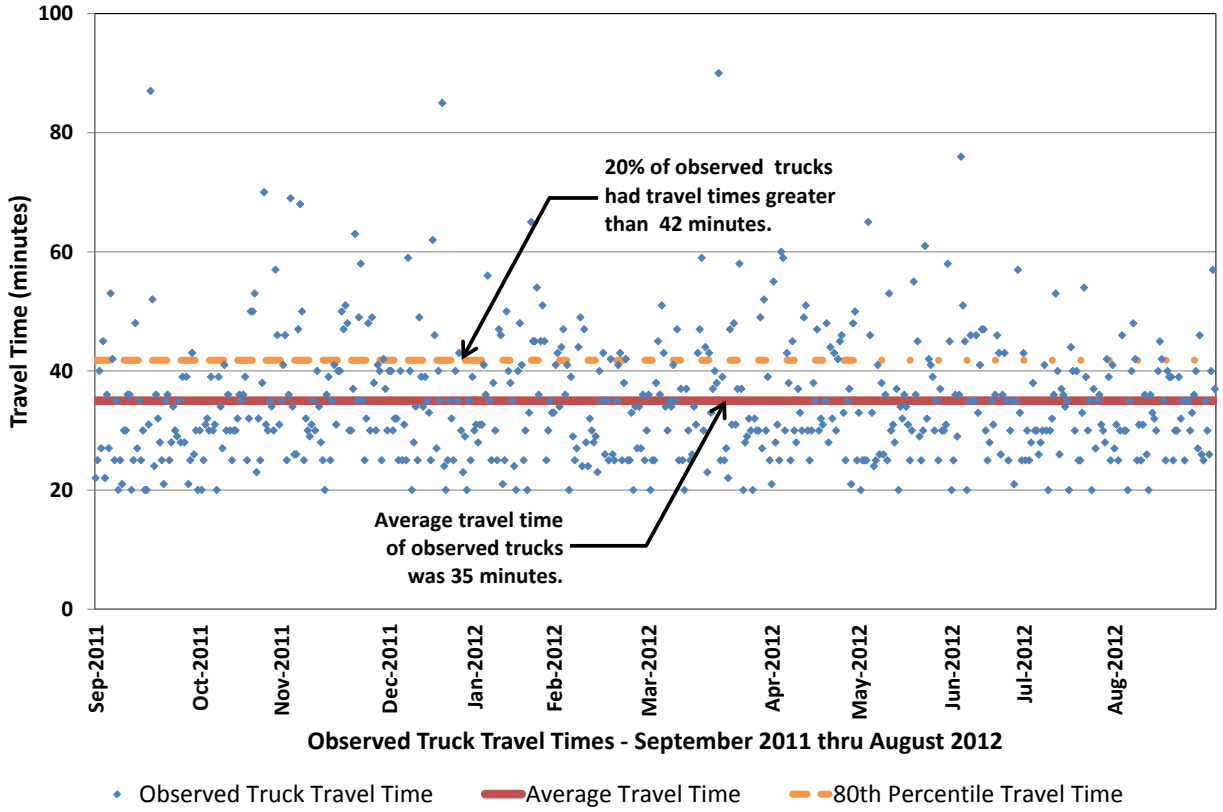
Downtown Seattle is located about 15 miles from the Kent industrial area. The times of day that trucks travel are constrained by the hours of operation and logistics of the businesses to which goods are delivered, the logistics of the manufacturing and distribution centers that deliver the goods. Due to narrower streets and alleys, as well as high traffic levels, the City of Seattle prohibits the use of large trucks for daytime deliveries in the CBD. Companies must use small to medium-sized trucks when delivering to Downtown, so more trucks are needed to make deliveries.[165]

As shown on Exhibit 45, trucks traveled on different local roads at both ends of their trips, but most used I-5 to travel between the two general areas. Even with congested conditions on I-5, it is unlikely that alternate routes using local highways and roads would result in faster travel times. Therefore, the routes that did not use I-5 may reflect trucks that chained deliveries to more than one destination located along the local roadways between Kent and Seattle.

