WASHINGTON STATE

FREIGHT SYSTEM PLAN

December 2017

Rail, Freight, and Ports Division

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1 INTRODUCTION

Freight movement is the transportation of raw materials and finished goods on the highways and roadways, railways, waterways, airports, and pipelines in Washington. The system relies on the trucks, trains, ships, barges, airplanes, and other vehicles and equipment to move freight on, and between, modes and at intermodal terminals, warehouses, processing facilities, farms, and other locations across the state. The multimodal freight transportation system in Washington is important to the economy of our state and country in many ways. It underpins our national and state economies, supports national defense, directly sustains hundreds of thousands of jobs, and delivers the necessities of life to residents on a daily basis. People depend on a reliable and low-cost freight system for their livelihoods. When the multimodal freight transportation system does not work, it not only affects businesses, it affects everyone.

2017 Freight Plan Requirement: 49 U.S.C. 70202

This section of the U.S. Code lists ten required elements that all State Freight Plans must address for each of the transportation modes. This section discusses elements of the following requirements:

(4) a description of how the plan will improve the ability of the State to meet the national multimodal freight policy goals described in section 70101(b) of this title and the national highway freight program goals described in section 167 of title 23;

(9) a freight investment plan that, subject to subsection (c)(2), includes a list of priority projects and describes how funds made available to carry out section 167 of title 23 would be invested and matched; and

(10) consultation with the State freight advisory committee, if applicable

1.1 Purpose of this plan

The freight transportation system plays a critical role in fostering economic vitality and competitiveness in regional and global markets. As one of the most trade-dependent states in the nation, Washington relies on an efficient freight transportation network. The Washington State Department of Transportation (WSDOT) has led the development of this *2017 Washington State Freight System Plan* to ensure that the transportation system in Washington supports and enhances trade and sustainable economic growth. In addition, this plan addresses federal and state policies and meets federal and state planning requirements.

Reflecting the diversity of the state and the various ways in which freight contributes to Washington's economy, three objectives guided development of this plan:

- Maintaining Washington's competitive position as a global gateway to the nation with intermodal freight corridors serving trade and international and interstate commerce, and the state and national Export Initiatives
- Supporting farm-to-market, manufacturing, and resource industry sectors in rural economies
- Developing an urban goods movement system that provides goods delivery to residents and businesses, supports jobs, bolsters the economy, and affords clean air for all.

The freight system in Washington has many transportation partners with varying roles and responsibilities, as detailed in Appendix D. The public sector is responsible for much, but not all, of the infrastructure used to move freight. It also has a regulatory role, ensuring safety for example. The private sector is responsible for some of the infrastructure, including much of the rail and pipeline systems. Private sector entities also are responsible for providing the majority of vehicles, vessels, and equipment used to move freight, and they make decisions about service, capacity, and rates that reflect market conditions.

This *2017 Washington State Freight System Plan* is the result of a fully collaborative process involving both public and private sector organizations involved in the freight industry. To develop the plan, WSDOT worked with many transportation partners, including the Washington State Freight Advisory Committee (WAFAC) and other freight industry representatives, metropolitan and regional planning organizations (MPOs/RTPOs), cities, counties, ports, and tribal governments, as well as with federal and state partners. WSDOT will work with these partners to implement strategies and take actions identified in this plan. We can meet the challenge together.

This *2017 Washington State Freight System Plan* provides:

- information on the importance of freight to the economy of the state, the regions, and the local communities
- analysis of volumes, and a forecast for freight
- information on the major freight trends, issues, and needs
- a blueprint of strategies to address the identified trends, issues, and needs

This plan includes two additional key components:

- *2017 Washington State Freight Investment Plan* in Appendix A that describes key funding sources, networks eligible for funding, and projects identified on those networks
- *2017 Washington State Marine Ports and Navigation Plan* in Appendix B that describes the marine system and assesses the transportation needs of marine ports, including navigation.

1.2 Relation to federal requirements

This plan meets several federal and state requirements. The planning requirements and the policies that guided its development are detailed in Appendix C. In particular, this plan is required to meet ten federal requirements described in 49 U.S.C. 70202.[1] These ten requirements, and how they are addressed within this plan, include:

1) An identification of significant freight system trends, needs, and issues with respect to the state. WSDOT identifies trends, needs, and issues for each of the state's six transportation system policy goals in Chapters 5 through 10. The trends, needs, and issues were developed from the *2014 Washington State Freight Mobility Plan*, the draft *2016 National Freight Strategic Plan*, other plans and studies developed since 2014, and outreach with transportation planning partners.

[1] *49 U.S.C. 70202. http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title49-section70202&num=0&edition=prelim*

2) A description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the state. WSDOT describes the freight policies in Section 1.6, including the state's six transportation system policy goals. WSDOT describes strategies within the discussion of each of the state's six transportation system policy goals in Chapters 5 through 10. WSDOT describes performance measures in Chapter 4.
3) When applicable, a listing of: a) multimodal critical rural freight facilities and corridors designated within the state under section 70103 of title 49 (National Multimodal Freight Network); b) critical rural and urban freight corridors designated within the state under section 167 of title 23 (National Highway Freight Program). WSDOT lists these facilities and corridors on the National Highway Freight Network in the *2017 Washington State Freight Investment Plan* located in Appendix A.
4) A description of how the plan will improve the ability of the state to meet the national multimodal freight policy goals described in 49 U.S.C. 70101(b) and the national highway freight program goals described in section 167 of title 23. WSDOT addresses each goal in Appendix C, Section 3.1.2.
5) A description of how innovative technologies and operational strategies, including freight intelligent transportation systems that improve the safety and efficiency of the freight movement, were considered. WSDOT describes this in Chapters 5 through 10.
6) In the case of roadways on which travel by heavy vehicles (including mining, agricultural, energy cargo or equipment, and timber vehicles) is projected to substantially deteriorate the condition of the roadways, a description of improvements that may be required to reduce or impede the deterioration. WSDOT describes this in Section 6.1.
7) An inventory of facilities with freight mobility issues, such as bottlenecks, within the state, and for those facilities that are state-owned or operated, a description of the strategies the state is employing to address those freight mobility issues. WSDOT describes this in Chapter 8.
8) Consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay. WSDOT describes this in Chapter 8.
9) A freight investment plan that, subject to 49 U.S.C. 70202(c), includes a list of priority projects and describes how funds made available to carry out 23 U.S.C. 167 would be invested and matched. WSDOT included this information within the *2017 Washington State Freight Investment Plan* located in Appendix A. The plan was developed to track recent freight funding investments and to guide future investments that benefit freight transportation in Washington. The fiscally constrained plan includes a list of priority projects and describes how National Highway Freight Program funds have and will be invested and matched. The plan also identifies investments from the Nationally Significant Freight and Highway Projects Program. Because eligibility for these programs depends, in part, on designation of the National Highway Freight Network (NHFN) as a criterion, discussion of the NHFN is also included. The plan is an appendix to the *2017 Washington State Freight System Plan* so that it can be updated separately, as needed.
10) Consultation with the State Freight Advisory Committee, if applicable. WSDOT consultation with the Washington Freight Advisory Committee (WAFAC) is described in Appendix E.

1.3 Relation to state requirements

The *2017 Washington State Freight System Plan* meets requirements in state law,[2] which include: "The state-interest component of the statewide multimodal transportation plan shall include a freight mobility plan which shall assess the transportation needs to ensure the safe, reliable, and efficient movement of goods within and through the state and to ensure the state's economic vitality."

This plan is a resource document for freight planning in Washington. WSDOT developed this plan, in collaboration with partners, which assessed freight transportation needs. The strategies identified in this plan create an approach that transportation partners can use to ensure the state's economic vitality, and the safe, reliable, and efficient movement of goods into, out of, within, and through Washington. Key strategies identified in this plan will be included in the *Washington Transportation Plan*, the statewide multimodal transportation plan.

1.4 Relation to the economy

The multimodal freight transportation system in Washington is vital to the economy of the state and country in many ways. It underpins the national and state economies, supports national defense, directly sustains hundreds of thousands of jobs, and delivers the daily necessities of life to residents. Goods are shipped into, out of, within, and through Washington on highways and roadways, railroads, waterways, pipelines, and intermodal facilities.

On a per capita basis, Washington is the second-most trade-dependent state in the nation, behind Michigan, with total imports and exports valued at $126.8 billion. In this context, WSDOT has defined trade dependence as the total per capita value of the state's international imports and exports. This is down from Washington's first place position in 2015, because state export value decreased 7.9 percent, and import value decreased 7.6 percent from 2015 to 2016.[3] In 2016, $79.6 billion in U.S. international trade was exported from or through Washington, of which $47.9 billion was related to transportation equipment (mostly aircraft) and $10.2 billion was agricultural products.[4]

There are 11,352 small- and medium-sized goods exporters in Washington, accounting for 90 percent of exporters, and 20 percent of export value. The U.S. currently has 14 free trade agreements in force with 20 countries. Washington's exports to free trade partners totaled $17.7 billion in 2016, accounting for 22 percent of exports. Since 2006, exports from Washington to free trade markets have grown by 35 percent. The Seattle-Tacoma-Bellevue metropolitan area is the third largest area reporting exports nationwide.[5] A total of $47.2 billion in U.S. international trade was imported to or through Washington.[6] In 2015, there were 1.41 million jobs in freight-dependent industries, including wholesale, retail, manufacturing,

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[2] *RCW 47.06.045: Freight mobility plan.* https://app.leg.wa.gov/rcw/default.aspx?cite=47.06.045
[3] *United States Census Bureau, Foreign Trade State data.* https://www.census.gov/foreign-trade/statistics/state/index.html
[4] *U.S. Department of Commerce. International Trade Administration, Export Product Profile to a Selected Market.* http://tse.export.gov/tse/TSEReports.aspx?DATA=SED
[5] *U.S. Department of Commerce. International Trade Administration.* https://www.trade.gov/mas/ian/metroreport/index.asp
[6] *U.S. Census Bureau. State Imports for Washington.* https://www.census.gov/foreign-trade/statistics/state/data/imports/wa.html

construction, transportation, and agriculture/timber and wood products. Gross business income for freight-dependent sectors in Washington totaled $550.5 billion.[7]

The freight transportation system in Washington has three integral components:

- **Global Gateways**, which provide freight access to international markets
- **Made in Washington**, the freight that is manufactured or produced in Washington
- **Delivering Goods to You**, representing local freight delivery for business and residents

1.4.1 Global Gateways

Washington is an economic gateway state, connecting Asian markets to U.S. industries, Alaska to the lower 48 states, and Canada to the U.S. West Coast. Imports to Washington support U.S. manufacturers and provide goods to consumers, while agricultural exports support family farms throughout the Pacific Northwest and Midwest. Goods coming into Washington by container ship often go to the Midwest and East Coast.

The marine industry, in the context of economic sectors, has long been a pillar of the state economy, and it continues to grow at an average of 6.4 percent per year. The industry provides well-paid jobs at an average of $70,800 annually, totaling over $4.7 billion in wages. The maritime industry is rooted in the historic strengths of natural resources, strategic location, and excellent transportation connections in Washington. It is a diverse industry that is larger than typical freight handling and logistics activities. It also includes ship building; commercial fishing and seafood processing; passenger vessel operations; recreational boating and sport fishing; military and federal activities through the U.S. Navy, U.S. Coast Guard and NOAA; and numerous support industries, including marine technology companies and a solid base of maritime education and training programs. The sector contributes more than $21.4 billion in gross business income, and directly employs nearly 69,500 people. Including indirect and induced impacts, the sector is responsible for 146,000 jobs in the state and $30 billion in economic activity.[8]

Many of the international trading partners important for exporters in Washington are located in Asia. In 2016, exports from Washington to Asia were valued at $37.7 billion.[9] The top commodity group exported to Asia by value includes transportation equipment, accounting for 52 percent of total exports, followed by agricultural products, which accounts for 24 percent. Ports in Washington handled a total of 19 million metric tons of international waterborne container trade in 2015,[10] and the Northwest Seaport Alliance handled the majority of the international container exports and imports. International trade moving through these two seaports exceeded $74.7 billion in 2015. The Ports of Vancouver, Kalama, Longview, Grays Harbor, Pasco, and Everett handle the majority of bulk goods. In 2015, the maritime industry in Washington supported 69,500 direct jobs, plus 121,600 indirect and induced jobs; the maritime

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[7] *Washington State Department of Revenue, Quarterly Business Reviews Calendar 2015. http://dor.wa.gov/Content/AboutUs/StatisticsAndReports/stats_qbr.aspx*

[8] *http://www.commerce.wa.gov/growing-the-economy/key-sectors/maritime/*

[9] *U.S. Department Trade of Commerce, International Trade Administration,2016 NAICS Total All Merchandise Exports from Washington. http://tse.export.gov/tse/tsehome.aspx*

[10] *U.S. Department of Transportation, Maritime Administration, U.S. Waterborne Foreign Container Trade by U.S. Customs Ports: https://www.marad.dot.gov/resources/data-statistics/*

sector supported, through indirect and induced effects, $37.8 billion in business revenue across Washington.[11]

Seattle-Tacoma International Airport (Sea-Tac) ranked 20th in North America by air cargo volume in 2015 and is the third largest airport for international cargo on the West Coast (excluding Alaska).[12] Sea-Tac offered daily, non-stop service to 77 domestic and 19 international destinations and accommodated more than 366,000 metric tons of total cargo in 2016. Sea-Tac dominates the air cargo market in the state with a mix of domestic and international belly cargo, domestic and international freighter cargo, and integrator/express cargo generated by FedEx and DHL. Sea-Tac makes significant economic contributions to the state, with its air cargo activity supporting 171,796 jobs (including direct, induced, and indirect), $6.1 billion in personal income, and $16.3 billion in business revenue in 2013.[13]

The multimodal freight system in Washington facilitates trade with Alaska and Canada. In 2013, more than 3.4 million tons of cargo moved between the Puget Sound and Alaska, nearly all by water. The value of freight to Alaska from the Puget Sound was estimated at $5.4 billion, making it one of the nation's most important routes for domestic waterborne commerce. Alaska accounted for an estimated 74,000 export-related jobs in the Puget Sound area in 2013.[14] The Lake Washington Ship Canal and Hiram M. Chittenden Locks connect the waters of Lake Washington, Lake Union, and Salmon Bay to the tidal waters of Puget Sound, allowing commercial vessels to travel to and from the docks and warehouses of Seattle's busy fresh water harbor. Canadian goods valued at more than $12.8 billion entered the U.S. economy through Washington, and American goods valued at $7.0 billion entered Canada through Washington in 2016.[15]

The military and defense sector is the second-largest public employer, and a key industry that cuts across many other sectors in Washington. More than 127,000 active duty, reserve, guard and civilian personnel are employed in this sector. Military and defense supports more than $13 billion in annual procurement supported by nearly 2,000 businesses across the state.[16] Businesses that serve the military and defense sector include those in energy, biofuels, cybersecurity, life sciences, and aerospace. In the last three years, state businesses were awarded nearly $15 billion in contracts. Deep-water ports, strategically located airports, proximity to the Pacific Rim, and integrated rail and road systems in the state allow the military to meet its mission needs.[17]

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[11] *Washington State Maritime Sector Economic Impact Study, 2017 Update:* https://files.acrobat.com/a/preview/93114479-ec98-4c7f-9524-ade42055bae5

[12] *Port of Seattle, Air Cargo at Sea-Tac:* https://www.portseattle.org/Cargo/AirCargo/Pages/default.aspx

[13] https://www.portseattle.org/About/Publications/Documents/pos_eco%20impact_seatac.pdf

[14] *McDowell Group, Ties that Bind: The Enduring Economic Impact of Alaska on the Puget Sound Region:* http://www.seattlechamber.com/docs/default-source/Events-and-Programs-Documents/ties-that-bind-report-feb-2015.pdf?sfvrsn=2

[15] *U.S. Census Bureau. Foreign Trade.* https://www.census.gov/foreign-trade/statistics/state/data/index.html

[16] *Department of Commerce. Military & Defense Sector.* http://www.commerce.wa.gov/growing-the-economy/key-sectors/military-defense/

[17] *Department of Commerce. Choose Washington.* http://choosewashingtonstate.com/why-washington/our-key-sectors/military-defense/

1.4.2 Made in Washington

Regional economies in Washington – and their manufacturing, agriculture, construction, and forestry components – depend on an effective and efficient freight transportation system. Businesses in Washington rely on the freight system to ship their products to local customers in the state, U.S. markets in California and on the East Coast, and worldwide. Freight-dependent industries provide 46 percent of all jobs in Washington. These jobs occur in the most heavily freight-dependent industry sectors such as wholesale and retail, manufacturing, construction, agriculture, and transportation. These sectors rely on the multimodal freight network to conduct day-to-day business.

The agriculture and food-manufacturing sector is a cornerstone of Washington's economy in both rural communities and metropolitan areas. The state's $49 billion food and agriculture industry employs approximately 140,000 people, and 13 percent of the state economy comes from agriculture. Agriculture generates income and employment on farms in all 39 counties, and the industry is an economic pillar of many rural communities. More than $15.1 billion in food and agricultural products were exported through ports in Washington in 2013; the third largest total in the U.S. Washington is a key production state of food for domestic and export markets, leading in numerous tree fruit and vegetable crops. The apple industry in Washington accounts for 70 percent of U.S. production, and the other top commodities include wheat, milk, and potatoes. The large food processing industry in Washington supports many supply and marketing services in machinery, pesticides and fertilizers, transportation, and packaging.[18] The top four agricultural supply chains in Washington are apples, dairy, wheat, and potatoes.

Aerospace supply chain

Manufacturing supply chains are especially dependent on freight systems and accounted for $176 billion in gross business income, 23 percent of the total produced in Washington in 2015. The most significant manufacturing subsector in Washington is aerospace manufacturing, with $69.9 billion in gross business income in 2015.[19] The aerospace industry is a major contributor to the state economy and an essential link in the global aerospace supply chain.

The aerospace industry accounts for 136,100 jobs in Washington and provides travel for billions of passengers each year. In Washington, there are 1,400 aerospace-related businesses, and each of the 39 counties has a presence in the aerospace industry. These businesses design and manufacture planes and other products ranging from seats and fasteners to in-flight entertainment systems. Public research institutions and private firms are leading the world in the advancement of new technologies, including advanced materials, unmanned aerial vehicles, aviation biofuels, and space exploration.[20] The total value of exports of aircraft and parts from Washington to foreign countries was $46.5 billion of the $47.9 billion of transportation equipment exported from or through the state in 2016.[21]

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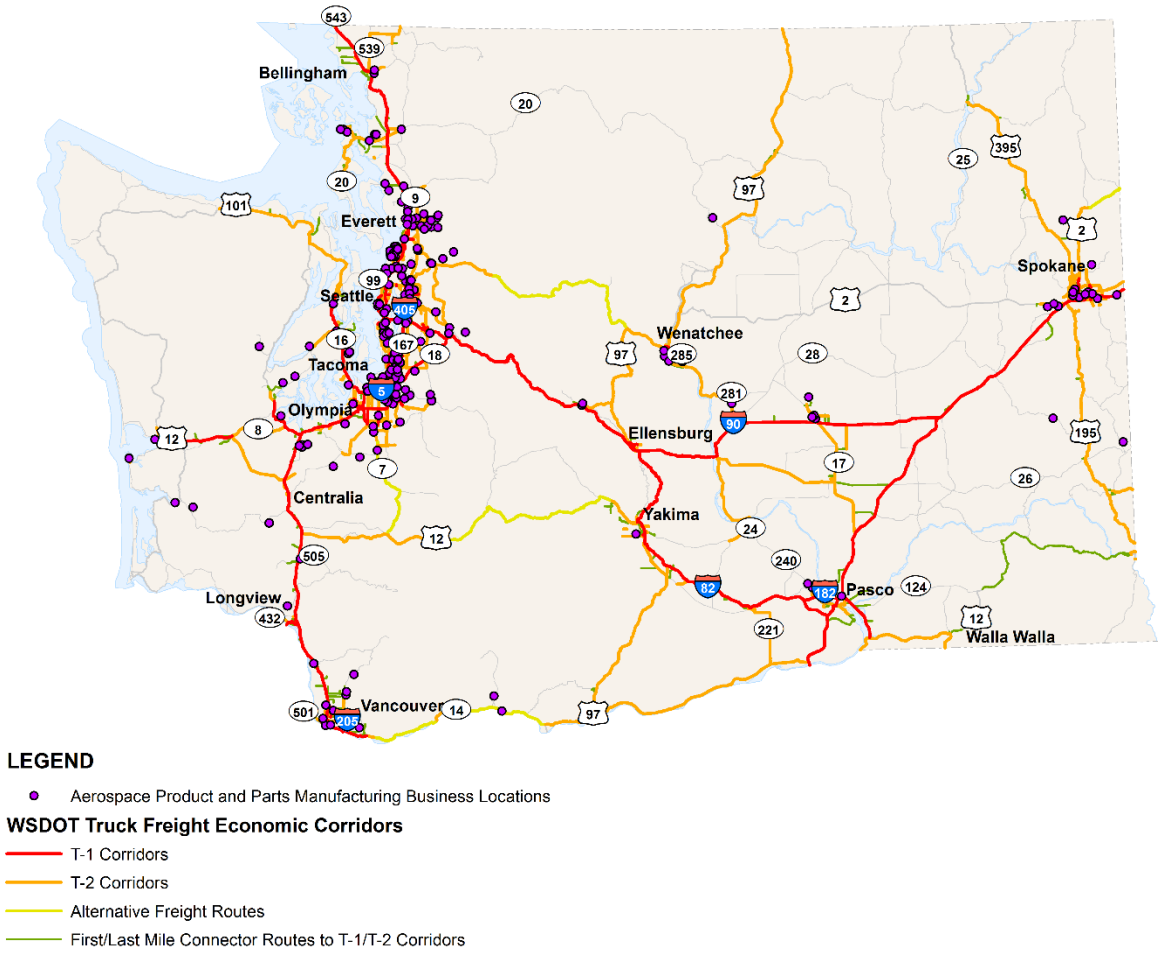
[18] http://www.commerce.wa.gov/growing-the-economy/key-sectors/agriculture-food-manufacturing/
[19] *Washington State Department of Revenue, Quarterly Business Reviews Calendar 2015:* http://dor.wa.gov/Content/AboutUs/StatisticsAndReports/stats_qbr.aspx
[20] http://www.commerce.wa.gov/growing-the-economy/key-sectors/aerospace/
[21] *U.S. Census Bureau, State Trade Data:* https://www.census.gov/foreign-trade/statistics/state/data/wa.html

Boeing, one of the largest aircraft manufacturers in the world, anchors the aerospace industry in Washington. Final assembly facilities for the 737, 747, 767, 777, 787, as well as the P-8 and KC-46 military aircraft are located in Washington. Boeing uses the highways, rail, marine, and air cargo system in its supply chains. For example, specialized port infrastructure in Everett supports oversized aircraft parts. Boeing's aircraft production is supported by a deep and extensively tiered supply chain, including parts and systems manufacturers, research and development, and material suppliers.

Washington is also an important hub state for aircraft maintenance and repair. The aerospace industry is concentrated in King and Snohomish counties, with a range of support activities and aerospace manufacturers spread across the state. King County is home to several major Boeing facilities, including the final assembly lines at its Renton plant, final delivery preparations and test flights at Boeing Field in Seattle, and a parts and components fabrication facility in Auburn. Snohomish County is home to Boeing's Everett final assembly site and hosts several suppliers. Pierce County is also an important center for suppliers and related industries, while Spokane County has a diverse aerospace and supporting services sector. Boeing's supply chain requires an efficient highway network in the Central Puget Sound region. It also requires multi-state highway corridors between their plants, with access for over-dimensional truck loads to support its assembly plants in Everett and Renton, and final production and testing activity at Boeing Field. In addition, Boeing relies on the rail system for fuselage deliveries from Wichita, Kansas to Renton, and relies on the marine system for short sea shipping from the Port of Everett to Mount Baker Terminal in Mukilteo.

The aerospace manufacturing industry had more than 300 establishments across the state in 2016. Exhibit 1-1 shows the locations of aerospace manufacturers in Washington and Truck Freight Economic Corridors.

Exhibit 1-1: Aerospace Supply Chain



Forest products supply chain

The forest products sector has been a cornerstone of Washington's economy for over 165 years. The industry consists of companies engaged in cutting, logging, transporting, as well as seeding, reforestation, and other forest management services. The industry's ability to innovate, modernize, and diversify is ensuring a critical role in the future. Factoring in pulp and paper and value-added wood products – such as doors, window frames and stairs – forest products is the third largest manufacturing sector in Washington.[22] There are more than 1,700 businesses in Washington in the forest products industry. The overall number of direct, indirect and induced jobs in the state for 2013 was 105,000 workers, earning $4.9 billion in wages. The total gross business income of forestry-related industries was approximately $28 billion per year.[23]

[22] *Department of Commerce. Key Sectors Bring Focus to High Growth Industries.* http://www.commerce.wa.gov/growing-the-economy/key-sectors/

[23] *Department of Commerce. Forest Products Sector.* http://www.commerce.wa.gov/growing-the-economy/key-sectors/forest-products/

Washington has 23 million acres of forestland. The federal government owns 44 percent of it, 37 percent is privately owned, 12 percent is state owned, and 7 percent is owned by tribal governments.[24] Approximately 3.2 billion board feet of timber were harvested within the state in 2014.[25] Logging is mostly concentrated in Grays Harbor, Lewis, Clallam, Snohomish, and Cowlitz Counties in western Washington. One of every eight logs came out of Grays Harbor County.[26] More than 3 billion board feet of timber harvested from public and private forests in 2014 were processed in wood product mills in Washington.

In 2014,[27] lumber production increased 9.2 percent to nearly 4 billion board feet, enough to frame about 245,000 homes, and an additional 469 million square feet of plywood was produced (board feet for logs and lumber are calculated using different scales). The utility pole industry produced nearly twice as many poles in 2014 than in 2006.

Approximately 5 million tons of wood chips and bark residues were produced, which move by truck, rail, and barge for processing or are used onsite at integrated facilities. Wood chips are primary sources of fiber for paper-making pulp mills and a potential source for research in biofuels. Bark is used for wood pellets or as hog fuel to generate energy for the mills and kilns.[28] Pulp mills produced 9 percent more paper and other products than in 2012.

The forest products supply chain is shown in Exhibit 1-2. Most forest product mills are located near T-1 or T-2 Truck Freight Economic Corridors. Logs primarily move by truck to mills or export facilities closest to the timberlands, although short moves by log raft, barge, and rail account for a small percentage. Lumber and paper products move by rail, barge, and trucks either to final market or to ports for export. Access to transportation options is crucial to the industry because of the long distances to national markets and gateways.

China was the top log export market in 2014, for the fifth consecutive year. Log exports continued to increase in 2014, reaching 1.14 billion board feet. Log exports are destined for deep-water ports including the Port of Olympia, Port Angeles, and the Port of Longview where they primarily are loaded onto bulk vessels, although some logs are containerized for export via the NWSA.

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[24] Washington Department of Commerce. Proposed Strategic Plan for Washington State: Forest Products Sector 2017-2019. December 2016. http://www.commerce.wa.gov/wp-content/uploads/2017/01/Sector-Leads-Forest-Strategy-2016.pdf

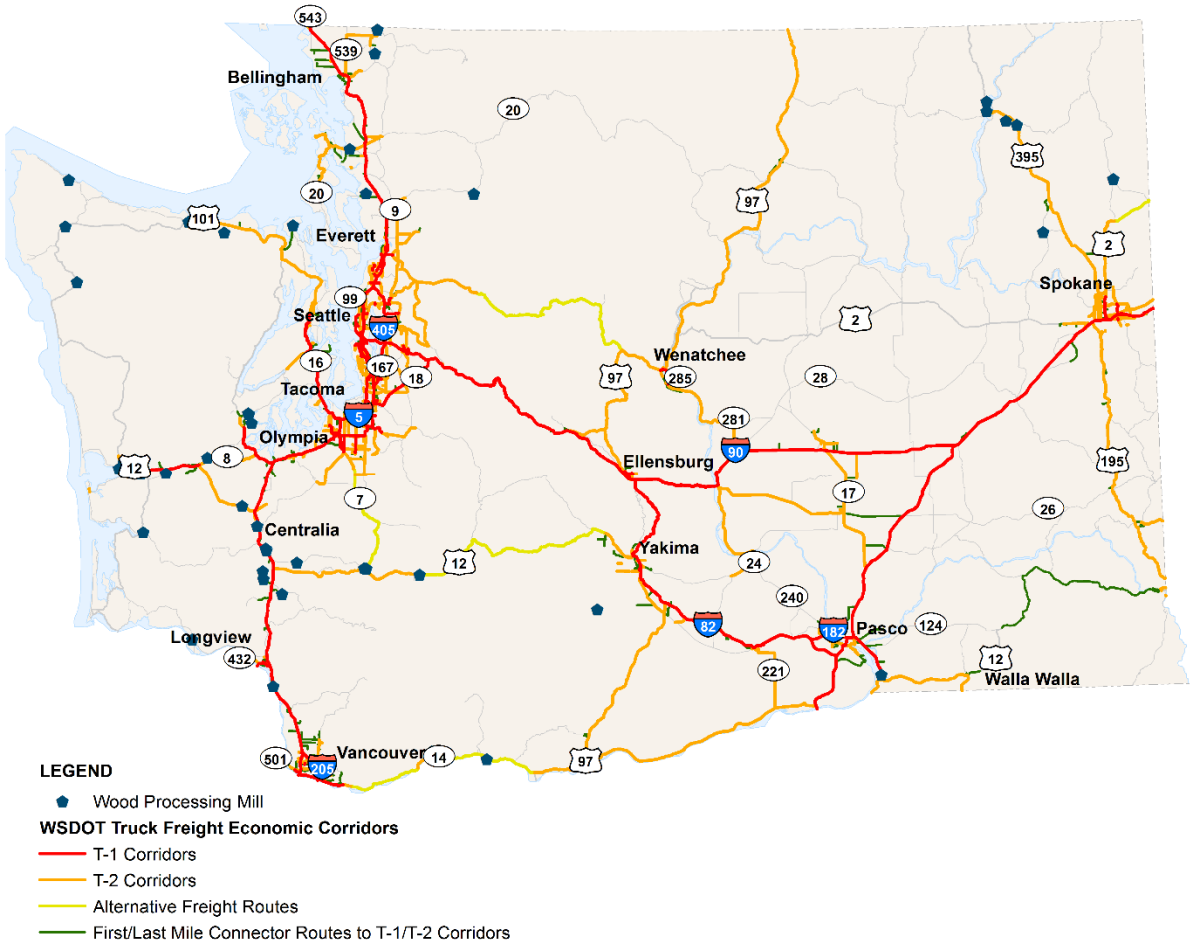
[25] Washington Department of Natural Resources. 2015 Washington Timber Harvest Report. September 2016. http://file.dnr.wa.gov/publications/em_obe_wa_timber_harvest_2015_final2.pdf

[26] Washington Department of Natural Resources. Washington Mill Survey 2014: Series Report #23. December 2015 http://file.dnr.wa.gov/publications/em_obe_2014_mill_survey_dec29_2015_nc.pdf

[27] Department of Natural Resources. Washington State Mill Surveys. http://www.dnr.wa.gov/about/fiscal-reports/washington-state-mill-surveys

[28] Department of Natural Resources. Washington Mill Survey 2014. http://www.dnr.wa.gov/publications/em_obe_2014_mill_survey_dec29_2015_nc.pdf

Exhibit 1-2: Forest Products Supply Chain



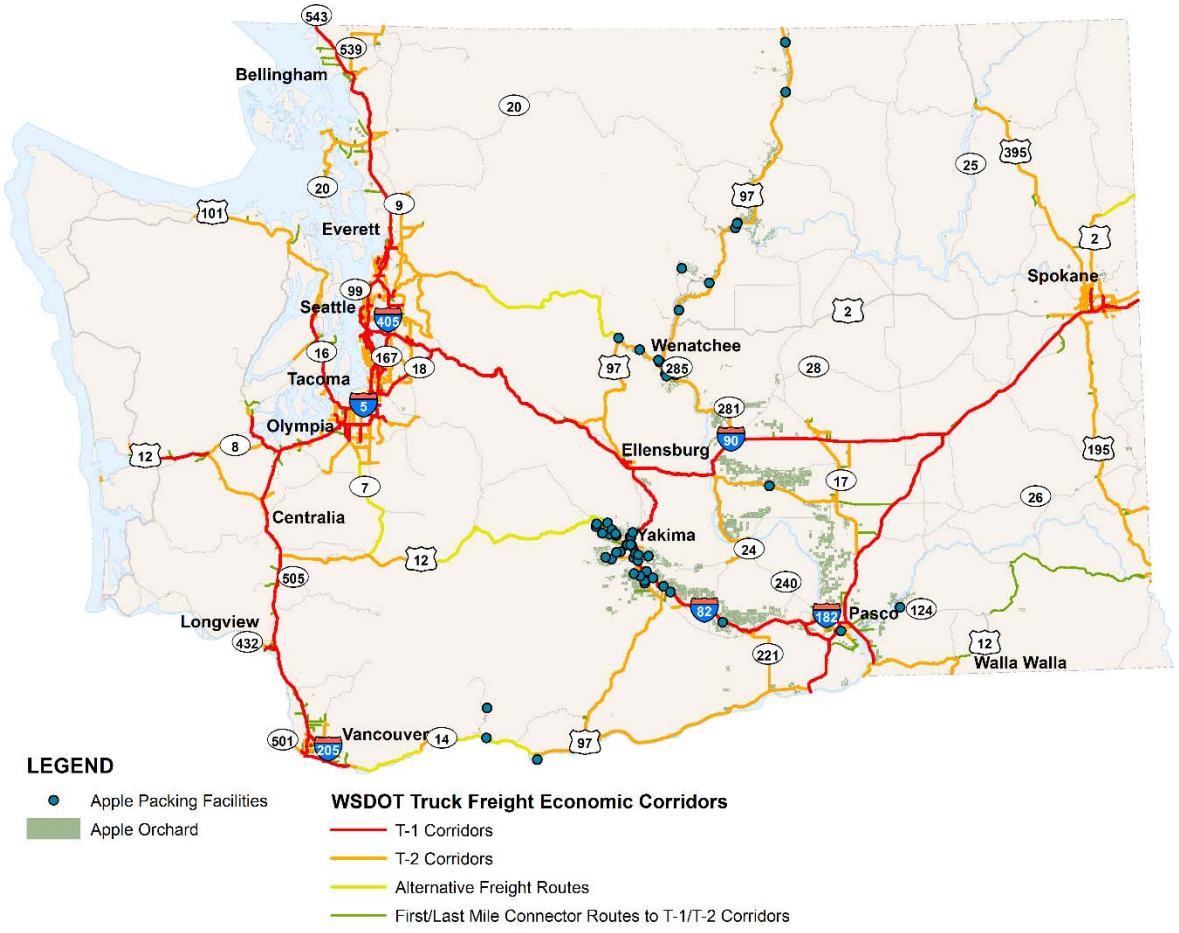
Apple supply chain

Apples are one of the top agricultural commodities produced in Washington by value, with a farm gate value of $2.4 billion in 2015. After packing, this translates into a sales value of $3.15 billion, not including transportation charges, on a crop of 115 million boxes. Like many commodities, the crop size is variable, and in 2014, a record crop of 142 million 40-pound boxes were harvested from apple orchards in Washington. For the 2014-2015 crop year, over 50 million boxes were exported to international markets, of which 16 million boxes were exported to Mexico and 7 million boxes were exported to Canada by truck. The remaining 27.4 million boxes were trucked to container ports in the Puget Sound for export to 42 other countries.

After harvest, the fruit travels by truck in bins to processing facilities. It is important to note that apples are not necessarily processed at the nearest facility. Some apples from the Wenatchee area are trucked to processing facilities in the Yakima area and vice-versa. Nearly all the apples grown in the Columbia Basin, which is located south of Moses Lake and east of Ellensburg, are trucked to Wenatchee or Yakima for processing due to labor availability. Apples leave the processing facility packed into 40-pound boxes. About 10 to 15 percent of them travel by rail to

the Midwest and East Coast. The remaining 85 to 90 percent travel by truck to other locations inside and outside Washington, with approximately one third of the annual harvest exported internationally.[29] Exhibit 1-3 shows the locations of apple packing facilities on Truck Freight Economic Corridors.

Exhibit 1-3: Apple Supply Chain



Milk supply chain

In 2013, milk was one of the top agricultural commodities produced in Washington by value, worth $1.2 billion. By 2015, Washington ranked 10th in total milk production among all 50 states, which exceeded 6.6 billion pounds. There are approximately 416 dairy farms, located in 29 of the 39 counties across the state, providing jobs and supporting other businesses in their communities.[30]

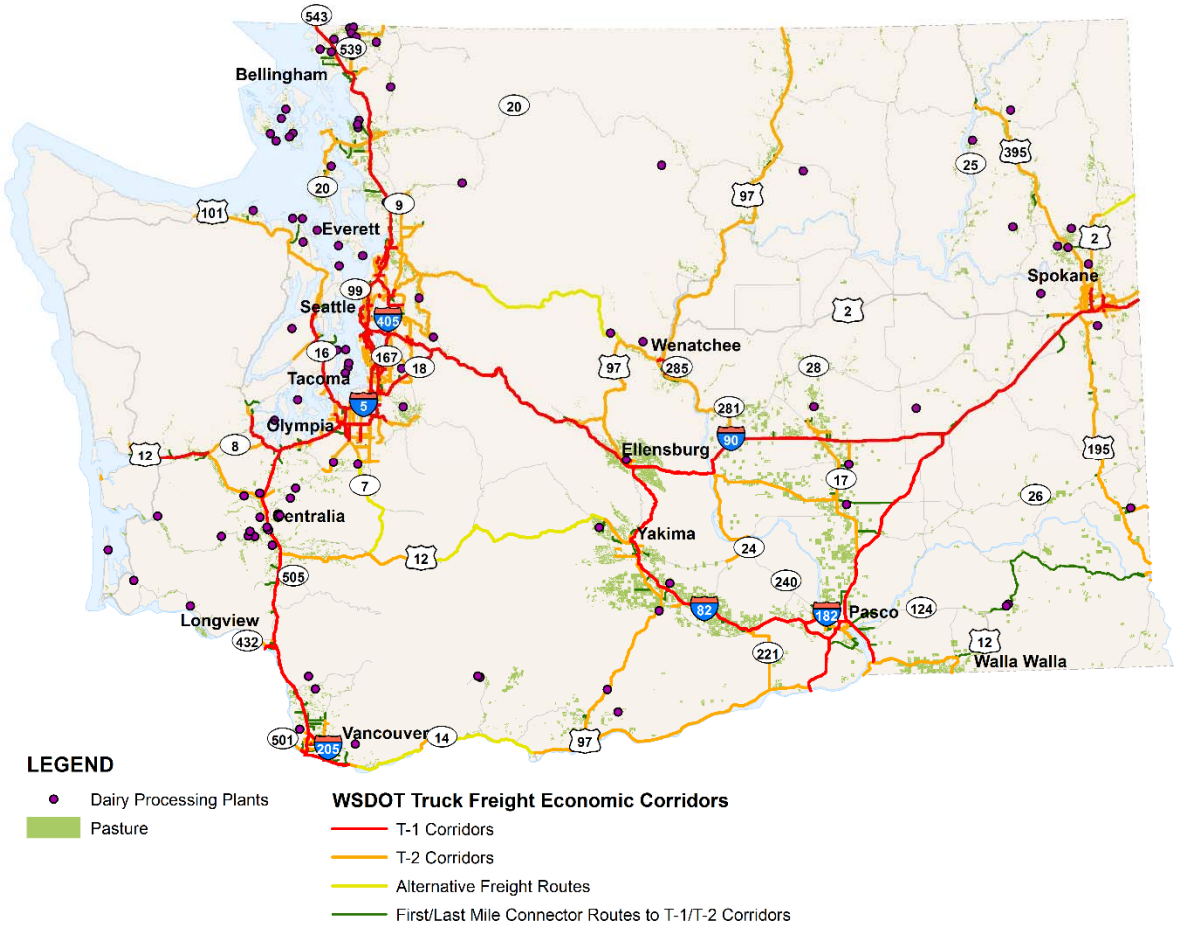
On the western side of the state, most dairy farms are located along the Interstate 5 (I-5) corridor in Whatcom and Skagit Counties. Over the past several decades, increasing property

[29] *Washington State Tree Fruit Association. March 2017. https://wstfa.org/*
[30] *Washington Dairy Products Commission, Facts about Washington's Dairy Industry. http://wadairy.com/sites/default/files/facts-about-washington-dairy-industry_0.pdf*

values have encouraged milk production to move east to the Yakima and Spokane Valleys, causing a gradual loss of farms in western Washington.

Milk travels by tanker truck from farms to processing facilities, which are mostly located near population centers on the west side of the state. About 90 percent of fluid milk moves from processing facilities to in-state or in-region destinations, such as supermarkets. A portion of milk produced in Washington is processed for use as an ingredient in other food products. This type of processed milk product is sold in truckload or railcar quantities, with approximately half being shipped to U.S. destinations and the other half being transported to the Port of Seattle, the Port of Tacoma, or the Port of Portland for export. Exhibit 1-4 shows the locations of dairy plant facilities on Truck Freight Economic Corridors.

Exhibit 1-4: Milk Supply Chain



Wheat supply chain

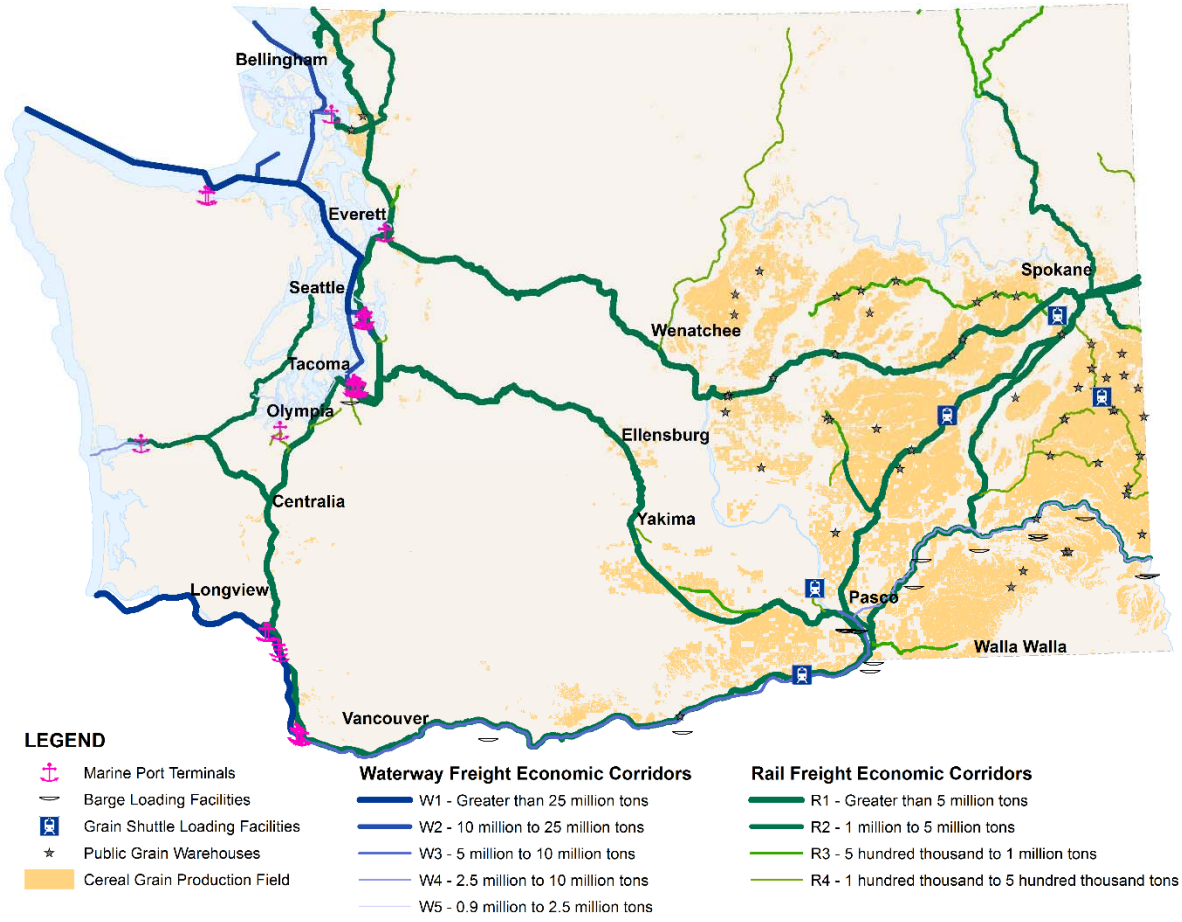
In 2016, Washington was the fourth largest wheat growing state in the nation, producing 111.9 million bushels of wheat grown on 2.3 million acres with a total value of $629 million.[31] In

[31] *United States Department of Agriculture. 2016 Washington State Agricultural Overview. https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=WASHINGTON*

Washington, 11,134 jobs depend on the wheat crop, and each wheat-farming dollar generates an additional 98 cents of economic activity.

The wheat industry in Washington is reliant on exporting grain commodity to domestic and international markets. Getting this product from the fields in southeastern Washington to consumers across the world first involves grain trucks transporting harvested wheat to on-farm storage or nearby commercial grain elevators. Once the wheat is sold, it is transferred by truck to regional rail or barge loading facilities. Approximately 30 percent of the wheat travels by rail to coastal grain terminals, while some travels to Portland by barge from intermodal facilities along the Columbia-Snake River System. About 55 percent of wheat produced in Washington moves by truck and barge, and another five percent moves by rail and barge from field to Portland.[32] From these seaport terminals, grain is loaded onto ocean freighters and exported around the world. Exhibit 1-5 shows the locations of cereal grain production fields on rail and marine Freight Economic Corridors.