Exhibit 46 shows the time that each observed truck took to travel from Kent to the Seattle CBD. As shown, the travel times for the approximate 15-mile trip varied greatly, with the lowest around 20 minutes and the highest around 90 minutes. The majority of trips took between about 25 and 40 minutes, with an average travel time of 35 minutes. The 80th percentile travel time was 42 minutes, meaning that 80 percent of truck trips had a travel time of 42 minutes or lower, and 20 percent had a travel time that was higher. Some of the variability could be due to longer trips for trucks that chained multiple deliveries. However, Exhibit 45 shows that the majority of trips were made using I-5. The high variability of the data indicates that overall, truck travel times between the Kent Industrial Area and Downtown Seattle were not very reliable. Similar to Case Study #1, a trip that takes 25 minutes on one day, may take over 60 minutes on another day. The fastest observed travel time was about 20 minutes; this likely reflects free flow travel conditions during uncongested times of day.

[165]The City of Seattle has a "Downtown Traffic Control Zone" into which trucks longer than 30 feet are prohibited from entering between 7:00 A.M.. and 7:00 P.M. except with a permit (Seattle Municipal Code (SMC) 11.62.080). The Downtown Traffic Control Zone extends from Yesler Way on the south to Lenora Street on the north and from 8th Avenue on the east to 1st Avenue on the west. The SMC also prohibits large trucks (over 30-feet long) from using Denny Way between Western Avenue and Olive Way during the commuter peak periods (7:00 to 9:00 A.M. and 4:00 to 6:00 P.M.) (SMC 11.62.120).

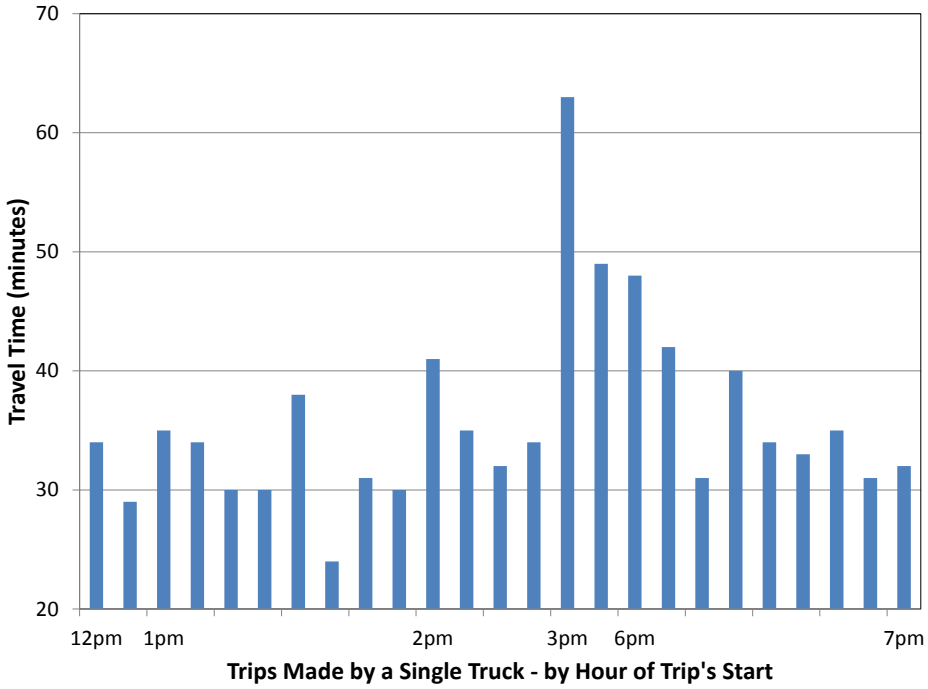
Exhibit 46: Observed Truck Travel Times – Kent Industrial Area to Downtown Seattle



Source: Washington State Department of Transportation, Heffron Transportation Inc. November 2012.

As with Case Study #1, trips made by just one truck were evaluated to eliminate travel time difference due to external factors associated with different delivery or customer needs. Exhibit 47 shows the travel time variability of one truck that made the trip from the Kent MIC to Downtown Seattle 25 times during the year. Trips made by this truck occurred in the afternoon between noon and 7:00 P.M. As shown, the afternoon travel times for this truck varied greatly from day to day, with the shortest trip made in 24 minutes and the longest in 63 minutes. The exhibit shows that the worst variability in travel time for this truck coincided with PM peak period between 3:00 P.M. and 6:00 P.M. For trips that departed during this period, travel times varied between 31 to 63 minutes. Trips departing between noon and 3:00 P.M. also experienced some variability in travel time but to a much lesser degree; travel times ranged from 25 to 41 minutes, with the majority between 30 and 40 minutes.

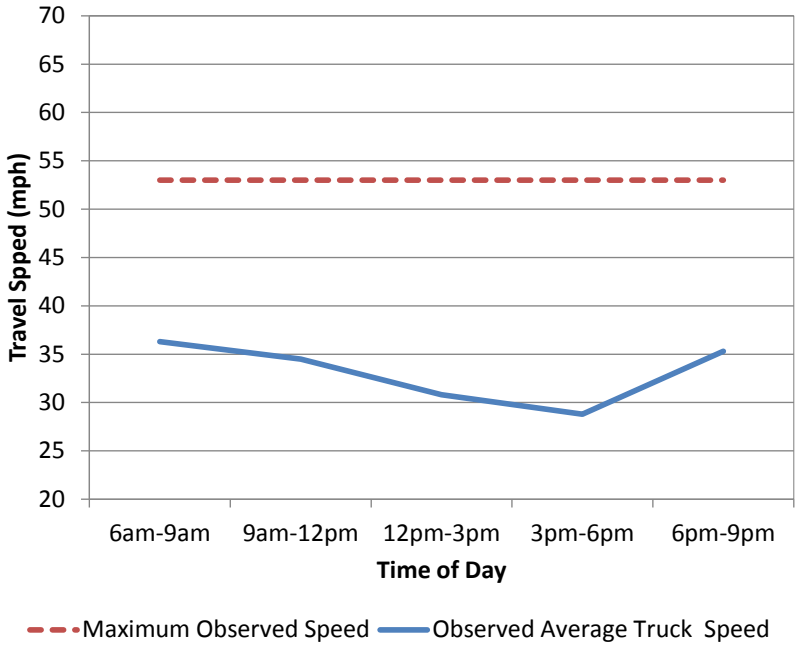
Exhibit 47: Variance in Travel Time for Multiple Trips by One Truck – Kent Industrial Area to Downtown Seattle



Source: Washington State Department of Transportation, Heffron Transportation Inc. November 2012. Data reflect the travel times for one truck that made the trip from the Kent MIC to downtown Seattle 25 times during the year-long study period.

Exhibit 48 shows the average truck speed by time of day for all of the measured truck trips shown previously on Exhibit 46. It shows a pattern throughout the day indicating that the measured trucks experienced steady degradation of average travel speed throughout the day, improving only after the end of the PM peak period. This pattern is consistent with the travel time variability illustrated on Exhibit 47; as congestion worsens, operations on a roadway become closer to a breaking point which can result in highly fluctuating travel times, particularly if combined with a distraction at the side of the road or a collision.

Exhibit 48: Average Truck Speed by time of Day –Kent Industrial Area to Downtown Seattle



Source: Washington State Department of Transportation, Heffron Transportation Inc. November 2012.

Conclusions

Analysis of the Performance Data for the observed trucks traveling from the Kent Industrial Area to Downtown Seattle indicated the following:

- Trucks traveled on different local roads at both ends of their trips, but most used I-5 to travel between the two general areas. Even with congested conditions on I-5, it is unlikely that alternate routes utilizing local highways and roads would result in faster travel times. Therefore, the trucks that did not utilize I-5 may reflect those that chained deliveries to more than one destination located along the local roadways between Kent and Seattle.
- Travel times for the approximate 15-mile trip varied greatly, with the lowest around 20 minutes and the highest around 90 minutes. The majority of trips took between about 25 and 40 minutes, with an average travel time of 35 minutes.
- The average travel speed decreased steadily from 6:00 A.M. until about 6:00 P.M.