Exhibit 1-5: Wheat Supply Chain



[32] *Washington Grain Commission. Washington Wheat Facts 2015-2016. http://wagrains.org/wp-content/uploads/2015/04/WGC-2015-16WF4WebFinal.pdf*

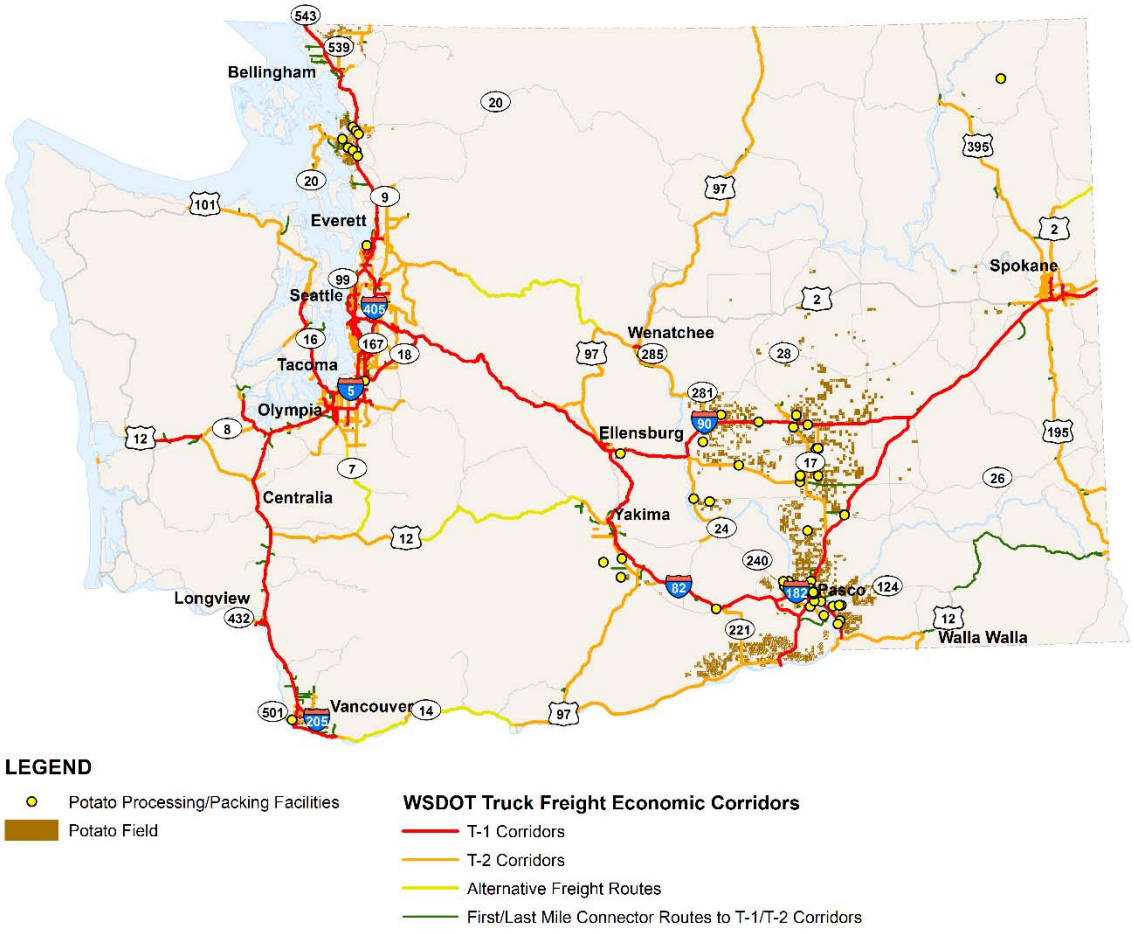
Potato supply chain

In 2016, potatoes were one of the most valuable agricultural commodities produced in Washington, worth $818 million. Approximately 10.5 billion pounds of potatoes produced in Washington are grown in three distinct regions: lower Columbia Basin, upper Columbia Basin, and Skagit Valley.

The potatoes grown in the upper and lower Columbia Basin move from the fields by truck to local potato processing facilities to be turned into frozen potato products (74 percent), dehydrated potato products (12 percent), fresh potatoes (8 percent), potato chips (5 percent), and other (1 percent). Most of the Skagit Valley potato crop remains fresh potatoes (91 percent), with the rest of the crop (9 percent) being processed into dehydrated potato products outside the Skagit Valley. After processing or fresh packaging, most potatoes or potato products (86 percent) travel by truck to their final destinations, including containerized exports, with a smaller portion traveling by rail (12 percent) and truck repacked to railcar (2 percent).[33] Exhibit 1-6 shows the locations of potato processing/packing facilities on Truck Freight Economic Corridors.

[33] *Washington State Potato Commission. http://potatoes.com/*

Exhibit 1-6: Potato Supply Chain



1.4.3 Delivering Goods to You

The freight transportation system enables regional and local distribution of an enormous variety of goods to residents and businesses in Washington. The warehouse and distribution system serves the retail, wholesale, and business service sectors, and produces up to 80 percent of all truck trips in metropolitan areas. The efficiency and reliability of the system is critical, as distribution companies must provide fast and ubiquitous service that is dependable under all conditions.

The local freight distribution system is a fundamental utility, since Washington residents would not have convenient access to necessities, such as food, clothing, and healthcare supplies, nor to essentials, such as cash and fuel, without it. Hospitals cannot wait for medical supplies, and small businesses are unlikely to succeed without reliable local delivery of stock.

The freight transportation system has broad effects, as it also supports retail and wholesale supply chains for consumer goods purchased in grocery stores, restaurants, medical centers and pharmacies, gas stations, and clothing and electronics stores across the state and region. Some goods are manufactured in-state and many others are imported from other countries or

states, arriving by truck, rail, ship, barge, or plane. Goods produced either inside or outside of Washington typically are consolidated in a warehouse or distribution center before moving to their final destinations. Approximately 717,000 employees work in the retail/wholesale sector in Washington, which produced over $302 billion in gross business income in 2015. Most goods arriving at distribution centers come in large trucks with trailers. Staff in warehouses or distribution centers unload incoming goods, then assemble orders for individual stores and load them into smaller trucks for final delivery to stores and homes.

Fuel supply chain

The freight transportation system also supports the fuel supply chain from production to delivery. Although crude oil is not produced in-state, Washington serves as a major refining center for Pacific Northwest markets with five refineries. Refineries in Washington can refine 633,700 barrels per day,[34] and are typically operating at 91 percent of full capacity.[35] Together they provide 3.4 percent of U.S. refining capacity.[36] In 2015, the five refineries processed 588,300 barrels per day and produced more than a dozen different products resulting in an output of 601,200 barrels per day. Gasoline, at 267,900 barrels per day in 2015, accounted for 44.6 percent of the total produced. Diesel oil and jet fuel were the next largest at 25.7 percent and 14.6 percent, respectively. Washington is a net exporting state of refined petroleum products, as the refineries produce more products than the state consumes. In 2015, 67.4 percent of in-state refined product was sold within the state; 24 percent was sold domestically outside Washington, and the remaining 8.7 percent was exported to other countries.[37]

The Washington Research Council calculated the total economic impact for fuel-related activities was 25,012 jobs (2,097 direct jobs, and 22,915 indirect and induced jobs) with a total income contribution of $1.86 billion to the state economy in 2015.[38] The total economic impact included that of downstream industries, which distributed refined petroleum products. Downstream industries supported 16,045 jobs and $458 million in personal income in Washington.

In 2015, 42.1 percent of crude oil came into the refineries by water, 31.4 percent came by pipeline, and 26.5 percent came by rail. Of the crude oil, 35.5 percent was from Alaska, 33.3 percent came from Canada, 24.9 percent was from North Dakota, and the remainder from a number of other places. This reflected a significant change in crude oil source from 2003, when about 90 percent of crude arrived via the marine system from Alaska. Driving this change was the steep decline of crude oil production in Alaska and an increase in production in North Dakota.[39]

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[34] *U.S Energy Information Administration, Refinery Capacity Report, June 2016. https://www.eia.gov/petroleum/refinerycapacity/refcap16.pdf*
[35] *https://researchcouncil.org/files/docs/2017/01/2016_refinery_report_010417.pdf*
[36] *Washington Research Council. The Economic Contribution of Washington State's Petroleum Refining Industry in 2015: https://researchcouncil.org/files/docs/2017/01/2016_refinery_report_010417.pdf*
[37] *Ibid.*
[38] *Washington Research Council based their analysis upon a survey of Washington refiners conducted by the Council in 2016 and the WRC-REMI model of the Washington state economy.*
[39] *Ibid.*

The refineries in Washington rely on the multimodal freight transportation network support facilities, such as terminals and bulk stations, wholesalers, and retailers, (such as gasoline stations and fuel oil dealers) to distribute their product to consumers. In terms of product transportation, 50 percent of finished petroleum products leave through the pipeline network to markets in Seattle and Tacoma and beyond; 36 percent goes by the marine network to Seattle, Portland, or elsewhere; trucks haul 11 percent; and the remaining 2.5 percent is shipped by rail.[40]

1.5 Relation to national multimodal freight policy

It is the policy of the United States, as described in 49 U.S.C. §70101,[41] to maintain and improve the condition and performance of the National Multimodal Freight Network to ensure that the network provides a foundation for the United States to compete in the global economy. Appendix C lists the policy goals, and includes a description of how this plan will improve the ability of Washington to meet each of the goals.

In the State of Washington, transportation partners will maintain and improve the condition and performance of the multimodal freight system to ensure the system provides a foundation for the state to compete in the global economy. Reflecting the diversity of the state and the various ways in which freight contributes to Washington's economy, WSDOT and its freight partners work together to maintain, support, and develop the following:

- Global gateways facilitating national and international trade that support Washington's competitive position and export initiatives
- Urban goods movement systems that provide goods delivery to residents and businesses that supports jobs, the economy, and clean air
- Rural farm-to-market, natural resource, and manufacturing industries that provide employment in non-urban areas.

1.6 Relation to state transportation system policy goals

RCW 47.04.280[42] establishes the state's six transportation system policy goals for the planning, operation, performance of, and investment in, the state's transportation system. It states that public investments in transportation should support achievement of these goals. The trends, issues, needs, and strategies described in this plan are consistent with the six policy goals, and are described below:

1) Economic vitality: To promote and develop transportation systems that stimulate, support, and enhance the movement of people and goods to ensure a prosperous economy
2) Preservation: To maintain, preserve, and extend the life and utility of prior investments in transportation systems and services

[40] *Ibid.*
[41] *49 U.S.C. 70101.* https://www.gpo.gov/fdsys/pkg/USCODE-2015-title49/pdf/USCODE-2015-title49-subtitleIX-chap701-sec70101.pdf
[42] *RCW 47.04.280 Transportation system policy goals.* http://apps.leg.wa.gov/rcw/default.aspx?cite=47.04.280

3) Safety: To provide for and improve the safety and security of transportation customers and the transportation system
4) Mobility: To improve the predictable movement of goods and people throughout Washington, including congestion relief and improved freight mobility
5) Environment: To enhance Washington's quality of life through transportation investments that promote energy conservation, enhance healthy communities, and protect the environment
6) Stewardship: To continuously improve the quality, effectiveness, and efficiency of the transportation system

1.7 Relation to recent planning activities

The *2014 Washington State Freight Mobility Plan*[43] identified policy recommendations and future issues to be addressed. Since that plan's completion, much progress has been made to address the issues and take action on recommendations. Below are examples of completed activities which have been integrated into this plan:

- Railroad condition: In 2015, WSDOT completed a study of short line rail inventory and needs.[44] Needs identified in that study are reported in Chapter 6.
- Economic impact analysis: In 2015, WSDOT completed an analysis of highway and rail projects that identify economic benefits. Results of this analysis were included in a report of multimodal economic analysis conducted by WSDOT.
- Freight mobility: In 2015, WSDOT completed a study of the data sources for reporting truck delay and reliability. Results of that study were used to comment on federal rule making.[45]
- Supply chains: In 2016, WSDOT completed a study of the food distribution and wheat supply chains. Results of that study informed the understanding of urban supply chains.[46]
- Critical urban and rural corridors: In 2016, WSDOT worked with partners to designate and identify critical urban and rural corridors in Washington. Designated corridors are listed in the *2017 Washington State Freight Investment Plan* in Appendix A.
- At-grade rail crossing prioritization: A study was completed in 2017, *JTC Prioritization of Prominent Road-Rail Conflicts*,[47] that includes a conflict map and database.
- Truck parking: In 2017, WSDOT completed a truck parking study that identifies opportunities to improve truck parking access and capacity. Key areas of concern are the focus of the truck parking topic in this plan.[48]

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[43] *WSDOT. 2014 Washington State Freight Mobility Plan.* http://www.wsdot.wa.gov/freight/freightmobilityplan.htm
[44] *WSDOT. 2015Washington State Short Line Rail Inventory and Needs Assessment.* http://www.wsdot.wa.gov/research/reports/fullreports/842.1.pdf
[45] *WSDOT.* http://www.wsdot.wa.gov/NR/rdonlyres/4869900F-9E88-4B2E-968B-EF2CA3B3D1FD/107207/8441.pdf
[46] *WSDOT.* http://www.wsdot.wa.gov/NR/rdonlyres/4869900F-9E88-4B2E-968B-EF2CA3B3D1FD/111987/SHRP2C20WSDOT20160322.pdf
[47] *Joint Transportation Committee. Prioritization of Prominent Road-Rail Conflicts in Washington State.* http://leg.wa.gov/JTC/Pages/Road-Rail-Study.aspx
[48] *WSDOT. Truck Parking Study.* http://www.wsdot.wa.gov/Freight/truckparking.htm

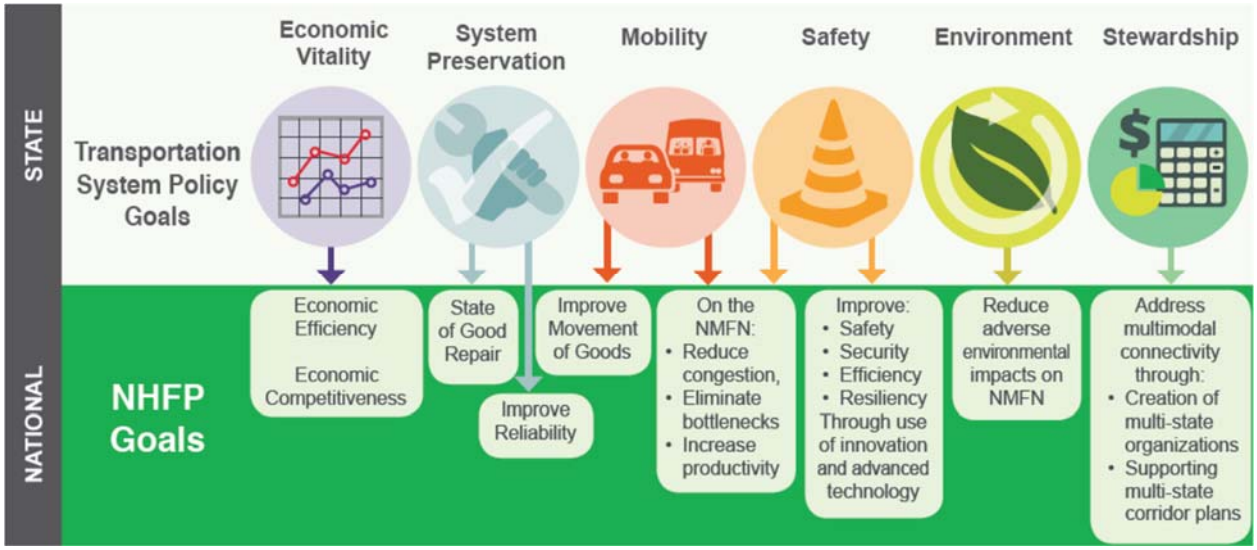
- Air Cargo: In 2017, WSDOT completed the *Washington Aviation System Plan* that identifies issues in air cargo. Results of that plan are included in the plan.[49]

1.8 Plan development

The *2017 Washington State Freight System Plan* was developed with input from the freight industry and industry associations, regional and local governments, ports, tribal governments, and federal and state partners. Outreach efforts are detailed in Appendix E. This plan will be available at the WSDOT Freight Transportation website located at www.wsdot.wa.gov/Freight/default.htm.

Exhibit 1-7 shows how the state transportation system policy goals align with the national multimodal freight policy goals. These goals were used to develop this freight plan.

Exhibit 1-7 Alignment of State and Federal Transportation Policy Goals



While developing this plan, WSDOT has concurrently developed two related plans: *2017 Washington State Freight Investment Plan* and *2017 Washington State Marine Ports and Navigation Plan*.

Freight Investment Plan

The *2017 Washington State Freight Investment Plan* was developed to guide investments that benefit freight transportation in Washington and to track recent freight funding investments. Federal law (49 USC 70202)[50] requires that each state freight plan include a freight investment plan that:

[49] *WSDOT. 2017 Washington Aviation System Plan.* http://www.wsdot.wa.gov/aviation/Planning/wasp.htm

[50] *49 USC 70202: State freight plans.* http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title49-section70202&num=0&edition=prelim

- includes a list of priority projects and describes how National Highway Freight Program (NHFP) funds made available would be invested and matched; and
- is fiscally constrained and includes a project, or an identified phase of a project, only if funding for completion of the project can reasonably be anticipated to be available for the project within the time period identified in the freight investment plan, which is five years.

The National Highway Freight Program (NHFP) provides Washington an estimated $89 million from federal fiscal years 2016 to 2020. WSDOT identifies freight projects eligible for NHFP funds using requirements set forth by the Washington State Legislature. The plan is included in Appendix A.

Marine Ports and Navigation Plan

The goal of the *2017 Washington State Marine Ports and Navigation Plan* is to assess the transportation needs of marine ports in Washington, including navigation, and to identify transportation system improvements needed to support the international trade and economic development role of marine ports in Washington. WSDOT developed this plan to meet the requirements in state law (RCW 47.06.070),[51] and to support the preservation and enhancement of the marine freight system in Washington.

This plan primarily is focused on freight transportation. It also generally covers passenger and recreational port and marine topics. The plan explains the economic context of marine transportation, while defining the marine freight system. Additionally, the plan reports on the analysis of the condition and performance, volumes and forecast, and trends and issues of the system. Lastly, the plan provides strategies to address the trends, issues, and needs. The plan is included in Appendix B.

[51] *RCW 47.06.070. Marine Ports and Navigation Plan.* https://app.leg.wa.gov/rcw/default.aspx?cite=47.06.070

2 FREIGHT TRANSPORTATION SYSTEM

An integrated, multimodal system of freight transportation assets, including highways and roadways, railways, waterways, airports, and pipelines exists in Washington. These modal systems rarely function independent from one another, and instead rely on intermodal facilities to move freight from one mode to another. Intermodal facilities, such as rail-truck, marine ports, airports, and pipeline terminals, are locations for the transfer of freight from one mode to another. This transfer is done either directly or through intermediate storage. Trucks are typically involved at some point in most intermodal freight movements.

Washington interconnects to the Pacific Northwest region. Some businesses in the state use major intermodal facilities in the neighboring states of Idaho and Oregon for their logistics needs. Vancouver, Washington functions as part of the Portland economic region and depends on highway and rail freight transportation corridors that connect the two states. Shippers and goods receivers in southwest Washington often use the Portland International Airport, located 12 miles from downtown Vancouver, or the Portland marine port, located eight miles from downtown Vancouver, more often than other intermodal facilities within Washington. Several high-volume truck corridors outside of Washington perform as primary routes for companies shipping and carrying freight into, out of, or through Washington. For example, many trucking companies carrying goods from Vancouver, Washington to eastern Washington choose to use Interstate 84 in Oregon instead of SR 14, the parallel route in Washington. Notably, this corridor is critically important when mountain passes are closed during winter weather events. Some businesses in the state use major truck corridors and intermodal facilities in the province of British Columbia. For example, some trucks travelling east-west use the Trans-Canada Highway in British Columbia as their primary truck corridor into or out of Canada.

2017 Freight Plan Requirement: 49 U.S.C. 70202

This section of the U.S. Code lists ten required elements that all State Freight Plans must address for each of the transportation modes. This section discusses elements of the following requirements:

(3) when applicable, a listing of-

(A) multimodal critical rural freight facilities and corridors designated within the State under section 70103 of this title; and

(B) critical rural and urban freight corridors designated within the State under section 167 of title 23;

2.1 Multimodal and intermodal

Although the United States Department of Transportation (USDOT) has not yet designated a final National Multimodal Freight Network, the designated interim network connects the freight modes mentioned above to one another and across state borders.

2.1.1 National Multimodal Freight Network (interim)

In 2016, USDOT established the interim National Multimodal Freight Network[52] in consultation with the Washington State Department of Transportation (WSDOT) and other freight partners. WSDOT has reviewed and commented on USDOT interim documents. Highway, railway, and marine corridors are designated in the network. A map[53] and a table[54] of this interim network have been provided by USDOT until the final versions are available. This network, when finalized, is intended to inform freight transportation planning and funding processes.

2.1.2 National Highway System Intermodal Connectors

Intermodal connector routes are roadways that serve as first-mile or last-mile connections between the National Highway System (NHS) and other transportation systems such as the rail, marine, and air systems. There are 88 designated NHS intermodal connectors in Washington,[55] some of which are freight-related. Port intermodal connectors are the most common type of intermodal connector representing 40 percent of all freight intermodal connectors in the state. Rail, airport, and pipeline intermodal connectors represent 26 percent, 26 percent, and 7 percent of freight intermodal connectors, respectively.

2.2 Highway and roadway system

Movement of goods in Washington relies on highways and roads for a wide variety of truck trip types, from long-distance transport to urban goods delivery to drayage. There are more than 80,000 centerline miles of roadway in Washington, consisting of about 7,000 miles of state routes, more than 39,000 miles of county roads, nearly 17,000 miles of city streets, and about 17,000 miles of other roadways (including state park, national park, Indian reservation, and U.S. forest).[56]

The Interstate Highway System contains the primary corridors for freight movement in Washington. Interstate 5 (I-5) is the most important north-south interstate corridor in Washington. It supports domestic trade and international trade with many partners, including Canada and Asia. It also links marine and air cargo port complexes with essential warehouse districts, industrial lands, intermodal transportation hubs, and major population centers in the state. Interstate 90 (I-90) is the main highway for east-west commerce. This route connects agricultural businesses and other industries in eastern Washington, as well as states farther

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[52] *U.S. Department of Transportation. Interim National Multimodal Freight Network.* https://www.transportation.gov/freight/InterimNMFN

[53] *U.S. Department of Transportation. Interim National Multimodal Freight Network in Washington.* https://www.transportation.gov/sites/dot.gov/files/docs/State_interimMFN_landscape_Washington_alt_text.pdf

[54] *U.S. Department of Transportation. Interim National Multimodal Freight Network in Washington* https://www.transportation.gov/sites/dot.gov/files/docs/Washington.pdf

[55] *Federal Highway Administration. Intermodal Connectors in Washington.* https://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/washington.cfm

[56] *Joint Transportation Committee. Transportation Resource Manual.* http://leg.wa.gov/JTC/trm/Documents/TRM%202017%20Update/21%20-%20Passenger%20Modes%20-%20Final.pdf

east, with urban markets in western Washington, along with global markets via the marine system.

The freight networks designated on the highway and roadway systems in Washington are described below.

2.2.1 National Highway Freight Network

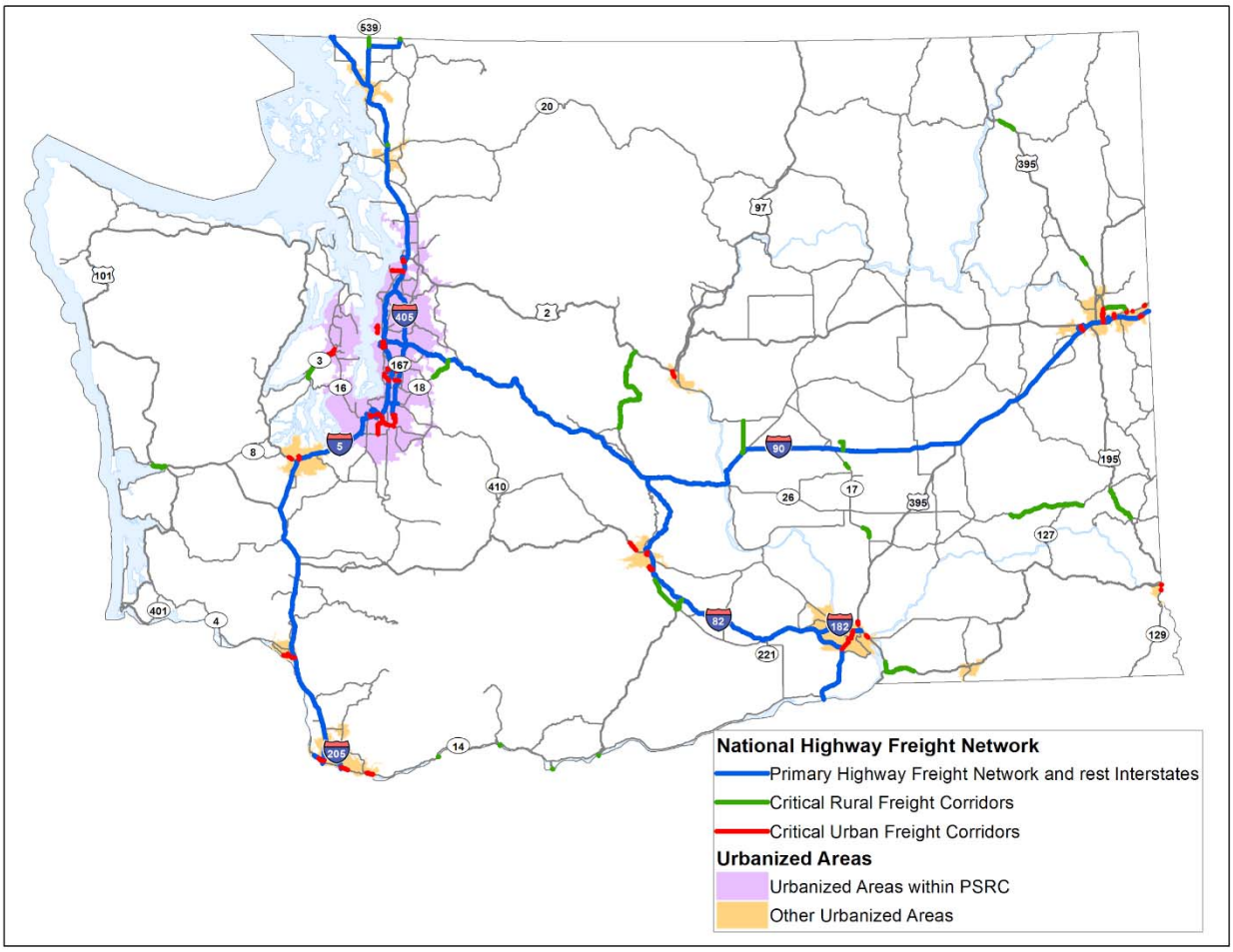
In 2015, USDOT established the National Highway Freight Network[57] (NHFN) in consultation with WSDOT and other partners to strategically direct federal resources and policies toward improved performance of highway portions of the U.S. freight transportation system. The NHFN includes the following components:

- Primary Highway Freight System (PHFS): This is a network of highways identified as the most critical highway portions of the U.S. freight transportation system determined by measurable and objective national data. The national network consists of 41,518 centerline miles, including 37,436 centerline miles of the Interstate Highway System, and an additional 4,082 centerline miles not on the Interstate Highway System. There are 816.6 miles of the PHFS located within Washington.
- Other portions of the Interstate Highway System not on the PHFS: These highways consist of the remaining portions of the Interstate Highway System not included in the PHFS. These routes provide important continuity and access to freight transportation facilities. These portions amount to an estimated 9,511 centerline miles of the Interstate Highway System nationwide, and will fluctuate with additions and deletions. A total of 17.6 miles of these routes are located within Washington.
- Critical Urban Freight Corridors (CUFCs): These are public roads in urbanized areas, which provide access and connection to the PHFS and the Interstate Highway System with ports and other intermodal transportation facilities. A total of 81.6 miles of CUFCs have been designated within Washington, with 38.54 miles in the Puget Sound Regional Council (PSRC) urbanized areas, and 43.10 miles in other urbanized areas.
- Critical Rural Freight Corridors (CRFCs): These are public roads not in urbanized areas, which provide access and connection to the PHFS and the Interstate Highway System with other important ports and other intermodal freight facilities. A total of 163.2 miles of CRFCs have been designated within Washington.

A listing of CUFCs and CRFCs identified in Washington are shown in Appendix A, along with a description of the process used by WSDOT and freight partners to designate these corridors. A map of this network in Washington is shown in Exhibit 2-1.

[57] *Federal Highway Administration. National Highway Freight Network.* https://ops.fhwa.dot.gov/freight/infrastructure/nfn/index.htm

Exhibit 2-1: National Highway Freight Network in Washington



2.2.2 Freight and Goods Transportation System

The Freight and Goods Transportation System (FGTS) is a Washington-specific designation system, separate from the national designation. In 2006, the Washington State Legislature required WSDOT to designate a FGTS including state highways, county roads, and city streets.[58] WSDOT classifies all highways, county roads, and city streets by reported annual gross truck tonnage, ranging from T-1, with the highest tonnage, to T-5, with the least tonnage. WSDOT prepares a biennial FGTS report, which serves as an inventory of the state freight system to meet state reporting requirements. It is used as a basis for eligibility by the Washington State Freight Mobility Strategic Investment Board (FMSIB) and other grant sources to fulfill federal reporting requirements, and to support planning for freight mobility improvements. Corridor classification and maps can be found at the WSDOT FGTS website.[59]

[58] *RCW 47.05.021: Functional classification of highways.* http://apps.leg.wa.gov/RCW/default.aspx?cite=47.05.021
[59] *WSDOT. Freight and Goods Transportation.* http://www.wsdot.wa.gov/Freight/FGTS/

2.2.3 Truck Freight Economic Corridors

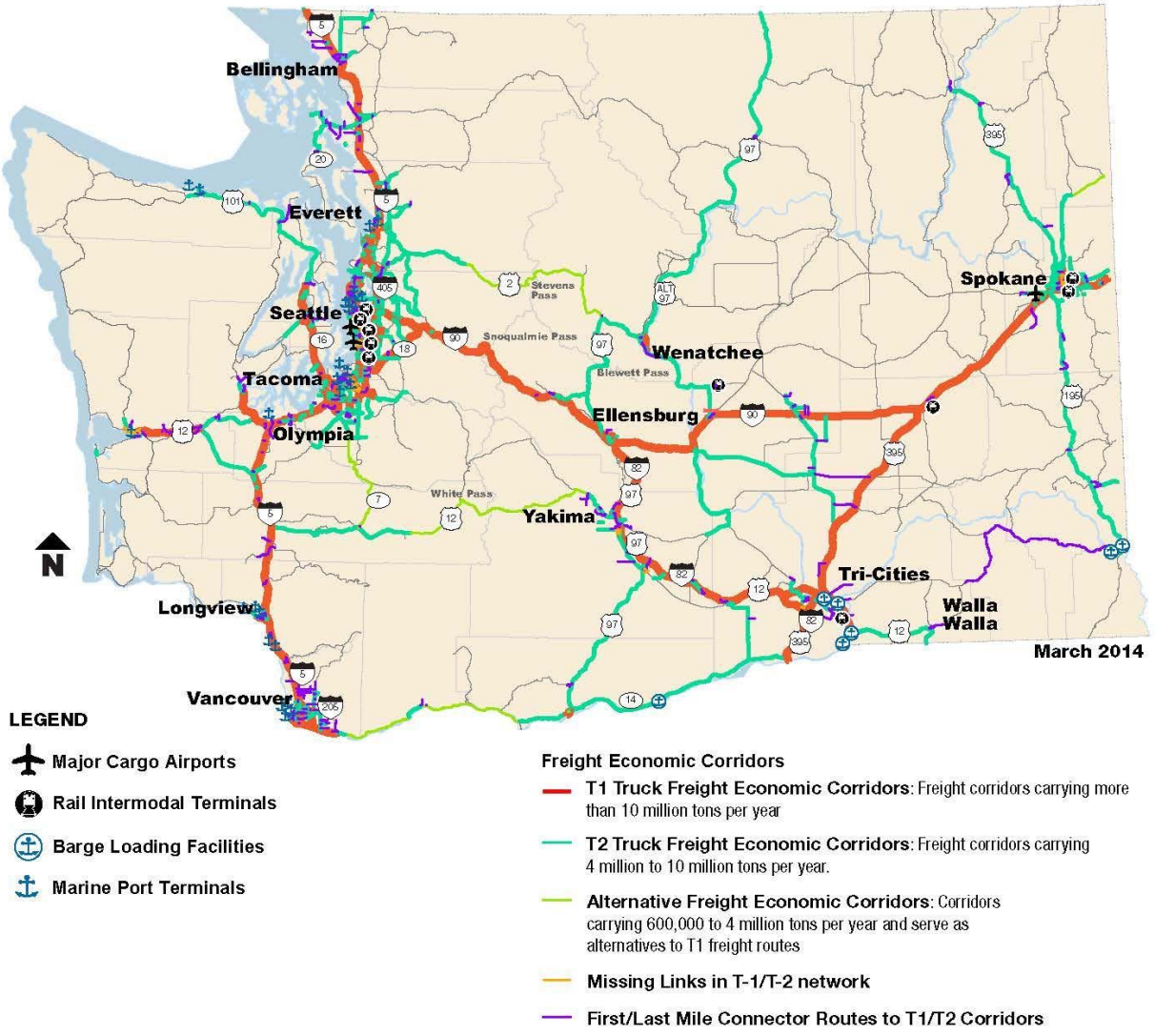
WSDOT, working with FMSIB, the freight industry, Metropolitan Planning Organizations (MPOs) and Regional Transportation Planning Organizations (RTPOs), and many cities, counties, ports, and tribal governments, established the Truck Freight Economic Corridors[60] in 2014. The designations were built on the FGTS classification by considering resiliency and first-mile/last-mile connectivity. This system was used in the *2014 Washington State Freight Mobility Plan* as project screening criteria to identify freight priority improvement projects. The Truck Freight Economic Corridors include the following components:

- High volume truck corridors: T-1 and T-2 freight corridors that are defined in the FGTS as carrying at least 4 million tons of gross truck tonnage per year.
- Alternate freight routes: routes that serve as alternatives to primary cross-state freight routes during severe weather or other disruptions to increase freight system resiliency. These routes include portions of US 2, US 12, SR 7, and SR 14.
- First-mile or last-mile connector routes: routes that connect freight intensive land uses to high volume and alternate routes. These routes provide important freight linkage to strategic national defense facilities, significant intermodal facilities, warehouse districts, industrial land and distribution centers, and agricultural processing centers.

This network, shown in Exhibit 2-2, is a planning tool that helps focus freight planning on these truck corridors.

[60] *WSDOT. Washington State Freight Economic Corridors.* http://www.wsdot.wa.gov/Freight/EconCorridors.htm

Exhibit 2-2: Truck Freight Economic Corridors



2.2.4 National Highway System

The National Highway System[61] (NHS) is considered the backbone of the nation's economy, as well as being critical to its defense and mobility networks. The NHS is an important component of the eligibility criteria for the Nationally Significant Freight and Highway Projects Program for highway or bridge projects. This includes projects that add capacity on the Interstate Highway System to improve mobility. The program is an important federal funding source for freight projects in Washington. The 160,000-mile NHS primarily consists of major highways, but also includes intermodal connector routes, described earlier, that provide first-mile or last-mile access between major intermodal facilities and the NHS. A total of 4,556 centerline miles are designated as NHS routes in Washington, including 3,577 miles of state highways and 979 miles of local roads.

[61] *WSDOT. National Highway System Routes – Washington State.* http://www.wsdot.wa.gov/mapsdata/travel/hpms/NHSRoutes.htm

2.2.5 Strategic Highway Network

The Strategic Highway Network[62] (STRAHNET) is a designated national network that is important to national strategic defense and used for emergency mobilization and peacetime movement of military vehicles. This 63,000-mile network provides defense access, continuity, and emergency capabilities for defense purposes. This network is a component of the NHS.

The U.S. military depends on the freight transportation system in Washington to move cargo for national defense. The military bases in Washington are: Joint Base Lewis-McChord (JBLM), Fairchild Air Force Base, Naval Base Kitsap, Naval Station Everett, and Naval Air Station Whidbey Island. JBLM is the only Power Projection Platform on the West Coast, which is an Army installation that strategically deploys forces.[63] This facility would rely on the I-5 corridor to access the STRAHNET in the event of a major conflict. If such an event were to occur, military goods from across the nation would surge through the Ports of Seattle, Tacoma, Olympia, and Everett.

2.2.6 National Truck Network

The National Network,[64] sometimes referred to as the National Truck Network (NTN), is used by conventional combination trucks with one semitrailer up to 48 feet in length or with two semitrailers of 28 feet in length. The 160,000-mile NTN supports interstate commerce by regulating the size of trucks.

2.3 Railway system

Railroads in Washington play a major role in the movement of a broad range of commodities, ranging from consumer electronics to heavy bulk goods. By handling these products for import and export and local production and consumption, the rail system plays a key role in moving these products to consumer markets in the U.S. and internationally. Two Class I railroads—BNSF Railway Company (BNSF) and Union Pacific Railroad (UP)—and more than 20 short line railroads operate over more than 3,300 miles of track in Washington.

BNSF operates more than 1,400 route miles in Washington, which represents 44 percent of the rail system in the state. Service is provided over seven major corridors, including three east-west corridors, a north-south corridor roughly parallel to I-5, and nine low-density corridors. The major corridors provide the primary conduits to the North American rail network, while the low-density corridors offer collection/distribution services. The BNSF has three commercial intermodal yards: Seattle, South Seattle, and Spokane. Rail yards are located in Auburn, Bellingham, Centralia, Everett, Pasco, Seattle, Spokane, Tacoma, Vancouver, Wenatchee, Wishram, and Yakima.

The UP operates more than 500 route miles in Washington, 16 percent of the rail system in the state. In addition, the UP has operating rights on BNSF tracks between Portland and Tacoma, and between Tukwila and the Port of Seattle. It operates on its own right of way between

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[62] *Federal Highway Administration. Strategic Highway Network.* https://www.fhwa.dot.gov/policy/2004cpr/chap18.cfm
[63] http://www.globalsecurity.org/military/facility/ppp.htm
[64] *Federal Highway Administration. The National Network.* https://ops.fhwa.dot.gov/freight/infrastructure/national_network.htm

Tacoma and Tukwila. The UP has two commercial intermodal container yards: Argo on Denver Avenue in Seattle, and TacSim on Milwaukee Way in Fife.

Twenty-three short line railroads operate over 1,300 miles of track, about 39 percent of the total number of right-of-way miles, in Washington. These rail carriers connect communities to the national rail system. According to the American Short Line and Regional Railroad Association,[65] regional and short line railroads originate or terminate one out of every four carloads moved by rail in the U.S. Short line railroads provide first-mile and last-mile connectivity to important multimodal terminals across Washington. The freight networks designated on the railway system in Washington are described below.

2.3.1 Rail Freight Economic Corridors

WSDOT defines the Rail Freight Economic Corridors[66] as those classified in the FGTS as "R1," which carry more than 5 million tons per year, through classification "R4," which carry between 100,000 tons to 500,000 tons per year. This network is a planning tool that helps focus freight planning on these rail corridors. These corridors are shown in Exhibit 2-3.

[65] *American Short Line and Regional Railroad Association. https://www.aslrra.org/*
[66] *WSDOT. Washington State Freight Economic Corridors. http://www.wsdot.wa.gov/Freight/EconCorridors.htm*

Exhibit 2-3: Rail Freight Economic Corridors

2.3.2 Strategic Rail Corridor Network

The Department of Defense and the Federal Railroad Administration established the Strategic Rail Corridor Network[67] (STRACNET) to ensure rail transportation readiness capabilities during a time of need. STRACNET is an interconnected and continuous rail line network consisting of more than 36,000 miles of track serving more than 120 defense installations. Approximately 850 miles of STRACNET rail lines are located within Washington State, serving six defense installations. Many of the heavy and tracked vehicles shipped by the military will deploy by rail to seaports of embarkation. The purpose of this network is coordination with appropriate transportation authorities, including railroads.

2.4 Marine system

The marine freight waterways in Washington consist of the Pacific Ocean, the Salish Sea, and the Columbia-Snake River System. These waterways and their channels, combined with commercial ports, terminals, locks/dams, and vessels, comprise the marine system. The marine

[67] *Bureau of Transportation Statistics.* https://ntl.bts.gov/lib/14000/14400/14494/ADA395342.pdf

freight system also includes ports, the intermodal land-side connections that allow the roadway and railway systems to move freight to and from the water. Marine freight supports international trade by providing safe, efficient, and cost-effective transportation options for shippers.

The Pacific Ocean forms most of the western border of Washington. All commercially navigable waters in Washington lead to the Pacific Ocean, where freight can be transported globally from ports and terminals. Both ships and barges traverse the Pacific Ocean. Grays Harbor is the only deep-draft port capable of handling ocean-going vessels located directly on the Pacific coast in Washington.

The Salish Sea is composed of three large bodies of water (the Strait of Juan de Fuca, the Strait of Georgia, and the Puget Sound), as well as several smaller bodies of water (e.g., Elliott Bay, Commencement Bay, Bellingham Bay, Hood Canal, Haro Strait, Rosario Strait) that are connecting channels and adjoining waters. There are seven deep-draft ports capable of handling ocean-going vessels in the Salish Sea, located at Port Angeles, Bellingham, Anacortes, Everett, Seattle, Tacoma, and Olympia. There also private terminals in operation outside port districts.

The Columbia-Snake River System is composed of the two connected rivers that facilitate commercial navigation. There are three deep-draft ports in Washington currently handling ocean-going vessels on the Columbia River, at Vancouver, Kalama, and Longview. An additional nine shallow draft ports in Washington handle barges at Clarkston, Garfield-Central Ferry, Whitman-Central Ferry, Whitman-Wilma, Whitman-Almota, Walla Walla, Benton, Pasco, and Klickitat. There are other ports not currently handling cargo that have the capability and infrastructure for handling marine freight, and private terminals in operation outside port districts. Shippers and receivers in Washington also use marine freight facilities and terminals on the Columbia-Snake River System outside the state, including Portland and Morrow in Oregon and Lewiston in Idaho.

The freight network designated on the marine system in Washington is described below. More detail about the marine system can be found in Appendix B, *Washington State Marine Ports and Navigation Plan*.

2.4.1 Marine Highways

America's Marine Highway System is part of America's Marine Highway Program led by the USDOT Maritime Administration (MARAD). The system is composed of Marine Highway Routes designated by the USDOT Secretary of Transportation that include over 29,000 nautical miles of navigable waterways including rivers, bays, channels, the Great Lakes, the Saint Lawrence Seaway System, coastal, and open-ocean routes.

The M-5 Corridor of the Marine Highway System includes the Pacific Ocean coastal waters, connecting commercial navigation channels, ports, and harbors from San Diego, California to the U.S.-Canada border north of Seattle. It spans Washington, Oregon, and California along the West Coast. At the Canadian border, it connects to the M-5 Alaska Marine Highway Connector.

The M-84 Corridor includes the Columbia, Willamette, and Snake Rivers, connecting commercial navigation channels, ports, and harbors. It spans Oregon, Washington, and Idaho from Astoria, Oregon to Lewiston, Idaho and a 26-mile portion of the Willamette River from

Willamette Falls to the confluence with the Columbia River. It connects to the M-5 Corridor at Astoria, Oregon.

2.4.2 Marine Freight Economic Corridors

The Marine Freight Economic Corridors in Washington are comprised of segments that are classified as "W1," which carry more than 25 million tons per year, through classification "W5," which carry 0.9 million to 2.5 million tons per year. This network is a planning tool that helps focus freight planning on these marine corridors. A map of these corridors is shown in Exhibit 2-4.

Exhibit 2-4: Marine Freight Economic Corridors

2.5 Air cargo system

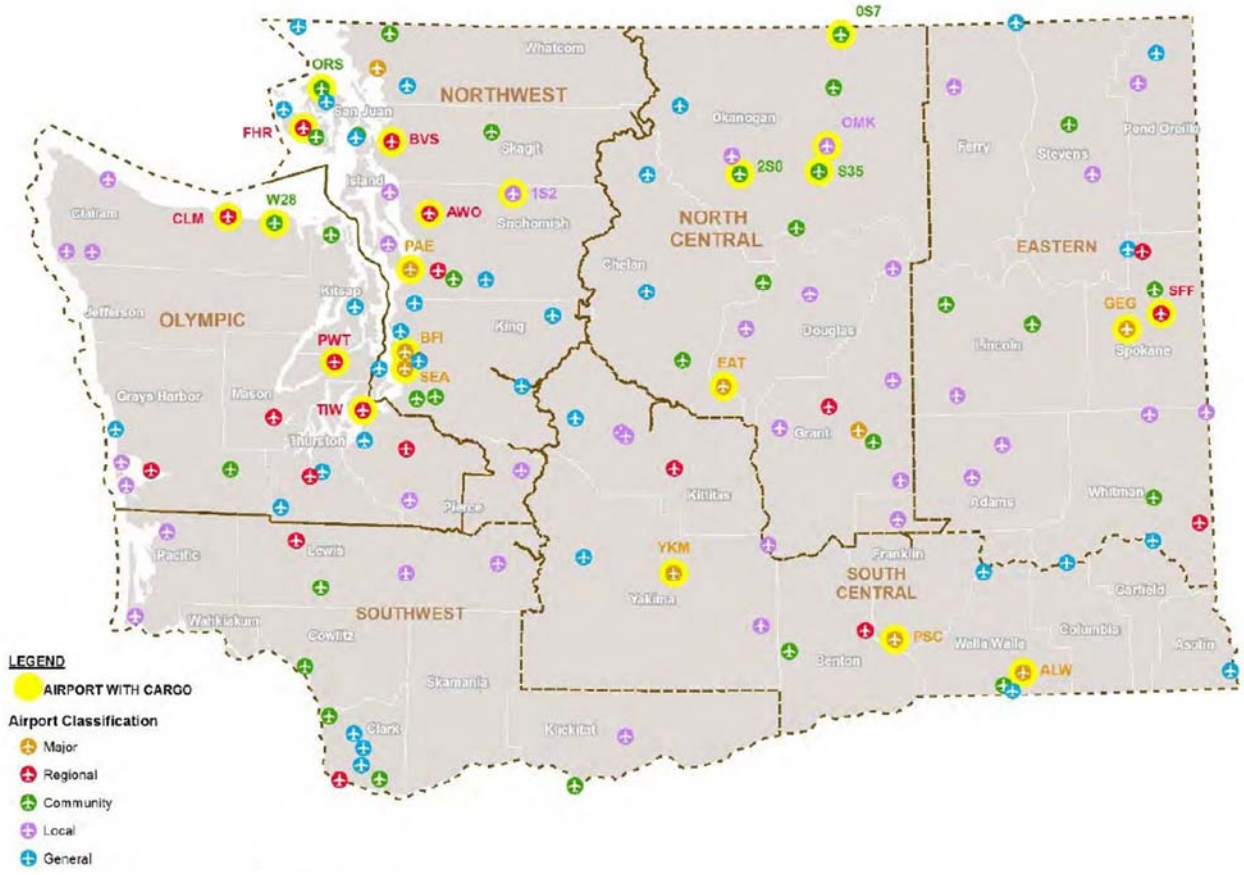
Air cargo consists of air freight and air mail, and is shipped in the belly of passenger planes and on planes dedicated to freight. High-value and time-sensitive goods move through airports in Washington, which play a key role in supporting the service sector as well as the manufacturing and agricultural sectors in the state. While a small fraction of the freight shipped in and out of Washington goes by air, the value of the cargo is disproportionately higher than by other modes, including trucking. Manufacturers, producers, and shippers choose air cargo services because their commodities are often time sensitive. Examples include agricultural products or seafood that could spoil, spare parts needed to repair a key piece of machinery, or consumer products

that need to get to store shelves for a specific launch date. Air cargo services are usually significantly more expensive than other modes of freight transportation. Freight shipped by air typically needs to arrive at its destination faster than the timeline other modes can provide, and air cargo users are willing to pay the higher cost for this service.

Airports and airlines are only a part of a larger ecosystem of support services and facilities that comprise the air cargo supply-distribution chain. An airport can be thought of as a key intersection between air logistics and real estate. Exporter and importer distribution facilities, logistics service providers, and freight forwarders and consolidators are concentrated in the south Puget Sound region and rely on this integrated network to deliver fast and reliable door-to-door service. The service and distribution sectors rely on air freight infrastructure for the transport of perishable food products, fragile merchandise, important documents and mail, and other high value goods.