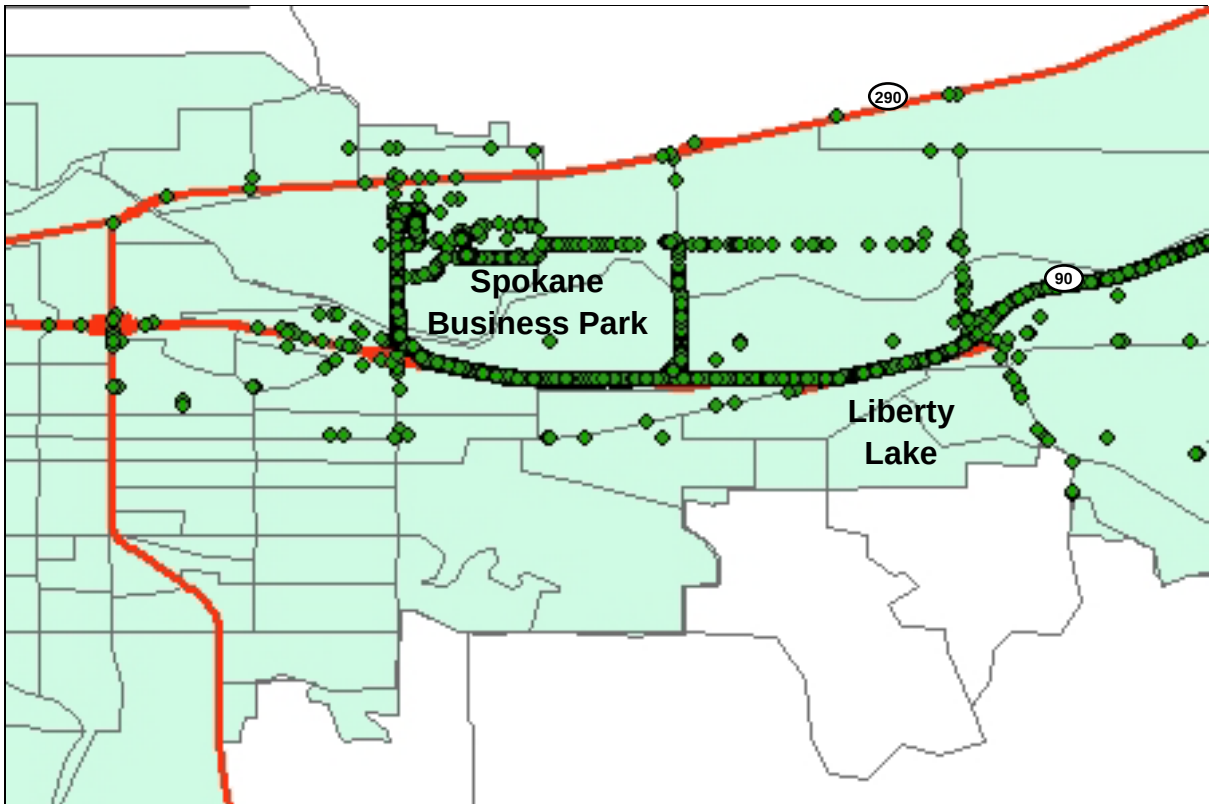
This pattern is challenging for delivery of goods because as the day goes on, the time and cost of delivery not only increases, but becomes less reliable. Many deliveries must occur during business hours, and time-critical deliveries also occur throughout the day. Therefore, restricting deliveries to off-peak times of day is often not an option. For packages that need to be delivered by a certain time of day (e.g. medical supply deliveries or overnight express packages), slower travel speeds can be factored into the overall delivery management. However, longer travel times, can affect the cost of distributing goods. Ultimately this can translate into a higher cost of goods to the consumer. They also will likely increase the volumes of trucks and in turn congestion on the road, because more trucks are required to make deliveries.