Air cargo activity occurs at 22 airports in Washington; mostly at airports in the northwestern part of the state. This is most likely due to the concentration of population in that area. Generally, air cargo activity in Washington is highly concentrated, primarily occurring at Seattle-Tacoma International Airport (Sea-Tac), King County International Airport, and Spokane International Airport. In 2014, Sea-Tac and King County International Airport combined had an 84 percent share of the total Washington state market. Spokane International Airport, the third largest cargo airport in the state, represents an 11.5 percent share of the market in Washington. Snohomish County's Paine Field experienced the most increase in air cargo in the last decade, and became the fourth largest air cargo airport in Washington, accounting for 2.6 percent share of the state market. In addition, businesses in Washington also rely on airports outside Washington, such as Portland International Airport. A map of the air cargo system in Washington is shown in Exhibit 2-5.

Exhibit 2-5: Airports with Cargo Activities in Washington



2.6 Pipeline system

Pipelines are the most cost-efficient method of transporting petroleum products. There are three main petroleum pipelines in Washington: the Olympic, the Chevron, and the Yellowstone. In addition, there are two main natural gas pipelines in Washington. In total, the system includes five major petroleum refineries (BP West Coast Products at Cherry Point and Phillips 66 Company in Ferndale, Shell Oil Products and Tesoro West Coast in Anacortes, and U.S. Oil & Refining in Tacoma). The Washington Utilities and Transportation Commission hosts a Pipeline Safety Map Viewer tool that displays the hazardous liquid pipelines and high-pressure natural gas pipeline system by county.[68] The U.S. Energy Information Administration maintains an online Energy Mapping System covering all of Washington.[69]

The natural gas pipeline system in Washington consists of wellhead pumps, compressor stations, tanks, underground reservoirs, and pipelines. The Northwest Pipeline Company owns the main natural gas pipeline in Washington. Sumas is the northern terminus for the system,

[68] *Washington Utilities and Transportation Commission. Pipeline Maps.* https://www.utc.wa.gov/regulatedIndustries/transportation/pipeline/Pages/pipelineMaps.aspx
[69] *U.S. Energy Information Administration. U.S. Energy Mapping System.* https://www.eia.gov/state/maps.php

where it receives up to 1.8 billion cubic feet (Bcf) per day of Canadian supplies and transports them within the northern tier of the region.[70] At Sumas, the system extends south along the I-5 corridor and east along the Columbia River. In addition to delivering Canadian natural gas, the system is bidirectional, with the capability to direct natural gas supplies from the Wyoming natural gas fields and the San Juan Basin to Washington, when needed.

The Gas Transmission Northwest Company system transports Canadian natural gas from the Canada/Idaho border through Washington and Oregon. In Malin, Oregon, where the Gas Transmission Northwest Company system delivers into the California Gas Transmission Company system, it also delivers into the Tuscarora Pipeline Company (0.1 Bcf per day) system, which extends natural gas transportation from the northern California border to the Reno, Nevada area. Puget Sound Energy owns the largest natural gas storage depot in Washington: the Jackson Prairie Underground Natural Gas Storage Facility in Lewis County. This reservoir can hold approximately 44 Bcf of natural gas to meet peak demand in winter.[71]

The majority of crude oil sent to refineries in Washington comes from Alaska by the marine system and from Canada by the rail system. At refineries, petroleum is refined into consumer and industrial products, transported primarily by pipeline. Distribution hubs are located near population centers across the state.

The Olympic Pipeline is a 400-mile interstate pipeline system that primarily runs along a 299-mile corridor in Washington from Blaine to Vancouver, with smaller pipelines branching off the main pipeline. The system transports gasoline, diesel, and jet fuel. The fuel originates at four Puget Sound refineries, two in Whatcom County and two in Skagit County, and is delivered to Seattle's Harbor Island, Sea-Tac, and destinations in Renton, Tacoma, Vancouver, and Portland.[72]

The Chevron and Yellowstone Pipelines distribute oil and fuel products to eastern Washington. The Chevron Pipeline runs between Salt Lake City, Utah and Pasco, with an extension connecting Spokane to Pasco. Refined product is currently transported from a Utah refinery to Boise, Idaho and Pasco. The Chevron Pipeline also delivers military jet fuel to Fairchild Air Base in Spokane. The Yellowstone Pipeline runs from Billings, Montana to Spokane and Moses Lake. This pipeline supplies about 34 percent of all consumer gasoline and diesel fuel to the Spokane market, roughly 42,000 barrels per day.

[70] *U.S. Energy Information Administration.* https://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/western.html
[71] *Puget Sound Energy. Natural Gas Storage.* https://pse.com/aboutpse/EnergySupply/Pages/Natural-Gas-Storage.aspx
[72] *BP. Olympic Pipeline.* http://www.bp.com/en_us/bp-us/what-we-do/bp-pipelines/our-pipelines-and-terminals/olympic-pipeline.html

3 VOLUMES AND FORECAST

The needs of the multimodal freight transportation system in Washington are driven by freight demand, which is closely tied to population and employment growth. In Washington, population is expected to grow 24 percent from 7,061,410 in 2015 to 8,764,005 million people by 2035.[73] Jobs are expected to grow 17 percent from 3,503,209 in 2014 to 4,085,682 jobs in 2024.[74] The state freight system serves as a global gateway for international trade; supports the transportation needs of products made in Washington; and delivers goods to residents and local businesses. Those unique characteristics make future freight forecasts critical to serving the future needs of residents and businesses in Washington over the next 20 years. Current and forecasted freight volumes are presented below for the nation and for Washington.

3.1 National freight forecasts

The national freight volumes presented in this section are based on the Freight Analysis Framework (FAF) that is produced through a partnership between the Bureau of Transportation Statistics (BTS) and Federal Highway Administration (FHWA). Starting with data from the 2012 Commodity Flow Survey and international trade data, the Version 4 (FAF4)[75] integrates data from a variety of sources to create a comprehensive picture of freight movement nationally by all modes of transportation. FAF4 provides estimates for tonnage and value, commodity type, and mode. Data are available for the base year of 2012, the recent years of 2013 to 2015, and forecasts from 2020 to 2045 in 5-year intervals. FAF4 forecasts are a reasonable exploration of current trends, but do not reflect major shifts in the national economy, future capacity limitations, or changes in transportation costs and technology.

According to FAF4, freight tonnage moving on the national transportation network is projected to grow 27 percent by 2035, while the value of the freight will increase 53 percent.[76] In 2015, nearly 18 billion tons of goods worth about $19.1 trillion were moved on the national transportation network. Forty-nine million tons of goods valued at more than $52 billion ship daily throughout the country on all transportation modes. The projections show that tonnage is anticipated to increase, reaching 62 million tons per day by 2035, while growth in value is expected to reach $80 billion per day, or $29 trillion total by 2035.

Exhibit 3-1 shows the tonnage of freight moved by mode in the nation, while Exhibit 3-2 shows the value of freight moved by mode in the nation. Trucks are by far the single most used mode to move freight, accounting for 63 percent of the tonnage in 2015 and 69 percent of the value. Tonnage for trucking is forecast to grow 28 percent by 2035, and value is forecast to grow 49

[73] *State of Washington Office of Financial Management, Forecasting & Research Division. Forecast of the State Population: November 2016 Forecast. February 2017.*
[74] *State of Washington Employment Security Department.* Long-term Occupational Projections. *Accessed May 22, 2017.* https://esd.wa.gov/labormarketinfo/projections
[75] *Bureau of Transportation Statistics, Federal Highway Administration, Center for Transportation Analysis. Freight Analysis Framework Version 4.* http://faf.ornl.gov/fafweb/
[76] *Bureau of Transportation Statistics.* DOT Releases 30-Year Freight Projections. *March 3, 2016.* https://www.rita.dot.gov/bts/press_releases/bts013_16

percent. Despite forecasted increases in freight transported by other modes, trucking is anticipated to continue to carry a similar percentage of the freight market in 2035.

Exhibit 3-1: Weight of Freight by Mode in the U.S.

Mode	2015		2035		% Change	% Annual Growth Rate
	Million Tons	Percent of Total	Million Tons	Percent of Total		
Truck	11,396	63%	14,550	64%	28%	1.2%
Rail	1,773	10%	2,028	9%	14%	0.7%
Water*	714	4%	856	4%	20%	0.9%
Air	6	<1%	12	<1%	121%	4.0%
Multiple modes & mail	438	2%	632	3%	44%	1.8%
Pipeline	3,358	19%	4,446	19%	32%	1.4%
No domestic mode	259	1%	246	1%	-5%	-0.3%
Total	**17,944**	**100%**	**22,770**	**100%**	**27%**	**1.2%**

** Includes crude petroleum imports that arrive by water at a waterside refinery.*
Source: Federal Highway Administration (FHWA) Freight Analysis Framework Version 4.

Exhibit 3-2: Value of Freight by Mode in the U.S.

Mode	2015		2035		% Change	% Annual Growth Rate
	$Billion (2012)	Percent of Total	$Billion (2012)	Percent of Total		
Truck	13,181	69%	19,657	67%	49%	2.0%
Rail	787	4%	1,257	4%	60%	2.4%
Water*	483	3%	695	2%	44%	1.8%
Air	622	3%	1,584	5%	154%	4.8%
Multiple modes & mail	2,334	12%	3,890	13%	67%	2.6%
Pipeline	1,486	8%	1,863	6%	25%	1.1%
No domestic mode	170	1%	162	1%	-5%	-0.3%
Total	**19,063**	**100%**	**29,108**	**100%**	**53%**	**2.2%**

** Includes crude petroleum imports that arrive by water at a waterside refinery.*
Source: Federal Highway Administration (FHWA) Freight Analysis Framework Version 4.

3.2 State freight forecasts

Freight forecasting data for Washington also was obtained from the best available data sources for each mode. For truck, rail, marine, pipeline, and multiple modes and mail, data was obtained from FAF4. The *2017 Washington Aviation System Plan* (WASP) was used to provide more granular and comprehensive analysis for air cargo in Washington, and to consider regional trends and constraints to produce future forecasts. The FAF4 modal forecast is not comparable to the WASP due to several major differences:

- Data sources: FAF4 uses 2012 Commodity Flow Survey as the major source, while the WASP uses data collected from individual airport records.
- Domestic vs. international: Domestic mode is defined as the mode used from zone of entry to the domestic destination, domestic origin to domestic destination, and domestic origin to zone of exit. The forecasts in FAF4 are for domestic modes of freight only, while the WASP includes both domestic shipments and international imports and exports of air cargo. In the case of imports and exports by air, FAF4 categorizes domestic moves by ground to and from the port of entry or exit as truck mode, while WASP classifies that as air shipment.
- Measures: FAF4 uses measures including tonnage (short tons), ton-mile, and value; while the WASP uses different volume measures, such as weight in metric tons.

Exhibit 3-3 shows a comparison of annual growth rate for freight tonnage between the national freight forecast and the state freight forecast. To avoid double counting, FAF4 classifies intermodal shipments, such as truck-rail and truck-water, into a separate category as multiple modes and mail, and excludes those from specific modal forecasts. The comparison results show that truck and rail freight volume moved in Washington is projected to grow slightly faster than the national trend, while the annual growth rates for pipeline and air are below the national trend. The annual growth rate for water freight shipment is consistent with the national trend.

Exhibit 3-3: Comparison of Freight Forecasts

Mode	National freight forecast – percent annual growth rate	State freight forecast - percent annual growth rate
Truck	1.2%	1.5%
Rail	0.7%	0.9%
Water	0.9%	0.8%
Air	4.0%	1.9%
Pipeline	1.4%	0.2%
Multiple modes and mail	2.6%	2.1%

Note: National freight forecast growth rate was calculated based on query results from FAF4 Data Tabulation Tool (http://faf.ornl.gov/fafweb/Extraction0.aspx) "Total Flows". The state freight forecast for air cargo comes from the 2017 Washington Aviation System Plan. Forecasts for other modes come from FAF4.

3.2.1 Truck forecast

According to FAF4, truck freight tonnage moved on the roadway network in Washington is projected to increase from 281.2 million in 2015 to 379.4 million in 2035. That translates to a total increase of 35 percent over a 20-year period and an annual growth rate at 1.5 percent. The total truck ton-miles moved will increase from 72.1 billion in 2015 to 102.7 billion in 2035 at an annual growth rate of 1.8 percent. Truck forecast from FAF4 is for freight moved exclusively by the truck mode, and does not include intermodal shipments, such as truck-rail and truck-water shipments.

The FAF4 forecast shows a much slower growth rate for truck freight volume compared to FAF3 projection, which was created based on 2007 Commodity Flow Survey and used in the *2014 Washington State Freight Mobility Plan* for the state freight forecast. Exhibit 3-4 shows tonnage and ton-miles, a measurement of one ton of freight carried one mile, for the truck freight system in Washington.

Exhibit 3-4: Summary of Truck Freight Forecast

	2015	2035	% Change	% Annual Growth Rate
Tonnage (million tons)	281.2	379.4	35%	1.5%
Ton-Miles (billion ton-miles)	72.1	102.7	42%	1.8%

Source: Federal Highway Administration (FHWA) Freight Analysis Framework Version 4. Data was retrieved from FAF4 Data Tabulation Tool (http://faf.ornl.gov/fafweb/Extraction0.aspx) by using "Total Flows" query, selecting 2015 and 2035 as the data year.

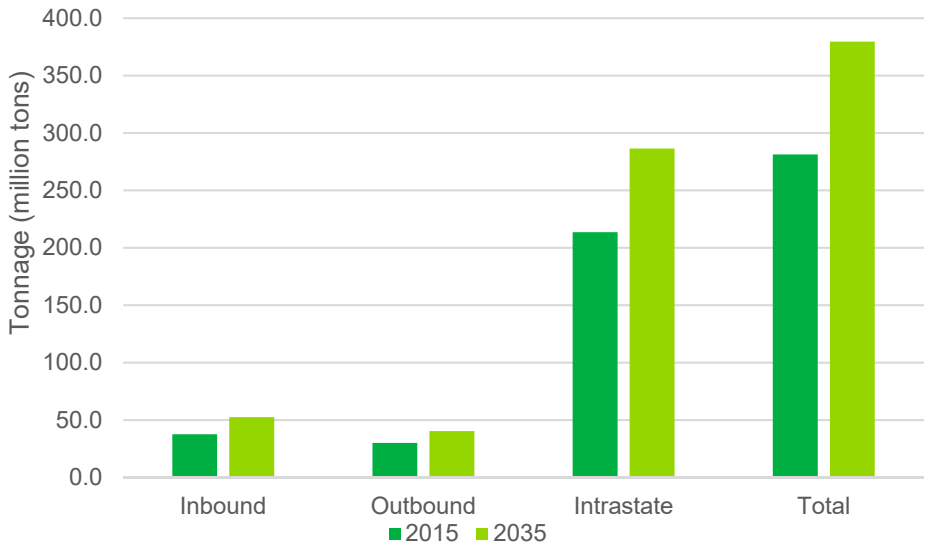
Exhibit 3-5 shows the truck freight shipment by direction in Washington for 2015 and 2035. Directional freight movements include freight transported out of, into, and within the state and defined as follows:

- Inbound: freight originating outside the state and transported to destinations within the state
- Outbound: freight originating within the state and transported to destinations outside state
- Intrastate: freight transported between origins and destinations within the state

In 2015, intrastate truck freight shipment accounted for 76 percent, inbound shipment accounted for 13 percent, and outbound shipment accounted for 11 percent of all truck freight. The share

of truck freight shipment by direction is predicted to be relatively constant in 2035, with much of the growth in truck freight tonnage driven by intrastate movement.

Exhibit 3-5: Truck Freight Shipment by Direction



Source: FHWA Freight Analysis Framework Version 4

3.2.2 Rail forecast

Forecasts from FAF4 indicate that freight tonnage moved exclusively by rail mode is projected to increase from 49.6 million in 2015 to 59 million in 2035. That translates to a total increase of 19 percent over a 20-year period, and an annual growth rate at 0.9 percent. The total rail freight ton-miles moved is anticipated to increase from 56.5 billion in 2015 to 71.0 billion in 2035 at an annual growth rate of 1.2 percent.

Exhibit 3-6 shows tonnage and ton-miles, a measurement of one ton of freight carried one mile, for the rail system in Washington. The rail forecast from FAF4 is for freight moved exclusively by railroads, and does not include intermodal shipments, such as truck-rail or rail-water shipments.

Exhibit 3-6: Summary of Rail Freight Forecast

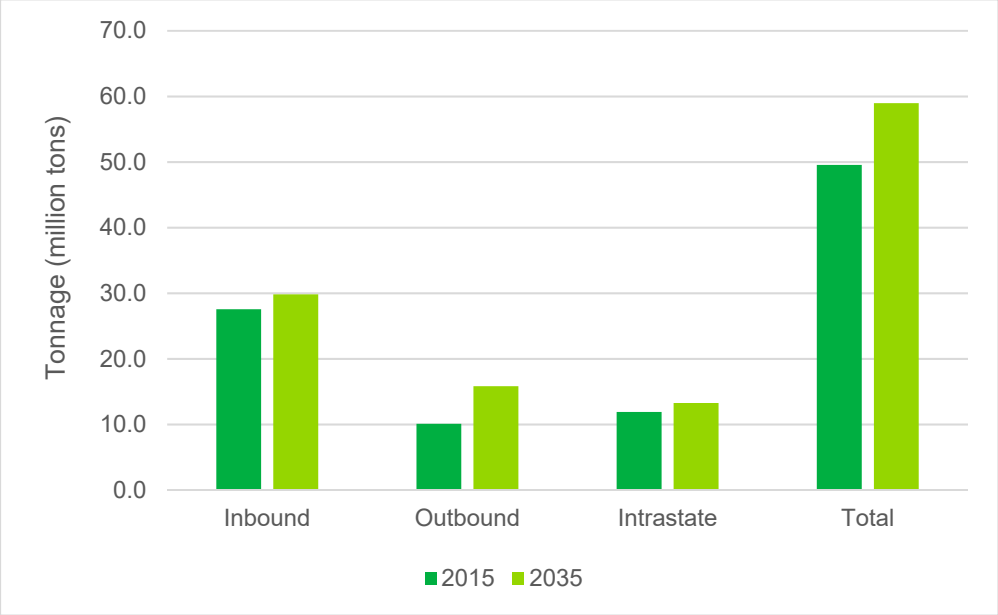
	2015	2035	% Change	% Annual Growth Rate
Tonnage (million tons)	49.6	59.0	19%	0.9%
Ton-Miles (billion ton-miles)	56.5	71.0	26%	1.2%

Source: FHWA Freight Analysis Framework Version 4. Data was retrieved from FAF4 Data Tabulation Tool (http://faf.ornl.gov/fafweb/Extraction0.aspx) by using "Total Flows" query, selecting 2015 and 2035 as the data year.

Exhibit 3-7 shows rail freight shipment by direction in Washington for 2015 and 2035. Outbound shipments are projected to grow at a faster pace compared to inbound and intrastate shipments.

Approximately 60 percent of the growth in total rail freight tonnage will be driven by outbound shipment growth.

Exhibit 3-7: Rail Freight Shipment by Direction



Source: FHWA Freight Analysis Framework Version 4.

3.2.3 Marine forecast

Forecasts from FAF4 indicate that freight tonnage moved exclusively by the marine modes (i.e., ships and barges) is projected to increase from 24.6 million in 2015 to 28.7 million in 2035. That translates into a total increase of 17 percent over a 20-year period, and an annual growth rate at 0.8 percent. The total freight ton-miles moved is anticipated to increase from 26.9 billion in 2015 to 32.1 billion in 2035, at an annual growth rate of 0.9 percent.

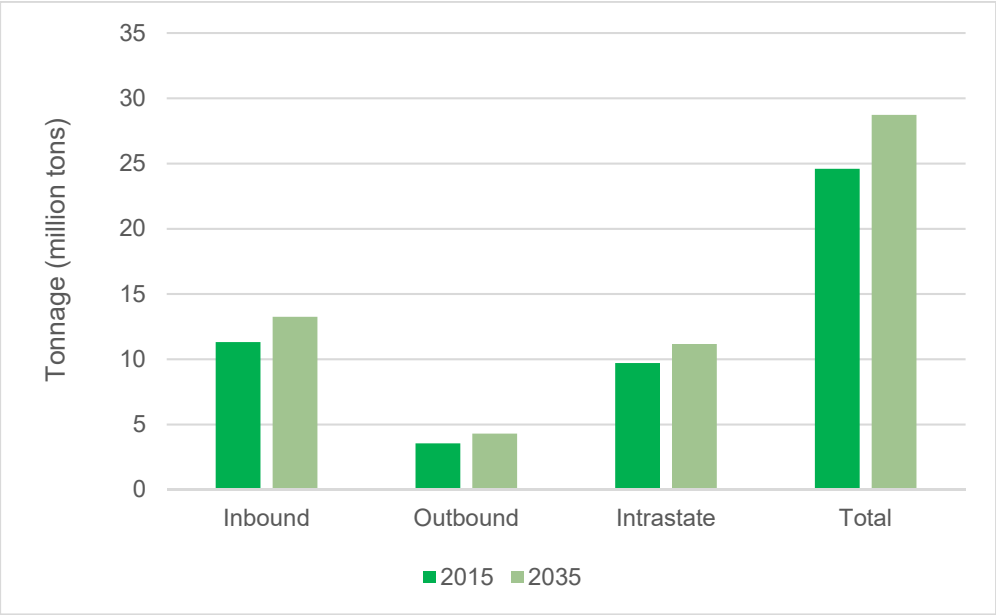
Exhibit 3-8 shows tonnage and ton-miles, a measurement of one ton of freight carried one mile, for the marine system in Washington. The marine forecast from FAF4 is for freight moved exclusively by water, and does not include multimodal shipments, such as truck-water or rail-water shipments.

Exhibit 3-8: Summary of Marine Freight Forecast

	2015	2035	% Change	% Annual Growth Rate
Tonnage (million tons)	24.6	28.7	17%	0.8%
Ton-Miles (billion ton-miles)	26.9	32.1	19%	0.9%

Exhibit 3-9 shows marine freight shipment by direction in Washington for 2015 and 2035. In 2015, inbound shipment accounted for 46 percent, outbound shipment accounted for 14 percent, and intrastate shipment accounted for 40 percent. In general, shipments for all directions are expected to grow at a similar pace over the 20-year period.

Exhibit 3-9: Marine Freight Shipment by Direction



3.2.4 Air cargo forecast

The WASP projects that the freight tonnage moved exclusively by air cargo system will increase from 510,939 metric tons in 2014 to 746,281 metric tons in 2034. That translates to a total increase of 46 percent over a 20-year period, and an annual growth rate at 1.9 percent.[77] Most of this growth will be driven by air cargo activity at Sea-Tac and King County International Airport. Air cargo activity at smaller non-hub airports is projected to increase at one percent per year over the planning period. It is not possible to quantify many of the factors influencing future aviation demand. As a result, the forecast process should not be viewed as precise, particularly given the major structural changes that have occurred in the air cargo industry. Exhibit 3-10 provides a summary of the air cargo forecast for the 20-year planning period.

Exhibit 3-10: Summary of Air Cargo Forecast (metric tons)

Year	Seattle-Tacoma International	King County International	Spokane International	Other Airports	Total Air Cargo
2014	319,490	109,653	59,567	22,229	**510,939**
2019	351,540	124,063	67,395	23,363	**566,361**
2024	383,010	140,365	76,251	24,555	**624,181**
2034	441,870	179,680	97,607	27,124	**746,281**

[77] *WSDOT. 2017 Washington Aviation System Plan.* http://www.wsdot.wa.gov/aviation/Planning/wasp.htm

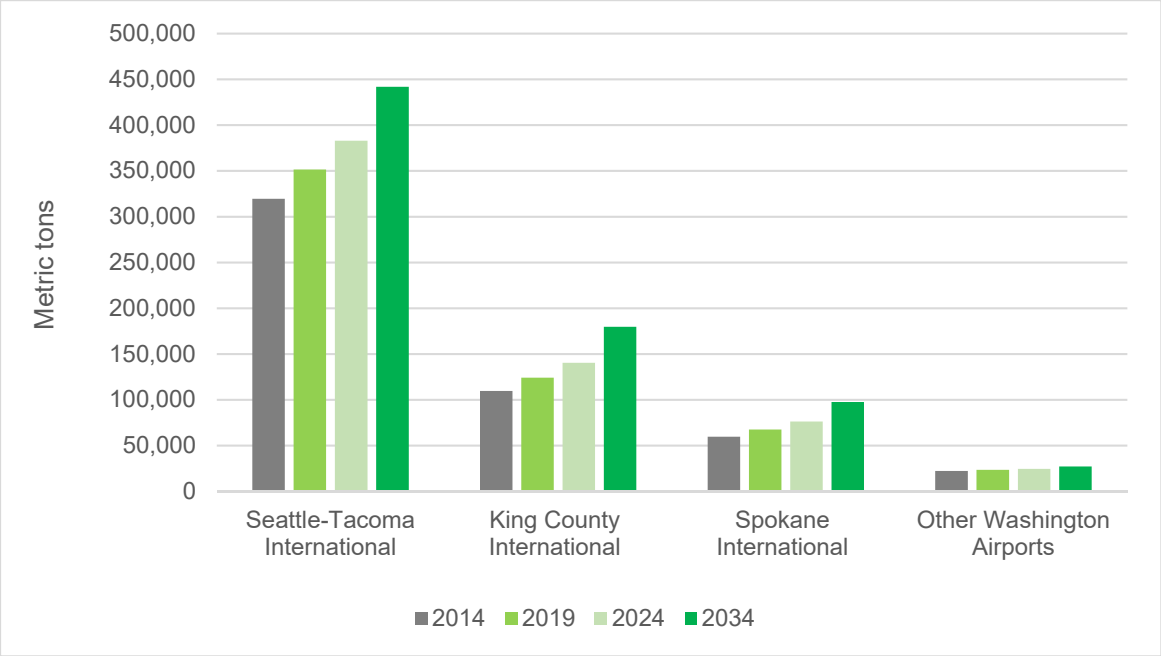
Average Annual Growth Rate (2014–2034)	**1.6%**	**2.5%**	**2.5%**	**1.0%**	**1.9%**

Source: 2017 Washington Aviation System Plan

Air cargo activity in Washington is highly concentrated and primarily occurs at Sea-Tac, King County International Airport, and Spokane International Airport. Non-hub and small commercial passenger airports within the state account for only 4 percent of the total air cargo volumes moved in 2014. By the year 2034, the market share of air cargo for non-hub airports is expected to decrease to 3.6 percent.

Exhibit 3-11 illustrates the air cargo volume forecast for the largest three air cargo airports in Washington. Spokane International, King County International, and Sea-Tac airports are all expected to experience significant growth of cargo volumes over the next two decades. By 2034, Sea-Tac is expected to handle more than 440,000 metric tons of goods shipped by airplane.

Exhibit 3-11: **Air Cargo Volume Forecast for Major Cargo Airports**



Source: 2017 Washington Aviation System Plan

Air cargo in Washington is primarily generated by activity at Sea-Tac. Reflecting a national trend, most of the recent cargo growth at the airport has been in international air cargo. Considering the emerging role of this airport as a cargo hub for Delta Air Lines and surge in new international wide-body passenger and cargo service at the airport, international air cargo tonnages likely will continue to increase.

Air cargo growth for King County International Airport and Spokane International Airport is projected to grow at 2.5 percent per year over the next 20 years. The two key factors that were considered in the projection of air cargo at the two airports were the significant presence of the

integrator express traffic at the airport and the above-average domestic air cargo volumes due to the growth of the e-commerce market.

Air cargo activity at small commercial service airports in Washington is generated almost exclusively by FedEx and United Parcel Service (UPS) with very small quantities of enplaned and deplaned belly cargo by Alaska/Horizon Airlines. Belly cargo capacity at smaller airports in the state is limited due to the regional aircraft used to serve these markets.

3.2.5 Pipeline forecast

The FAF4 forecast projects that the freight tonnage moved exclusively by the pipeline system will increase from 50.3 million tons in 2015 to 52.8 million tons in 2035. This translates into a total increase of 5 percent over a 20-year period, and an annual growth rate at 0.2 percent. The total ton-miles moved through pipelines is anticipated to increase from 2.1 billion in 2015 to 2.6 billion in 2035 at an annual growth rate of 1.1 percent. Exhibit 3-12 shows tonnage and ton-miles, a measurement of one ton of freight carried one mile, for pipeline system in Washington. Pipelines in Washington move refined petroleum products and natural gas.

Exhibit 3-12: Summary of Pipeline Freight Forecast

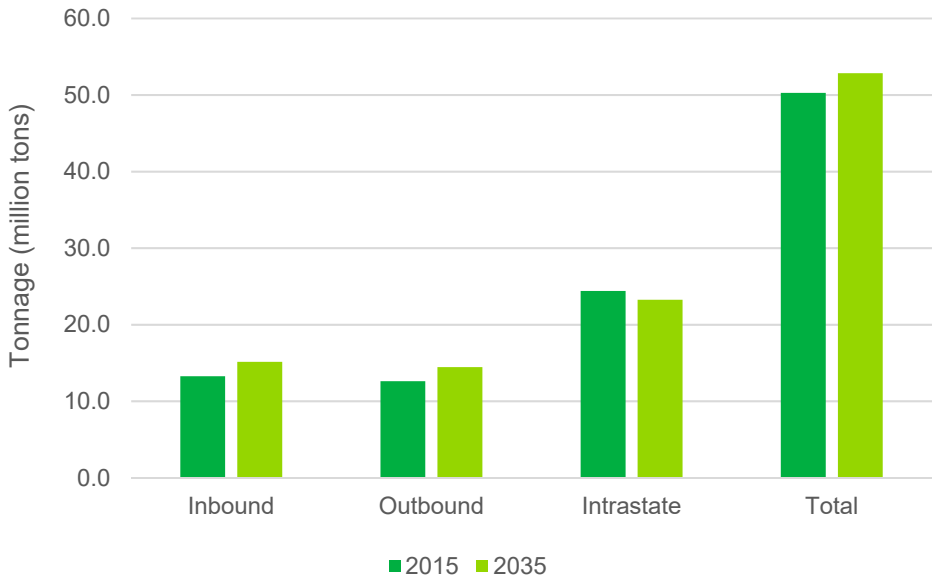
Mode	2015	2035	% Change	% Annual Growth Rate
Tonnage (million tons)	50.3	52.8	5.0%	0.2%
Ton-Miles (billion ton-miles)	2.1	2.6	24%	1.1%

Source: FHWA Freight Analysis Framework Version 4

Exhibit 3-13 shows pipeline freight shipment by direction in Washington for 2015 and 2035. During the 20-year period, inbound and outbound shipments are expected to grow 14 percent, while the intrastate shipment is expected to decline slightly.

Exhibit 3-13: Pipeline Freight Shipment by Direction

Source: FHWA Freight Analysis Framework Version 4



3.2.6 Multimodal forecast

The FAF4 forecast projects that the freight tonnage moved by multiple modes and mail will increase from 21.7 million tons in 2015 to 32.6 million tons in 2035. This translates into a total increase of 50 percent over a 20-year period, and an annual growth rate at 2.1 percent. The multiple modes and mail category in FAF4 includes all other shipments transported by more than one mode, such as bulk products moved by rail and water and mixed cargo hauled by truck and rail. The multiple modes and mail category also includes small shipments sent via postal and courier services. This category is not limited to containerized or trailer-on-flat car shipments. The total ton-miles moved by multiple modes and mail is anticipated to increase from 25.2 billion in 2015 to 42.9 billion in 2035 at an annual growth rate of 2.7 percent. Exhibit 3-14 shows tonnage and ton-miles, a measurement of one ton of freight carried one mile, for multiple modes and mail in Washington.

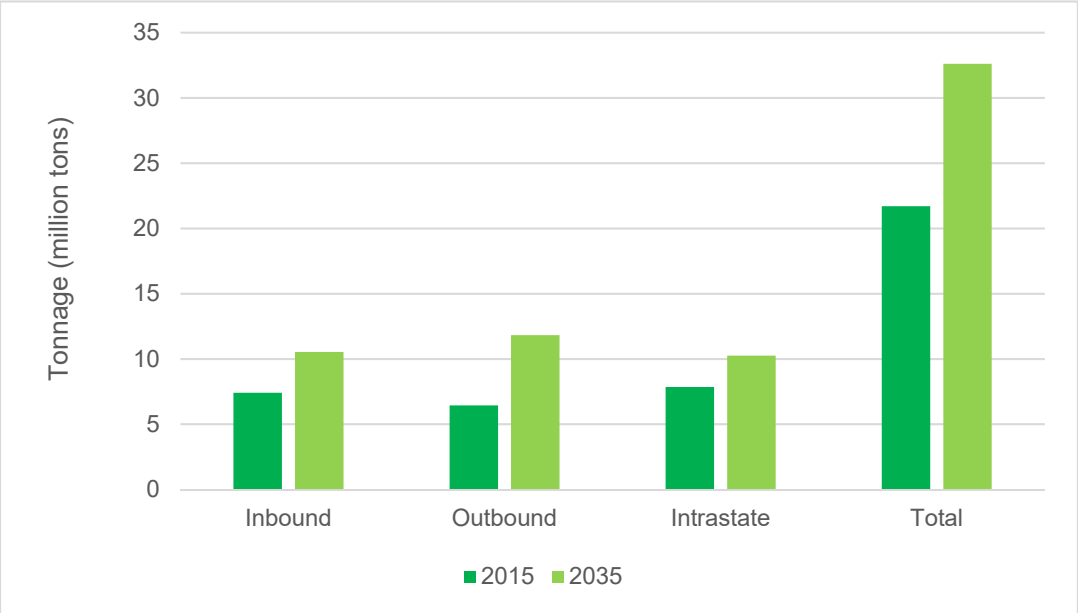
Exhibit 3-14: Summary of Multimodal Freight Forecast

Source: FHWA Freight Analysis Framework Version 4

	2015	2035	% Change	% Annual Growth Rate
Tonnage (million tons)	21.7	32.6	50%	2.1%
Ton-Miles (billion ton-miles)	25.2	42.9	70%	2.7%

Exhibit 3-15 shows multimodal freight shipment by direction in Washington for 2015 and 2035. During the 20-year period, outbound shipments are expected to grow at 83 percent, a faster pace than inbound and intrastate shipments.

Exhibit 3-15 Multimodal Freight Shipment by Direction



4 PERFORMANCE MEASURES

The United States Department of Transportation (USDOT) is implementing a new set of performance measures in 2017, based on rulemakings released in several phases over six years as part of a program to strengthen the U.S. transportation system. The new transportation rules require the Washington State Department of Transportation (WSDOT) to measure and report performance in the following areas: safety, pavement and bridge condition, system performance/congestion, freight movement, and congestion mitigation and air quality. Exhibit 4-1 summarizes these final performance measures released by the USDOT, as part of MAP-21. The final rulemaking on the safety performance measure became effective in April 2016, and the final rule on the other five areas took effect in May 2017. WSDOT is required to report on these measures annually.

2017 Freight Plan Requirement: 49 U.S.C. 70202

This section of the U.S. Code lists ten required elements that all State Freight Plans must address for each of the transportation modes. This section discusses elements of the following requirement:

(2) a description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State;

Exhibit 4-1: MAP-21 Federal Performance Measures

Measure Area	Performance Measures
Safety	Number of fatalities on all public roads.
	Number of fatalities per 100 million vehicle miles traveled on all public roads.
	Number of serious injuries on all public roads.
	Number of serious injuries per 100 million vehicle miles traveled on all public roads.
	Number of non-motorist fatalities and serious injuries on all public roads.
Pavement	Percentage of pavements on the Interstate Highway System in good condition.
	Percentage of pavements on the Interstate Highway System in poor condition.
	Percentage of pavements of the non-Interstate Highway System NHS in good condition.
	Percentage of pavements of the non-Interstate Highway System NHS in poor condition.
Bridge	Percentage of NHS bridges in good condition.
	Percentage of NHS bridges in poor condition.
Performance of the National Highway System	Percent of the person-miles traveled on the Interstate Highway System that are reliable.
	Percent of person-miles traveled on the non-Interstate Highway System NHS that are reliable.
Freight Movement	Truck Travel Time Reliability Index (TTTR) on the Interstate Highway System.
Congestion mitigation and air quality	Annual hours of peak hour excessive delay per capita.
	Percent of non-single occupancy vehicle travel.
	Total emissions reduction.

WSDOT also is developing state freight performance measures for the multimodal freight system. Several of these measures are reported in the Gray Notebook, WSDOT's quarterly performance and accountability report.[78] Each edition features quarterly and annual updates on key agency functions and provides in-depth analysis of topics aligned with the agency's strategic plan emphasis areas as well as the state's transportation system policy goals. WSDOT reports on performance of the multimodal freight transportation system on a semi-annual basis. To ensure the state freight measures drive performance improvement, they are: focused on a short list of performance goals that matter most to freight customers; specific and limited to areas where data exists; and applied to freight systems the state can control or influence.

4.1 Highway system performance

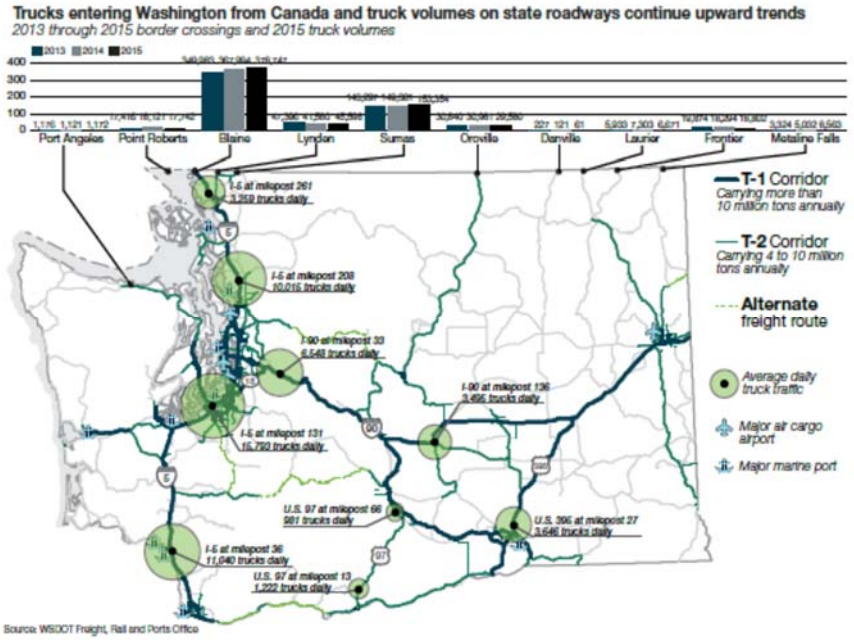
Truck freight data is reported annually as part of the Gray Notebook. The measures and indicators tracked include tonnage and value, corridor segments with the greatest truck volumes, and international border crossings.

WSDOT has developed a truck volume performance measure that tracks the key high-volume truck segments on the state highway system. WSDOT regularly tracks this information as part of the Gray Notebook update to measure change in volume as it relates to highway congestion and delay. Estimated average daily truck volumes increased on Interstate 5 (I-5) in the south Puget Sound area from 2015 to 2016. In Olympia, truck volume increased 9.9 percent from 13,158 in 2015 to 14,466 in 2016. On I-90, the average daily truck volume increased 3.1 percent from 6,548 to 6,749 in North Bend and by 5.6 percent from 3,495 to 3,691 in Vantage. On State Route 18, daily volume increased 7.4 percent from 5,317 to 5,711 in Auburn, and 5.6 percent from 3,853 to 4,067 at Snoqualmie. Increases in truck traffic are largely due to the growing economy. Another factor is the end of container shipping through the Port of Portland in 2016, which is leading businesses to truck their containers to and from ports in Seattle and Tacoma instead.

WSDOT has also developed a border crossing performance measure that is regularly tracked and reported in the Gray Notebook, as shown in Exhibit 4-2. The number of trucks entering Washington from Canada decreased by 1.3 percent in 2016 to 652,427 from 661,106 in 2015. This slight decline was the first since 2009. The border crossings at Blaine and Sumas continue to see the bulk of the traffic, comprising 80.3 percent of total trucks entering the state from Canada in 2016. The Blaine border crossing had 365,489 trucks enter from Canada in 2016, down 5.7 percent from 387,747 in 2015. Sumas had 158,257 trucks, a 3.2 percent increase from 153,354 in 2015.

[78] *https://www.wsdot.wa.gov/Accountability/GrayNotebook/*

Exhibit 4-2: Border Crossings by Trucks



In addition, WSDOT will begin to track and report freight performance on the Interstate Highway System as required by USDOT and published in the Federal Register in January 2017.[79] The state will calculate the TTTR index, which represents the 95th percentile of truck travel time divided by normal truck travel time at the 50th percentile. The following steps will be used to calculate the TTTR index:

1. Calculate TTTR for each reporting segment for five time periods using one year of data: AM peak, midday, PM peak, overnight, and weekend.
2. Determine the maximum TTTR of the five time periods for each reporting segment, and multiply that maximum TTTR with the segment length.
3. Sum the calculated results from step 2 for all the segments, and divide it by the total reporting length of the Interstate Highway System.

WSDOT currently has access to the National Performance Management Research Data Set (NPMRDS), which provides vehicle probe-based travel time data for passenger autos and trucks. Real time probe data is collected from a variety of sources including mobile devices, connected autos, portable navigation devices, commercial fleets, and sensors. In 2015, WSDOT completed a study evaluating this dataset and found several major data limitations for using it to compute freight performance measures, such as limited size of vehicle sample, many missing data points and data bias towards slower speeds. To compute and track truck performance measures over time, a more reliable and robust truck travel time dataset is needed. The Federal Highway Administration (FHWA) is working on improving the quality of the NPMRDS and making some changes to the data.

WSDOT is considering the following truck performance measures to better monitor and track system performance in the future:

[79] https://www.federalregister.gov/documents/2017/01/18/2017-00681/national-performance-management-measures-assessing-performance-of-the-national-highway-system

- Total delay: Total delay is defined as travel time divided by the congestion threshold in units of vehicle hours for trucks. This measure is based on travel time and integrates truck volume and the target set by various state agencies, Metropolitan Planning Organizations (MPOs), and research organizations to measure congestion.
- Hours of annual congestion: Annual congested hours are calculated as the number of hours where truck speeds are below a specified congestion threshold. A similar measure is also included in the WSDOT mobility screening process for evaluating the severity of congestion for general traffic during daylight hours.
- Delay cost: Delay cost is the monetized value of truck delay, and can be calculated as annual truck hours of delay multiplied by the value of truck time. This is a second order performance measure directly resulting from changes in congestion and commonly used for evaluating the impact of bottlenecks and quantifying the potential benefits of improving them.

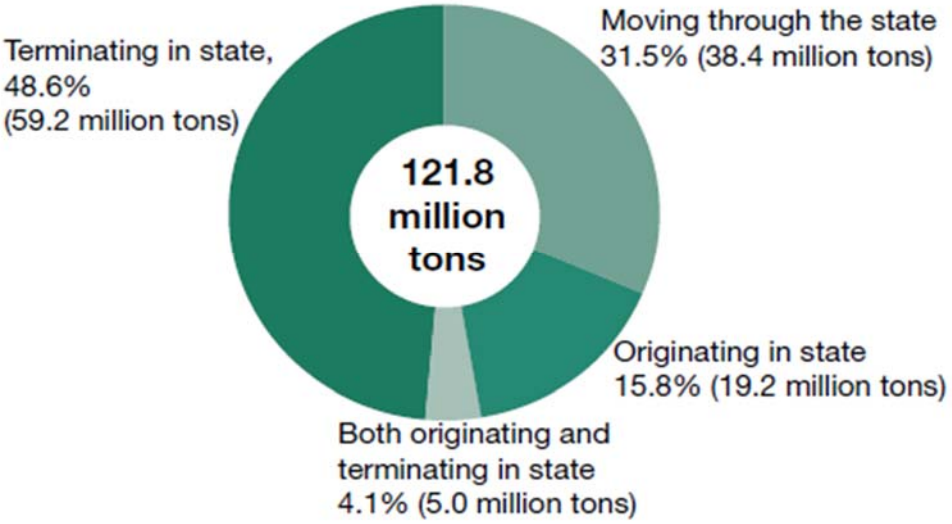
The three measures identified above are recommended by the FHWA Freight Performance Measure Approaches Report[80] for monitoring congestion and reliability. They are easy to communicate and understand and scalable for use at the segment level, corridor level, or system level. The results of truck freight performance analysis will be useful for monitoring system performance trends, tracking progress towards achieving freight performance targets, and identifying truck freight bottlenecks on the highway system.

4.2 Rail system performance

USDOT has not issued any rules on rail freight performance measures. However, WSDOT has developed rail system performance measures as part of the Gray Notebook. One freight rail measure tracked and reported by WSDOT is the freight rail tonnage moved in the state on an annual basis. The latest year of available data is 2014. Railroads in Washington transported 121.8 million tons of freight in 2014, an increase of 13.6 percent from 2013.[81] Nearly half (48.6 percent) of freight moved by rail in Washington was shipped into the state and terminated here. Freight rail shipments moving through Washington, which originate outside the state and terminate outside the state, accounted for 31.5 percent of total freight rail tonnage, as shown in Exhibit 4-3.

[80] https://ops.fhwa.dot.gov/publications/fhwahop15033/sec4.htm
[81] *Surface Transportation Board Waybill Data.*

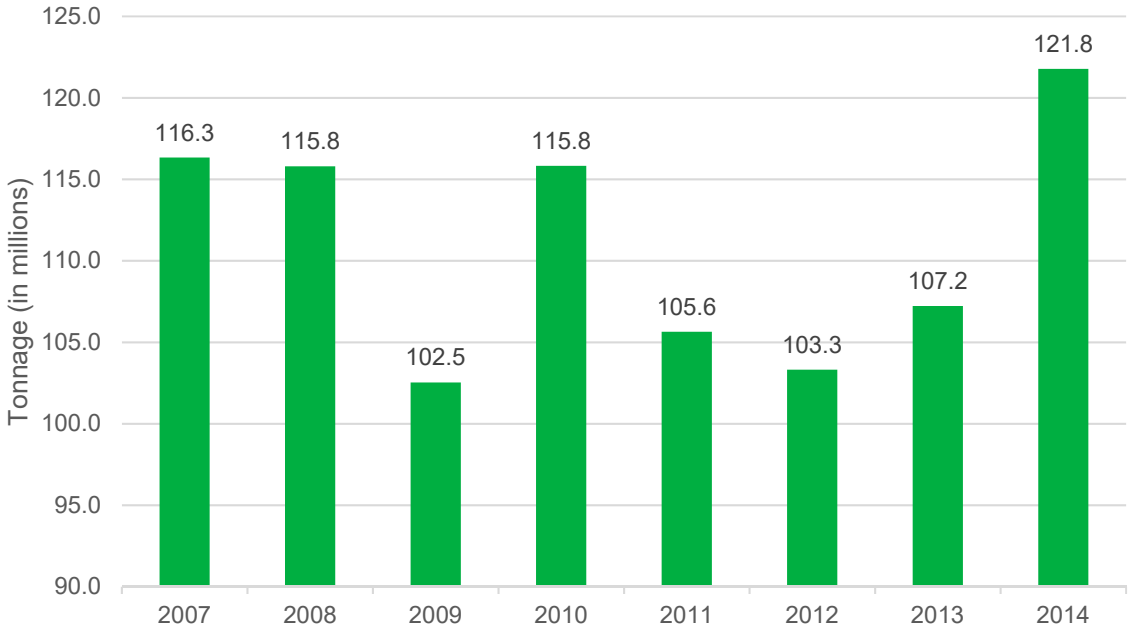
Exhibit 4-3: Freight Rail Movement



Data source: Surface Transportation Board Carload Waybill Data.