The City of Seattle restricts the size of trucks that can make deliveries to Downtown during daytime hours. Smaller trucks may need to make several trips back to the distribution center during the day to deliver all of the goods that would otherwise be carried in a large truck. This results in more truck trips on I-5 and a longer delivery day. The travel speed declines in the afternoon substantially affect the reliability of afternoon trips.

Case Study #3: Liberty Lake to Spokane Valley Business Park

This case study reflects the trips from a manufacturing center in Liberty Lake to a distribution center in the Spokane Business & Industrial Park in the City of Spokane Valley. The Truck Performance Measure GPS data included over 1,700 observations of trucks that made the trip from the Liberty Lake industrial area to the Spokane Business & Industrial Park (with each observation beginning its trip at Liberty Lake and ending its trip at the Spokane Business Park). Exhibit 49 shows the routes traveled by the trucks that were observed.

Exhibit 49: Observed Truck Travel Routes – Liberty Lake to Spokane Business Park



Source: Washington State Department of Transportation, November 2012. Each dot on the map represents the position of a truck when it communicated through its GPS transponder.

Land Use Characteristics

The City of Liberty Lake, located to the east of Spokane, has an industrial area with mixed manufacturing. About 35 percent of the total city area (about 1,157 acres) is designated for commercial/industrial land use. Industrial uses within the City include electronics, high tech, and assembly manufacturing. Areas with a light-industrial land use designation are comprised of predominantly industrial uses such as manufacturing, but may incorporate office and commercial uses that support and complement the industrial area.[166]

The Spokane Business & Industrial Park includes existing distribution centers, and could potentially be a location for additional distribution centers in the future. Located in eastern Spokane Valley, the park is located between I-90 and SR-290. It is about 615 acres in size, has more than 70 buildings ranging in size from 1,200 to 270,000 square feet, and currently houses about 120 companies that employ about 4,500 people. Businesses located in the Spokane Business & Industrial Park include Pella Windows, Golden State

[166] City of Liberty Lake, Comprehensive Plan 2003-2022, adopted September 16, 2003, Revised November 17, 2009.

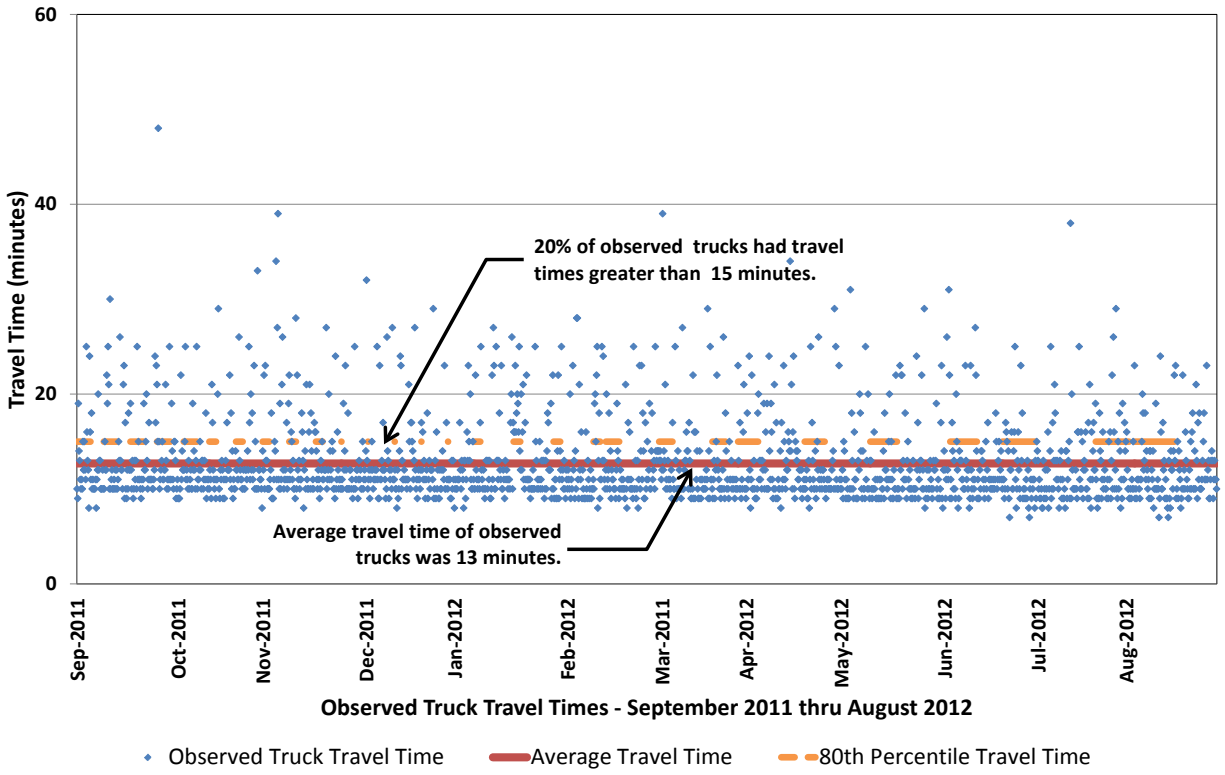
Foods, a supplier for the quick service restaurant industry, and L.B. Foster, a supplier of materials needed to build infrastructure.[167]

Truck Trip Characteristics

The Spokane Business & Industrial Park is located about six miles away from Liberty Lake. As shown on Exhibit 49, both areas are located near I-90, so the potential routes that drivers may choose were generally different combinations of I-90 and local roadways.

Exhibit 50 shows the time that each observed truck took to travel from the Liberty Lake industrial area to the Spokane Business & Industrial Park. The travel times for the approximate six-mile trip varied, with the lowest around seven minutes and the highest at 48 minutes. However, the vast majority of trips took between about 10 and 15 minutes, with an average travel time of 13 minutes. The 80th percentile travel time was 15 minutes, meaning that 80 percent of truck trips had a travel time of 15 minutes or lower, and 20 percent had a travel time that was higher. The data showed that 45 percent of the total observed truck trips occurred between noon and 3:00 P.M.

Exhibit 50: Observed Truck Travel Times – Liberty Lake to Spokane Business Park

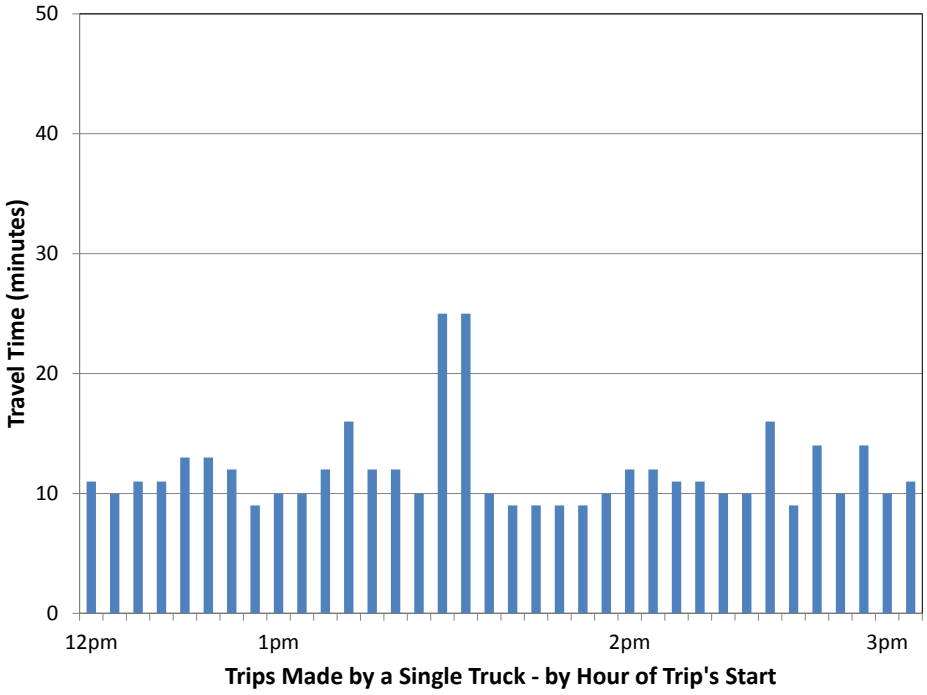


Source: Washington State Department of Transportation, Heffron Transportation Inc. November 2012.

Exhibit 51 shows the travel time variability of **one truck** that made the trip from Liberty Lake to the Spokane Business & Industrial Park 26 times, in the afternoon between noon and 3:00 P.M. As shown, with only two exceptions, the observed trips exhibit fairly low variability