Exhibit 4-4 shows the 7-year trend of total freight shipment by rail. The total freight rail tonnage reached its record high in 2014.

Exhibit 4-4: Tonnage of Freight Shipment by Rail (7-years)



Data source: Surface Transportation Board Carload Waybill Data.

Additional freight rail performance measures and indicators tracked in the Gray Notebook include value, commodities hauled, and the number of loan and grant projects awarded for each

biennium. As published in the *2013 Washington State Rail Plan*,[82] WSDOT should partner with other state agencies, stakeholders, and shippers to identify other key performance measures to monitor freight rail system performance and provide information on where the greatest impediments to freight performance are. Examples of potential rail freight performance measures WSDOT can develop include:

- Percent of railroad system that can be operated at 25 MPH or above;
- Percent of railroad system that is capable of handling 286,000-pound rail cars;
- Delays at grade-crossings;
- On-time freight rail performance on key corridors; and
- Container freight rates to Chicago.

4.3 Marine system performance

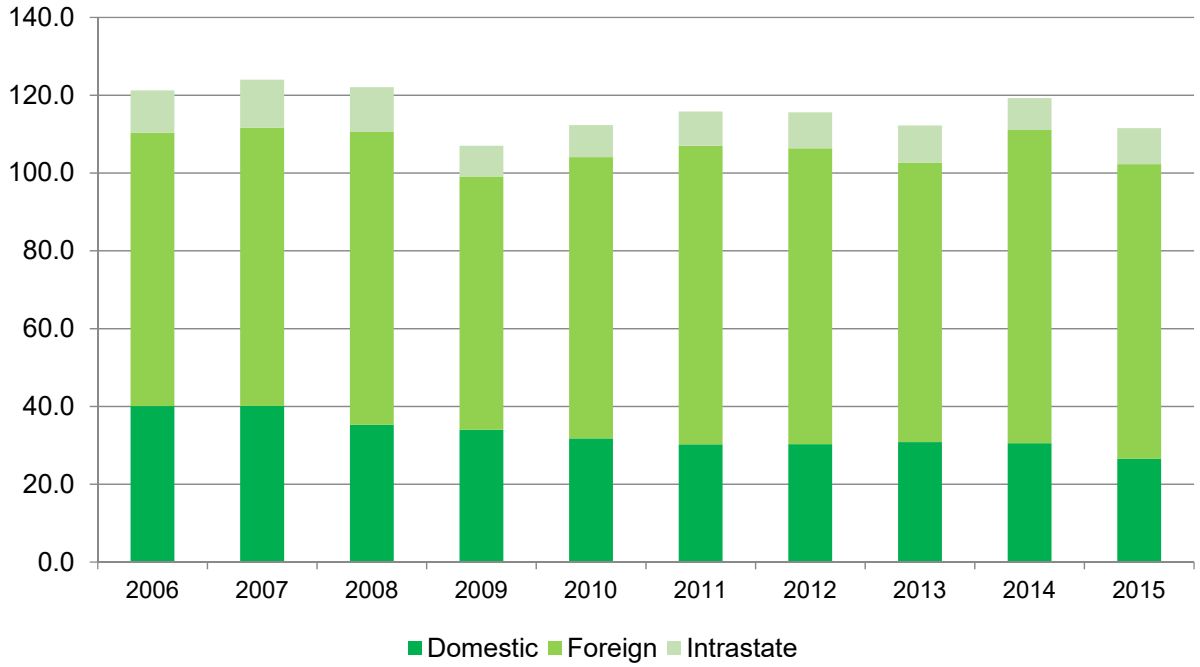
USDOT has not issued any rules on marine freight performance measures. However, WSDOT has developed marine system performance measures as part of the Gray Notebook. One marine performance measure tracked and reported is the waterborne freight tonnage moved in the state on an annual basis. All vessel operators report this data to the U.S. Army Corps of Engineers, delineating the point of loading and the point of unloading for each commodity transported as cargo. These locations are attributed to the nearest port.

The marine system in Washington moved a total of 111.5 million tons in 2015, a 6.5 percent decrease from 2014 levels. Waterborne freight is categorized as foreign, domestic or intrastate depending on both the origin and destination. In 2015, 23.8 percent of waterborne freight was domestic (moved between Washington and another part of the U.S.), 67.9 percent was foreign (moved between Washington and another country), and the remaining 8.3 percent remained within Washington (moved between two places within Washington). Exhibit 4-5 shows the 10-year trend of waterborne freight shipments in Washington. Exhibit 4-6 shows the cargo tonnage for ports in Washington in 2015.

[82] http://www.wsdot.wa.gov/NR/rdonlyres/F67D73E5-2F2D-40F2-9795-736131D98106/0/StateRailPlanFinal201403.pdf

Exhibit 4-5: Annual Marine Freight Tonnage

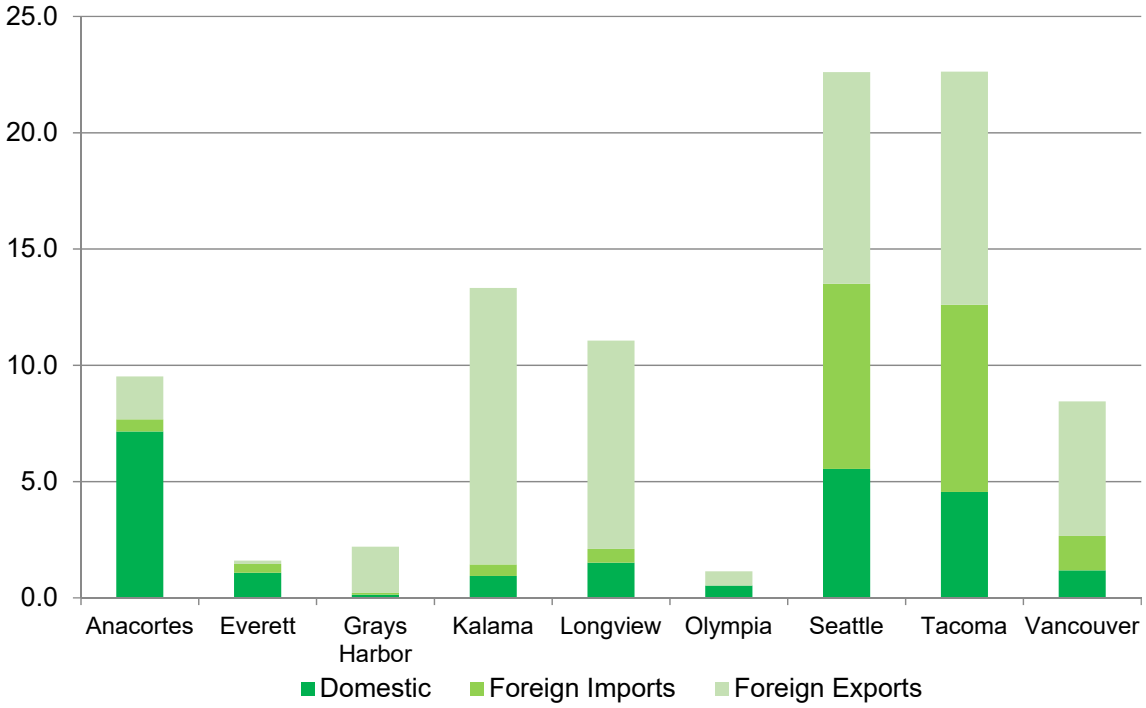
in million tons, 2006-2015



Data source: U.S. Army Corps of Engineers, Navigation Data Center.

Exhibit 4-6: Marine Freight Tonnage by Port

Tonnage in million tons



Data source: U.S. Army Corps of Engineers, Navigation Data Center.

Additional marine freight performance measures and indicators tracked in the Gray Notebook include value and origin/destination (i.e., foreign, domestic, intrastate). New federal law requires USDOT to establish a port performance freight statistics program and report annually on port capacity and throughput at the top 25 ports.[83] USDOT's Bureau of Transportation Statistics reports on the following measures, which WSDOT will consider for all ports in Washington:

- Port throughput: measures reflect the amount of cargo or number of vessels the port handles over time, measured in tonnage, container TEU (a measurement of volume), or vessel calls; and
- Port capacity: indicators suggest relative maximum throughput of ports, such as channel depth, container terminal berth length, container terminal size, container terminal crane number and size, and rail connectivity.

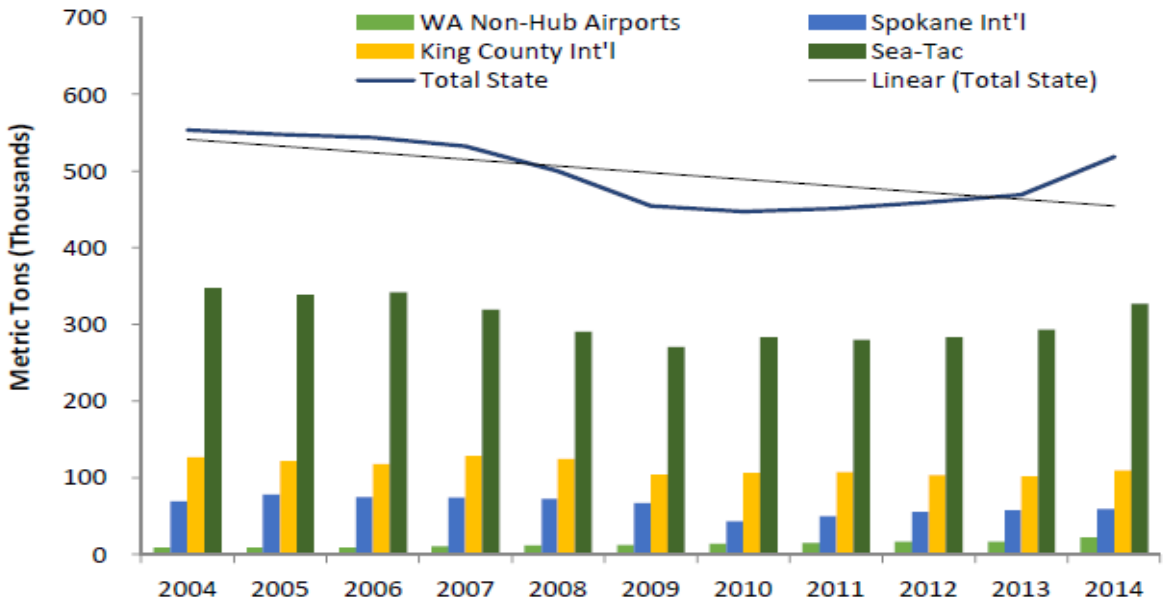
[83] https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/PPFS_Annual_Report.pdf

4.4 Air cargo system performance

USDOT has not issued any rules on air cargo performance measures. However, WSDOT has developed air cargo performance measures as part of the Gray Notebook. One air cargo measure tracked and reported is the tonnage moved in the state on an annual basis. In addition to tracking air cargo tonnage, WSDOT also tracks air cargo value in the Gray Notebook.

The historical trend of air cargo activity in Washington is shown in Exhibit 4-7, as based on the *2017 Washington Aviation System Plan* (WASP).[84]Reflecting trends in general economy, as well as systemic changes in the air cargo industry, air cargo volumes in Washington have fluctuated over the past 10 years from a high of 553,415 metric tons in 2004 to a low of 454,419 metric tons during the economic crisis of 2008/2009. Air cargo volumes in the state slowly increased 3.8 percent per year from 2009 to 2014. Most of the growth in air cargo within the state is driven by the increase in international wide-body aircraft air service at Seattle-Tacoma International Airport (Sea-Tac).

Exhibit 4-7: Annual Air Cargo Tonnage by Airport



Source: 2017 Washington Aviation System Plan

In addition, WSDOT will consider additional air cargo performance measures. The WASP established goals, objectives, system performance measures, and airport metrics for measuring the system's performance. Airport metrics are tied directly to those goals and address specific parameters to evaluate how each airport is supporting the aviation activities that exist at the airport. Specific to freight, the plan recommends tracking and reporting annually on air cargo/freight activity, such as the number of operations, tonnage, and type of freight carried.

[84] http://www.wsdot.wa.gov/aviation/Planning/wasp.htm

5 ECONOMIC VITALITY

The Washington state transportation system policy goal of Economic Vitality is: "To promote and develop transportation systems that stimulate, support, and enhance the movement of people and goods to ensure a prosperous economy." The freight objective identified in this plan is to improve economic vitality. Washington is an economic engine of importance to national, regional, and local economies. Given the importance of trade to the economy, it is vital that the state maintain and continue to improve its ability to move freight efficiently to stay competitive with other states and countries. This chapter identifies the significant trends, issues, and needs related to economic vitality. The strategy and action items identified in this chapter directly relate to the goal of economic vitality.

2017 Freight Plan Requirement: 49 U.S.C. 70202

This section of the U.S. Code lists ten required elements that all State Freight Plans must address for each of the transportation modes. This section discusses elements of the following requirements, related to **economic vitality**:

(1) an identification of significant freight system trends, needs, and issues with respect to the State;

(2) a description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State;

(5) a description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of freight movement, were considered;

Increases in freight volume is an indicator of a healthy economy, because freight haulers are moving freight to gateways; moving agricultural products and raw materials to production facilities; and moving goods to market. Population, job growth, and household formation are the primary drivers of demand for consumer goods, which accounts for much of the freight shipped within the state.

The Washington State Office of Financial Management (OFM) produces annual reports on population estimates and projections. According to an OFM press release in June 2017,[85] Washington's population was 7.3 million, up from 6.7 million in 2010. The increase in this population growth rate is mainly due to migration, which accounted for 72 percent of growth. Population growth remains concentrated in the five largest metropolitan counties, with 77 percent of the state's total population increase occurring in Clark, King, Pierce, Snohomish, and Spokane Counties. Within those counties are the state's top cities for population growth: Seattle, Vancouver, Spokane, Federal Way, Kent, Tacoma, Auburn, Redmond, and Everett. Cities and counties will accommodate population and business growth in various ways.

[85] *http://www.ofm.wa.gov/pop/april1/ofm_april1_press_release.pdf*

Business growth will drive demand to move goods at the right cost and right time on Freight Economic Corridors. WSDOT's interviews with agribusiness, manufacturing firms, and carriers show how their supply chains likely will react as they respond to cost pressures and market opportunities. In the near-term, worldwide demand for Washington agricultural products will grow, increasing the importance of the I-90 corridor, marine ports and airports, inland transload centers, waterways, and the rail system to the state's economy.

5.1 International trade is changing

International trade is increasing, global manufacturing centers are shifting, and new trade routes are opening. The economy is increasingly reliant on international trade. Over the past 30 years, international trade has increased at a much faster rate than overall economic growth. United States exports nearly doubled in value over the past decade. In the next 30 years, it is reasonable to expect that imports and exports will continue to grow with major implications for America's ports, airports, border crossings, and the overall freight transportation system. Economic expansion in developing countries in Asia, Africa, and Latin America is shifting world production and creating new trade patterns. International trade is growing in importance and putting increasing pressure on our ports, border crossings, airports, and intermodal facilities to efficiently move imports and exports to market. Major infrastructure investments, such as the widening of the Panama Canal and the rapid growth of deep-draft ports in Asia, are also affecting increasingly complex global supply chains and value chains.[86] The Introduction of this plan discusses the trade-dependence of Washington and freight-dependent industries. The effects of these changes in Washington are uncertain, but because of our role as a global gateway, it is likely that businesses in Washington will be affected significantly by changes to international trade and U.S. trade policy.

The effects of changes to U.S. trade policies are uncertain given the volume of international trade influencing the Washington economy. Changes in the federal approach to international trade and regulation of interstate commerce have the potential to affect the economic vitality of the state. Changes in international border tariffs and other trade regulations could profoundly affect markets and the movement of goods, especially in Washington. A shift in global trade policies, such as withdrawing from the Trans-Pacific Partnership, likely would create a drastic shift away from globalization and the traditional national approach to trade. The extent of changes to enforcement and regulations is still unclear, providing an uncertain international trade future.

The Joint Legislative Oversight Committee on Trade Policy in the Washington State Legislature monitors the impacts of trade agreements on Washington laws. The Committee maintains active communication with the state trade representative's office, the Office of the United States Trade Representative[87], Washington's congressional delegation, the National Conference of State Legislatures, and other bodies regarding ongoing developments in international trade agreements and policy. The Committee examines international trade, international economic integration, trade agreements, and assesses the impacts of international trade agreements

[86] *Draft National Freight Strategic Plan. https://www.transportation.gov/sites/dot.gov/files/docs/DRAFT_NFSP_for_Public_Comment_508_10%2015%2015%20v1.pdf*
[87] *Office of the United States Trade Representative https://ustr.gov*

upon Washington law. The Committee hears public testimony on the actual and potential effects of international trade agreements and negotiations on Washington and submits an annual report to the state trade representative's office.[88]

The Washington state trade office, Export Washington, monitors and promotes international trade for Washington businesses. The office is part of the Washington State Department of Commerce and provides free or low-cost export resources to assist businesses with exporting freight internationally. The office helps businesses in Washington find international buyers, research foreign markets, comply with export compliance rules, and find government-guaranteed export finance, credit insurance and working capital products. International trade experts provide one-on-one assistance to companies seeking help selling to international markets.[89]

Promoting international trade

Transportation partners can continue to promote international trade. Public and private transportation partners in Washington monitor global supply chain dynamics to assess their effect to the Washington economy. These dynamics include things like potential diversion of freight to East Coast ports through the enlarged Panama Canal and changes to U.S. trade agreements with other nations. State policymakers are in a position to support existing business and identify new opportunities for businesses in Washington. Export Washington can continue to use this information to promote trade opportunities beneficial to freight exporters in Washington. Testimony can be provided to the Joint Legislative Oversight Committee on Trade Policy Committee regarding issues related to exporting. There is a need to determine the role of the freight transportation system in enhancing international trade. WSDOT will work with Export Washington, as needed, to enhance export opportunities for businesses in Washington.

5.2 Port competition is increasing

A prosperous Washington economy depends heavily on goods imported by container through marine and land-side transportation infrastructure. In addition to supporting jobs in trade and logistics sectors, container imports benefit manufacturers and agricultural producers that export through the ports by spreading total port capital and operations costs across a wider area. Two-thirds of the U.S. population lives east of the Mississippi River, and up to 70 percent of containers imported through the Ports of Seattle and Tacoma in the past decade were destined for the Midwest and eastern seaboard.

In an ongoing effort to reduce shipping costs and remain competitive, the container-shipping industry has continued to trend towards larger vessels, increasing the average vessel capacity of the fleets. Ships have continued to increase in both size and capacity, particularly for container vessels. In the 1970s, the average size was 1,100 twenty-foot equivalent units (TEU), a unit of capacity based on the volume of a 20-foot-long intermodal container. Between 2010 and 2015, the average vessel size increased from 5,500 to 6,500 TEU in the Trans-Pacific

[88] *Trade Policy, Joint Legislative Oversight Committee.* http://leg.wa.gov/JointCommittees/LOCTP/Pages/default.aspx
[89] *Department of Commerce. Export Assistance.* http://www.commerce.wa.gov/promoting-washington-state/export-assistance/

Fleet. Today, 10,000 TEU ships are becoming a common sight in Puget Sound. Fewer and larger ships are serving the West Coast as a result. As vessel size increases, the number of ports capable of handling the vessels and their larger container volumes decreases. In addition, vessels are expected to unload and load more containers during a single port call, thereby resulting in longer time in port. This increases pressure on terminal infrastructure, truck and rail networks, and intermodal load centers to handle higher volumes in more compressed periods.

Canadian ports have redirected U.S. market share to the Ports of Prince Rupert, British Columbia and Metro Vancouver, British Columbia. A recent economic impact analysis[90] shows that approximately 10,000 jobs in the Puget Sound region are at risk due to cargo diversion to Canadian ports. Some shipping lines already have shifted a significant volume of U.S.-destined intermodal cargo from Puget Sound ports to Canadian ports. In 1995, Seattle and Tacoma combined had five times the market share of the Ports of Prince Rupert, British Columbia and Metro Vancouver, British Columbia combined. Now they are nearly equal.[91]

The Port of Prince Rupert, British Columbia, developed as part of the Canadian government's national trade strategy, has been particularly effective in competing with ports in Washington. Its container volume growth rate is outpacing ports in Washington due to a variety of advantages, including transit time and cost. Because of the remoteness of the port from major population centers, rail moves 99 percent of cargo processed via Prince Rupert. The port advertises rail transit times to Chicago nearly a day faster than the transit time from Seattle, and has closer proximity to key Asian markets. It also costs much less to ship a container from Asia to Chicago through Prince Rupert versus other west-coast ports, partly attributable to the differences in tax structures. The Harbor Maintenance Fee (HMF) adds to the cost of each container imported through a U.S. port. In contrast, U.S. imports moving through Canadian ports do not pay the tax. The Port of Prince Rupert recently completed a 500,000 TEU expansion in 2017 to further expand its capacity.

The Panama Canal expansion, completed in 2016, has realigned the competitive landscape for U.S. ports. Larger vessels, up to 13,000 TEU, now can use the Panama Canal between the Pacific Ocean and eastern U.S. ports, reducing the cost of transportation per container. With the ability of the Panama Canal to handle larger vessels, the breakeven cost (where it is equally expensive to ship via a West Coast or East Coast port) has expanded west. More U.S. markets are now competitively accessible via an East Coast port, increasing the competition that ports in Washington face to hold or grow their market share.

The HMF results in an average of $109 per TEU per import container. The Federal Maritime Commission estimated that if the HMF were removed, half of the U.S. cargo that passes through Canadian ports would revert to U.S. ports.[92] Cargo diversion from U.S. ports reduces HMF collections and threatens the stability of the existing trust fund.

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[90] *https://www.portseattle.org/Supporting-OurCommunity/EconomicDevelopment/Documents/2014_economic_impact_report_martin.pdf*

[91] *Washington State Freight Trends & Policy Recommendations. http://www.fmsib.wa.gov/fac/20140602-FINALComplete%20Folio_for%20printer5-7-14.pdf*

[92] *Study of U.S. Inland Containerized Cargo Moving Through Canadian and Mexican Seaports. http://www.fmc.gov/assets/1/News/Study_of_US_Inland_Containerized_Cargo_Moving_Through_Canadian_and_Mexican_Seaports_Final.pdf*

The challenge of trucking freight in and out of Puget Sound ports has spurred interest in developing one or more inland seaports within Washington. An inland seaport receives export cargo and transfers it to another mode, typically rail, to move the cargo to a marine port. This would allow trucks to avoid long trips through congested areas and make more trips per day. Receiving cargo dockside by rail that otherwise would be arriving by truck alleviates congestion on the last mile roadway segments around the marine port. Inland seaports have been developed in the eastern United States. Some examples include Front Royal (Virginia), and Inland Port Greer and Port Dillon (South Carolina). A location for an inland seaport in Washington has not been identified, but Northwest Seaport Alliance is exploring the concept with potential partners.