in travel time. While two of the trips were 25 minutes in length, the remaining trips varied between nine and 15 minutes. This indicates that typically during midday, travel times from Liberty Lake to the Spokane Business Park were reliable.

[167] The Park: Spokane Business &Industrial Park. Informational http://www.thepark.biz/index.htm

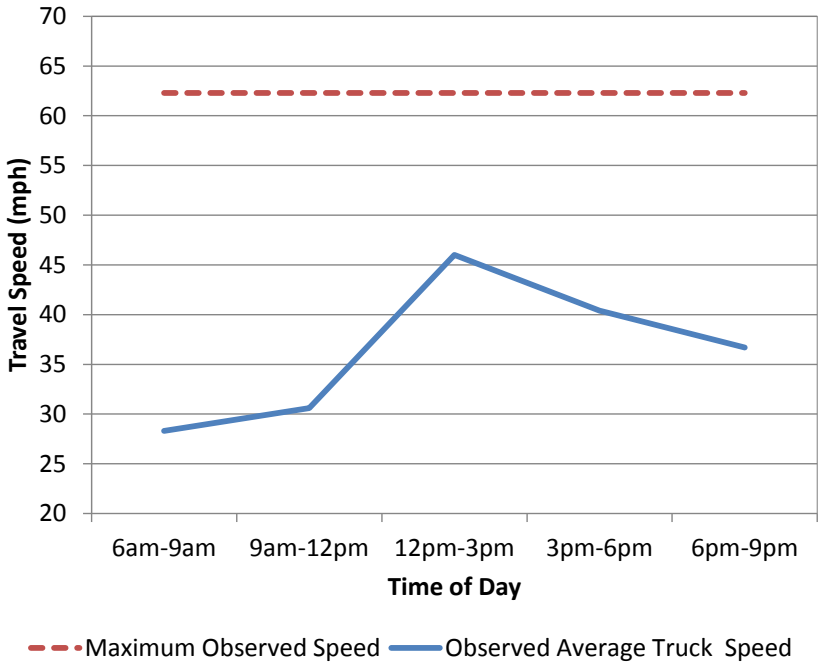
Exhibit 51: Variance in Travel Time for Multiple Trips by One Truck –Liberty Lake to Spokane Business Park



Source: Washington State Department of Transportation, Heffron Transportation Inc. November 2012.
Data reflect the travel times for one truck that made the trip from Liberty Lake to the Spokane Business & Industrial Park 26 times during the year-long study period.

Exhibit 52 shows the average truck speed by time of day for all of the measured truck trips shown previously on Exhibit 50. These data show a conventional urban traffic pattern, in which congestion is higher (thus, average travel speeds are lower) during the AM and PM peak periods, and congestion is lower (thus, average travel speeds higher) during the midday off-peak times. This pattern is consistent with the midday travel times illustrated on Exhibit 51; these data indicate that during off-peak hours congestion was lower and travel times were faster and fairly reliable. Much of the variations in travel time shown on Exhibit 50 likely occurred during peak periods when congestion was higher.

Exhibit 52: Average Truck Speed by time of Day – Liberty Lake to Spokane Business Park



Source: Washington State Department of Transportation, Heffron Transportation Inc. November 2012.

Conclusions

Analysis of the Performance Data for the observed trucks traveling from Liberty Lake to the Spokane Business & Industrial Park indicated the following:

- Both areas are located near I-90, so the routes that drivers chose were generally different combinations of I-90 and local roadways.
- The travel times for the approximate six-mile trip varied, with the lowest around seven minutes and the highest at 48 minutes. However, the vast majority of trips took between about 10 and 15 minutes, with an average travel time of 13 minutes.
- The data indicated a conventional urban traffic pattern, in which congestion is higher (thus, average travel speeds are lower) during the AM and PM peak periods, and congestion is lower (thus, average travel speeds higher) during the midday off-peak times.

With this type of traffic volume pattern, congestion is low during off-peak periods and goods can be transported quickly, while transport times are much slower during the peak periods. Some companies might be able to concentrate deliveries during off-peak times of day, which may explain why such a high proportion of the observed truck trips (45 percent) occurred between noon and 3:00 P.M. However, many companies need to be able to deliver throughout the day. Even if high congestion can be reliably predicted during certain times of day, the actual travel times may not be reliable since even small incidents can have a large effect on road operation under these conditions.

Both the Liberty Lake and Spokane Business & Industrial Park areas have considerable existing industrial and commercial development, but also have room to grow and stated goals to do so. Efficient truck transport between the two areas is beneficial to both, as it encourages synergy between them.

Uses of Truck Performance Measure Data

The case studies presented above represent an initial analysis of what can be done with the Truck Performance Measure data to evaluate operations along major freight roadway corridors. However, given that these data represent only current conditions, they cannot yet be used to track trends. Instead they reflect a baseline against which future performance data can be compared. The use of the data could be expanded in the future in the following ways:

- Travel time trends – WSDOT will track travel times for the three case study travel sheds as well as other major travel sheds in future years to assess how truck travel time and reliability change due to growth or major changes in the highway network, including new capacity and/or tolling.
- Travel route trends – The travel routes that truck drivers choose between major destinations could be tracked to identify where transportation improvements would be most beneficial to freight movement, or to monitor how routes change due to growth or major changes in the highway network.
- Calibration of truck travel demand models – Some Metropolitan Planning Organizations are improving truck modules for their regional travel demand models and some plan to develop them. However, there are limited data available to calibrate these models. Data related to route choices and travel speeds along major truck lines may be used to improve truck travel estimates in these models.
- Truck bottleneck analysis – Currently, WSDOT receives GPS reads at five- to 15-minute intervals, which does not provide enough detail to analyze short segments such as highway ramps or to pinpoint bottlenecks. The Federal Highway Administration (FHWA) Office of Freight Management and Operations will provide one-minute interval truck GPS data to the states in 2013, allowing for more sensitive analysis.
- Emergency route planning – Route analysis during an unexpected closure of a major highway within or outside urban areas (e.g., I-90 at Snoqualmie Pass during a snow event, or I-5 in Chehalis during a flood event) could be used to identify the most-used alternative routes that truckers use.

Summary

The retail and wholesale distribution system delivers the goods to the residents of Washington State. These are the goods that affect our quality of life: food, medical supplies, documents, household goods, and fuel. These goods are transported to their point of sale almost exclusively by truck. Changes in the supply chains and the market means that more of the deliveries are time sensitive, particularly medical supplies and documents. Within the urban areas, where most goods delivery occurs, trucks compete with all of the other transportation needs, including commute trips, school trips, recreation trips, as well as all of the other freight trips associated with other elements of the supply chain. Delays caused by incidents and congestion affect these time-sensitive deliveries, and increase costs to businesses in the supply chain. Some businesses may have to add trucks to account increased travel time, or shift deliveries to other times of day to avoid congestion. These costs are ultimate passed onto the consumer. Therefore, effective and efficient urban goods transportation affects the quality of life and the cost of living for Washington's residents.