Improving competitiveness of marine ports

Ports across Washington are delivering capital projects to remain competitive. To accommodate larger ships, ports are looking at all aspects of their infrastructure from cranes, to dredging, wharves, bridges, on dock rail, peak trucks per day, on dock staging areas, and turning basins. A longer ship requires not only a longer berth, but also more cranes. A wider ship needs a longer crane and will take more time to bring containers from one side of the ship to the dock, if the containers move at current speeds. To keep pace with export volumes, ports and railroads have had to scale up. Stack trains move 200 containers at a time to and from ports or yards near ports. Additionally, unit trains of 110 cars or more, that previously were primarily limited to coal, have become common for other commodities bound for export. The Port of Longview is actively pursuing redevelopment of Berth 4, the former Continental Grain Terminal. The former dock was removed and replaced and a construction material study is underway. At the Port of Vancouver USA, the West Vancouver Freight Access project is a decade-long effort to improve port access. It consists of 21 individual projects to improve freight rail movement through the port and along the BNSF Railway and Union Pacific Railroad mainlines connecting the Pacific Northwest to major rail hubs in Chicago and Houston, and from Canada to Mexico. At the Port of Everett, terminal rail enhancements are underway, which will allow freight arriving and departing the terminals to use rail instead of truck. The Port of Grays Harbor is redeveloping land for unloading and storage of potash, and a ship loader and new berth facility for shipment to international markets. These are just a small set of examples of projects underway that will improve the ability of ports to compete in global trade.

Ports are developing technological improvements to be more efficient. Efficiencies have been found by using more sophisticated online systems to track cargo. Customs can be handled online, allowing multiple parties to be involved at once and decreasing the time it takes to clear customs. Additionally, the development of Terminal Operating Systems (TOS) has improved the efficient handling of cargo through a port once it has cleared customs. A TOS provides real-time status of cargo, tracks cargo in a port to show available port capacity, and then catalogs associated paperwork efficiently. Northwest Seaport Alliance is developing and deploying a Port Community System[93] that will provide real-time network visibility to shipment information, such as container location, vessel schedules, and terminal conditions within a single, shared platform.

[93] *Northwest Seaport Alliance. Port Community System. https://www.nwseaportalliance.com/sites/default/files/port-community-system-1p-2017.pdf*

Ports are considering operational enhancements to remain competitive. To address growing competition with West Coast ports, the Ports of Seattle and Tacoma partnered to create the Northwest Seaport Alliance, a combined port authority. The two separate seaports were competitive rivals for most of the 20th century. The combined port authority, formed in 2015, is now the fourth largest cargo port in the United States by container volume. Under the agreement, properties from both ports were placed in a common pool. The operations are overseen by both port commissions, ending decades of competition. Partners may assess the viability of alternatives that may affect supply chains in the state. The Northwest Seaport Alliance is exploring the possibility of developing inland seaports to divert containers originating in eastern Washington to existing rail corridors and keep them from congested highway segments in the state. WSDOT will monitor the inland seaports topic within the state.

5.3 Pressure builds to convert freight-oriented sites to other uses

Maintaining the supply of industrial land adjacent to freight infrastructure is important to sustaining Washington's economic competitiveness. Population and employment growth, particularly in urban areas, has spurred interest in converting industrial properties to other uses. There is continual pressure to infill freight areas with incompatible uses, such as commercial, residential, and schools near railroads and marine ports in urban areas. The Port of Seattle marine area, Seattle-Tacoma International Airport (Sea-Tac), and King County International Airport/Boeing Field all have limited lands to expand onto and face gentrification and increased competition for use of access routes. The marine terminals in Tacoma also experience complaints from newer communities nearby with regard to normal port operations. There is a need to preserve these critical freight-intensive land uses at both marine and air cargo ports, as well as the major warehouse district in the Green River Valley. In many other urban areas in Washington, because of concentration of population and elevated land values, this is also true. This is also the case for land adjacent to much of the trucking, rail, marine, air cargo, and pipeline infrastructure in the state. State law defines many freight transportation assets as essential public facilities.[94] Local comprehensive plans are required to include a process for identifying and siting essential public facilities.

The Governor's Ports Initiative[95], passed in 2009, requires Seattle and Tacoma to include a container ports element in their respective comprehensive plans. This is designed to address transportation and land use near rail and other port infrastructure to ensure adjacent industrial properties are protected and available for future use. MPOs are required or encouraged, depending on population, to plan for ports in regional land use and transportation planning activities. State law now requires cities with large container ports to include a container port element in their comprehensive plans; it also recommends plans include a marine industrial port element.[96] This law provides detail on process and components that will improve coordination of land use planning near port areas. Land use planning, which is inclusive of the needs of

[94] *Essential public facilities. http://app.leg.wa.gov/wac/default.aspx?cite=365-196-550*
[95] *Governor's Container Ports Initiative. https://app.leg.wa.gov/ReportsToTheLegislature/Home/GetPDF?fileName=ContainerPorts_0809cb94-fa2f-47f9-aa82-812c72dc0da0.pdf*
[96] *Comprehensive plans—Port elements. https://app.leg.wa.gov/rcw/default.aspx?cite=36.70A.085*

trucking, rail, marine, air cargo, and pipeline systems, can reduce conflicts that pressure freight-oriented sites in the future. Seattle, Tacoma, Everett, and Vancouver now include port elements in comprehensive planning.

Protecting freight-dependent industrial sites

Regional and local partners should preserve freight-dependent land for freight use. Land that is adjacent to irreplaceable infrastructure (e.g., rail, port terminals and waterways, and airports) should be preserved for those uses, when appropriate. Protecting cargo-oriented development areas enhances jobs and the economy, as well as reduces land use conflicts. Cities, counties, ports, and tribal governments are responsible for land use decisions. Metropolitan Planning Organizations (MPOs) and Regional Transportation Planning Organizations (RTPOs) coordinate regional planning that may ensure preservation of the most important assets for freight. Cities and counties can preserve land for freight with zoning. One example of this occurred in Clark County, where designated industrial railroad base zones are located near some rail lines. The designation is appropriate for land uses that require and take advantage of rail access for industrial and manufacturing purposes, such as manufacturing, assembly, fabrication, processing, bulk handling, and bulk storage.

Regional and local partners should include freight in comprehensive planning. The Puget Sound Regional Council (PSRC) designates Manufacturing and Industrial Centers, which are employment areas with intensive, concentrated manufacturing and industrial land uses that cannot be easily mixed with other activities. These areas are intended to continue to accommodate a significant amount of regional freight related employment growth. In its regional transportation plan, PSRC has committed to supporting Manufacturing and Industrial Centers, and ensuring that industrial and freight-related land uses are supported in local plans. Other metropolitan areas and cities also should consult freight stakeholders to ensure their comprehensive land use plans and transportation plans support freight-related land uses. WSDOT will work with partners to include freight in comprehensive planning. WSDOT will encourage and assist with the incorporation of freight transportation planning into local land use and transportation plans, including developing policies and strategies to support and enhance freight transportation. These efforts will ensure appropriate land use planning for freight-oriented sites. WSDOT regularly produces *Local Planning Resources*,[97] a document that details transportation-related requirements, recommendations, and resources for local planning. WSDOT will continue to encourage inclusion of freight elements in local planning by regularly updating the document.

5.4 Freight industry labor is in short supply

The freight and logistics industry is facing an unprecedented labor shortage, affecting freight supply chains.[98] The shortage of trained workers in the freight industry, ranging from drivers/operators to warehousing, is due to an aging workforce and the need to replace workers with those who are more technology oriented. The shortage may raise transportation and

[97] *WSDOT Local Planning Resources* http://www.wsdot.wa.gov/sites/default/files/2017/11/14/GMAResource-WSDOTLocalPlanningResources.pdf

[98] *Journal of Commerce.* http://www.joc.com/trucking-logistics/labor/us-warehouse-logistics-sector-warned-labor-shortage_20150929.html

storage costs, and create demand for mechanized labor. While this issue relates to the rail, marine, and air cargo sectors (e.g., engineers, pilots), much of the shortage falls within the trucking sector due to the large number of truck drivers in the industry. Due to numerous challenges and concerns, transportation partners will need to monitor this issue for potential collaborative action.

Since 2006, truck driver shortages have been a challenge to the economic vitality of Washington. The American Trucking Association (ATA) reports the trucking industry has a shortage of qualified drivers and a rapidly aging workforce. ATA estimates the industry has a deficit of 35,000 to 40,000 drivers nationally, which they expect to grow along with freight demand and worsen as drivers retire.[99] While this is a commonly held belief, some entities, including the Owner Operator Independent Drivers Association (OOIDA), question the validity of the shortage. They argue that, if a driver shortage existed, driver wages would be higher. Qualifications and requirements, such as a commercial driver license (CDL), insurance, and background checks, may make it difficult for potential drivers to enter the industry. Although any driver over 18 years old with a valid Washington driver license can operate a commercial vehicle with a Commercial License Permit,[100] they must abide by restrictions, such as accompaniment by a valid CDL holder. Knowledge and skills tests also are required to obtain a CDL. To operate commercial vehicles from one state to another, drivers must be at least 21 years old, thus eliminating many truck driving jobs as an immediate career for recent high school graduates. Additional endorsements are required for a CDL driver to haul hazardous materials, a tank vehicle, a double-trailer, or in other states, a triple-trailer. These barriers to entry may be part of the reason the average age of a truck driver is 49 years old, as compared to 42 for the general U.S. working population.[101] In addition, only 6 percent of drivers are women, as compared to 47 percent of the U.S. working population, leaving a large portion of the hirable population untapped.[102]

The marine workforce in Washington, which includes captains, pilots, engineers, shipbuilders, dock workers, deck hands, and other workers, is headed for a mass retirement. Nearly a third of the more than 5,800 marine-transportation workers in Washington are older than 55. Young people entering the workforce do not work in the marine industry as much as previous generations did, and retirements in the industry are occurring at a higher rate.[103] Approximately 40 percent of the Washington State Ferry system's vessel employees, and around 88 percent of

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[99] American Trucking Association. News and Information. http://www.trucking.org/ATA%20Docs/News%20and%20Information/ Reports%20Trends%20and%20Statistics/10%206%2015%20ATAs%20 Driver%20Shortage%20Report%202015.Pdf

[100] Department of Licensing. http://www.dol.wa.gov/driverslicense/cdl.html

[101] American Trucking Association. News and Information. http://www.trucking.org/ATA%20Docs/News%20and%20Information/Reports%20 Trends%20and%20Statistics/10%206%20 15%20ATAs%20Driver%20Shortage%20 Report%202015.pdf (page 8)

[102] American Trucking Association. News and Information. http://www.trucking.org/ATA%20Docs/News%20and%20Information/Reports%20 Trends%20and%20Statistics/10%206%20 15%20ATAs%20Driver%20Shortage%20 Report%202015.pdf (page 8)

[103] U.S. Census Bureau. QWI Explorer. https://qwiexplorer.ces.census.gov/static/explore.html?s=fddfe&v=bar&t=ac0&fc=true&st=WA#x=0&g=0

the captains, are eligible for retirement in the next 5 to 10 years.[104] About 70 percent of chief engineers at Washington State Ferries are eligible for retirement within 10 years, as are nearly 90 percent of captains.[105]

Addressing freight employment needs

Transportation partners can continue to promote employment and recruitment in freight-dependent industries. The freight and logistics industry is facing an unprecedented labor shortage, affecting freight supply chains. Some companies in trucking and warehousing are addressing the problem by providing in-house training, mentoring, and online training courses to attract young talent and promoting the workers within their organizations. Some trucking companies are helping to recruit new drivers in the industry by offering programs that give aspiring truck drivers free training for a commercial driver's license and a job opportunity after completion. To help retain drivers, some trucking companies are improving benefits for drivers, such as safe driver and performance related incentives, career advancement opportunities, and retirement plans. The move toward driverless vehicles, discussed in the Mobility chapter, could increase as the driver shortage worsens and capacity tightens. Efficiencies gained through operational changes will also help address labor shortages. Due to numerous challenges and concerns, transportation partners will need to monitor this issue for potential collaborative action. WSDOT will work with partners, as needed, to address employment and recruitment in freight-dependent industries.

Transportation partners can continue to work to ensure workers have needed skills. The maritime industry needs well-trained, skilled workers. To meet this need, Vigor Industrial Shipyards partnered with South Seattle College to form the Harbor Island Training Center, the Classroom-In-A-Shipyard. Designed to meet the needs for all maritime companies in Puget Sound, the goal of the program is to strengthen Seattle's maritime industry and to produce marketable graduates who are ready to fill the needs in the marine industry.[106] Port of Seattle has several workforce development initiatives aimed at ensuring skilled workers are available for the maritime industry. In 2017, Port of Seattle offered 150 paid internships for high school and college students.[107] The Department of Commerce supports employment in the marine industry by working with industry and existing training and education resources to address gaps in the system, and to develop a clear career pathway to jobs in the marine economic sector.[108] The U.S. DOT Maritime Administration (MARAD) provides grant funding for training that fosters employee skills and enhances productivity at small U.S. shipyards. The grants, provided through the Small Shipyard Grant Program, help eligible shipyards invest in emerging technologies and a highly skilled workforce. The Joint Transportation Committee of the

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[104] Bureau of Labor Statistics. Occupational Employment Statistics. https://www.bls.gov/oes/current/oes_wa.htm#53-0000

[105] *Seattle Times. http://www.seattletimes.com/seattle-news/transportation/washington-state-ferries-looks-to-train-workforce-of-its-future-as-retirements-loom/*

[106] *South Seattle College. elding Intensive for Maritime & Manufacturing Environments. http://www.southseattle.edu/harbor-island-training-center/*

[107] *Port of Seattle. Workforce Development Programs. http://www.portseattle.org/Supporting-Our-Community/Economic-Development/Pages/Workforce_Development.aspx*

[108] *Department of Commerce. Maritime Sector. http://www.commerce.wa.gov/growing-the-economy/key-sectors/maritime/*

Washington State Legislature plans to conduct a study of marine pilotage in the 2017-2019 biennium with a goal of recommending best practices for pilot recruitment, training, review, and selection.

5.5 Intermodal connector routes lack attention

Intermodal connector routes provide connections between modes, typically between trucks and rail, marine, air cargo, and pipeline terminals. These roadways serve as first-mile or last-mile connections. Some are owned by WSDOT and other public partners with the responsibility of maintaining and improving these routes so that they are suitable for freight transportation. Some intermodal routes are identified in plans and studies due to their importance in freight supply chains, while some are not identified, and their importance to the freight system may not be fully recognized by the roadway owner. As a result, those routes are at risk of becoming insufficient due to a lack of maintenance or to encroachment of incompatible land development or competing transportation demands.

WSDOT collaborates with partners to identify first-mile and last-mile connections on the freight system. In 2014, WSDOT established the Freight Economic Corridors that include local connections to freight-intensive land uses critical to supply chains in the state. In 2016, WSDOT worked with cities, counties, ports, and tribal governments to identify Critical Urban and Rural Freight Corridors important for moving freight between modes.

The Federal Highway Administration (FHWA) maintains a national listing of intermodal connections between the National Highway System (NHS) and other transportation systems such as the rail, marine, and air systems. FHWA provides a listing for each state. There are 88 designated NHS intermodal connectors in Washington, some of which are freight-related.[109] FHWA uses the listing to identify national freight networks, including the interim National Multimodal Freight Network and the National Highway Freight Network. In addition, designation as an NHS intermodal connector route provides funding eligibility as an NHS route. The Washington listing is outdated. Designation of new intermodal connectors has not kept pace with the evolution of the regional freight network. Some functionally obsolete and lightly traveled connectors are still designated as critical NHS connectors. There also are some new, heavily used connectors that have not yet been added to the Washington listing. The need to modify the NHS Intermodal Connectors listing likely will increase as freight and supply chain trends indicate a continued increase in usage of multiple freight modes. It is the responsibility of states to maintain accuracy in the state listing.

In addition, truck-to-truck terminals share many of the same characteristics as designated NHS freight terminals. Truck to truck terminals often attract large volumes of trucks to lesser used and local roads. Goods are stored, transloaded, and reloaded back into trailers for delivery to final destinations. Many of these truck-to-truck terminals are co-located with rail intermodal facilities. However, many of the trucks that access the truck-to-truck terminals do not use the rail facilities. Additionally, they often use different access roads compared to trucks that are

[109] *Federal Highway Administration. Intermodal Connectors-Washington. https://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/washington.cfm*

accessing the rail facilities. There is a need to consider adding these facilities to the NHS intermodal terminal listing.

Improving intermodal connections

Regional and local partners should include intermodal connections in planning activities. Intermodal connections are critical for moving freight between modes. It is important that cities, counties, ports, and tribal governments work together with their MPO and RTPO partners in identifying these routes in plans to ensure their importance to freight supply chains is recognized regionally. WSDOT will work with partners to include intermodal connections in planning activities. WSDOT regularly updates its *Local Planning Resources*[110] document to provide coordination with partners. In that document, WSDOT recommends that local partners identify intermodal freight terminals, such as rail terminals, marine terminals, and air cargo terminals. Many of these terminals are at strategic locations for operational efficiency. WSDOT recommends that local partners adopt policies to discourage development encroachment upon these intermodal nodes. WSDOT will continue to update this resource to assist partners in protecting important freight intermodal connectors.

WSDOT and transportation partners can update the NHS Intermodal Connectors listing for Washington. The listing needs to be updated to reflect current demand and use of the multimodal freight system. Because funding criteria and national networks are based on this listing, the NHS Intermodal Terminals listing needs to reflect the intermodal infrastructure in Washington accurately.

Transportation partners can continue to improve intermodal connector routes. Improvements to connector routes are typically the responsibility of the owner or operator, such as WSDOT, local governments, and private companies. However, contributions from multiple partners does occur. One example is the $18 million North Lead Rail Improvement Project[111] the Port of Tacoma completed in 2017. The project increased rail capacity and efficiency throughout the Tacoma Tideflats area by adding two long tracks to the rail yard, resulting in five tracks for arriving and departing trains. In Everett, the 41st Street Freight Corridor project was completed in 2017 to address increased demand for freight capacity between Interstate 5 and the port's south terminal. In July 2015, the Washington State Legislature approved the Connecting Washington Transportation Funding Package, prioritizing the Puget Sound Gateway Program with nearly $1.9 billion in state, toll, and local investments, the most of any state project in the package. This major investment by WSDOT and other partners provides additional capacity and reliability for the movement of freight in and out of the waterfront industrial areas in both Seattle and Tacoma. The SR 509 portion of the project will provide congestion relief for the more than 9,000 trucks, while the SR 167 completion project will provide a critical missing link for freight traffic by connecting the Port of Tacoma with I-5.

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[110] *WSDOT Local Planning Resources.* http://www.wsdot.wa.gov/sites/default/files/2017/11/14/GMAResource-WSDOTLocalPlanningResources.pdf

[111] *Port of Tacoma. Pier Side.* https://content.govdelivery.com/accounts/WAPT/bulletins/1994ed8

6 PRESERVATION

Washington's economy depends on a strong freight transportation system and the efficient movement of goods, both of which rely on the adequate condition of highways and roads, railways, waterways, pipelines, airports, and intermodal facilities in the state. The freight system in Washington must be preserved for the continued efficiency and effectiveness of the system.

The Washington state transportation system policy goal of Preservation is: "To maintain, preserve, and extend the life and utility of prior investments in transportation systems and services." The freight objective in this plan is to enhance freight system preservation.

This chapter identifies the significant trends, issues, and needs related to preservation. Likewise, the strategy and action items identified in this chapter directly relate to the goal of preservation.

2017 Freight Plan Requirement: 49 U.S.C. 70202

This section of the U.S. Code lists ten required elements that all State Freight Plans must address for each of the transportation modes. This section discusses elements of the following requirements, related to **preservation**:

(1) an identification of significant freight system trends, needs, and issues with respect to the State;
(2) a description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State;
(5) a description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of freight movement, were considered;
(6) in the case of roadways on which travel by heavy vehicles (including mining, agricultural, energy cargo or equipment, and timber vehicles) is projected to substantially deteriorate the condition of the roadways, a description of improvements that may be required to reduce or impede the deterioration;

6.1 Truck corridors have pavement and bridge preservation needs

Poor pavement and bridge condition negatively affect truck operations. Infrastructure deterioration results in potential safety concerns, increased truck operating costs due to slower speeds, increased wear and tear on trucks, and more damage to fragile goods. Poor condition of pavement and bridges also may result in weight restrictions that limit access and use for trucks. Trucks contribute to pavement and bridge structural deficiencies, which affect the ability to carry loads. High volume truck corridors have a higher potential for rapid infrastructure deterioration, and therefore higher preservation costs.

Condition of Pavement on State Highways

The Washington State Department of Transportation (WSDOT) manages almost 18,500 lane miles of state highway pavement excluding bridge decks, over 2,000 lane miles of ramps and

special use lanes, and about 7,500 lane miles of shoulders. Of those lane miles, 54 percent are asphalt, 33 percent are chip seal, and 13 percent are concrete. In 2015, 93 percent of WSDOT-managed pavement lane miles were in fair or better condition, which exceeded the performance goal of 90 percent lane miles being in fair or better condition. WSDOT has succeeded in maintaining the percentage of pavement in fair or better condition at a relatively steady level in the last ten years by focusing on lowest life-cycle cost to manage its pavement assets, which aims to achieve the highest benefit at the lowest cost over the life of the pavement.

Freight mobility on the truck freight network is dependent on the condition of Truck Freight Economic Corridors. Exhibit 6-1 illustrates the locations on Truck Freight Economic Corridors where pavements are in poor or very poor condition.

Exhibit 6-1: Poor and Very Poor Pavement Condition on Truck Freight Economic

Corridors

WSDOT evaluates pavement condition using three indicators: surface cracking, which is an indicator of structural deterioration; rutting (which is monitored for safety and structural reasons); and smoothness. These criteria are used to classify pavements into five categories: very good, good, fair, poor, and very poor. Pavement in poor condition is deficient and needs repair, while very poor condition indicates failure and the need for substantial restoration and possibly reconstruction.

The percentage of pavements in acceptable (i.e., fair or better condition) has remained relatively steady for the last ten years and met performance goals of 90 percent fair or better due to the cost-effective strategies and management of WSDOT's pavement preservation program. In 2015, 76 percent of pavement was in good/very good condition, 17 percent in fair condition, 5 percent in poor condition, and 2 percent in very poor condition. However, the strategies implemented over the last ten years may not be sufficient to continue preserving pavement at acceptable levels. Much of the concrete pavement has reached a critical age and the ability of WSDOT to meet expected performance goals for pavement preservation is unlikely, without adequate funding. Additional investment in preservation will be needed to address future pavement conditions as traffic volume, including heavy truck volume, increases.

Aging concrete roadways are becoming a problem in Washington. Concrete pavement makes up 50 percent of the Interstate Highway System lane miles in Washington. Interstate Highway System corridors carry 28 percent of statewide truck vehicle miles traveled and are the highest volume truck corridors. More than half of WSDOT's concrete pavement has been in use for more than 40 years. Much of this pavement was constructed in the 1960s and 1970s, when concrete roadways were built without dowels and were expected to last for about 20 years. Although WSDOT has extended the life of its concrete pavement using a variety of rehabilitation treatments, no more than 10 percent of its concrete pavement is expected to remain in acceptable condition beyond the age of 60 years.

Heavy truckloads often contribute to the substantially deteriorated pavement condition found on roadways. WSDOT recognizes that pavements develop structural deficiencies due to truck traffic, as well as environmental conditions, such as water and freezing temperatures.[112] According to the Congressional Budget Office, the cost of pavement damage caused by truck traffic ranges between 0.7 to 1.0 cents per ton-mile.[113] WSDOT analysis of agricultural and timber supply chains in the state recognizes that deteriorating infrastructure is a significant freight transportation problem facing these sectors. Washington is a major production state of agricultural and timber products typically transported in heavy truckloads. The forestry industry relies heavily on local roads and highways to truck timber to mills. The agriculture sector in north central Washington and the Columbia Basin – a national center of apple, potato, onion, hay, wine, and lumber production – depends especially on the I-82 and I-90 corridors. Wheat grown in Eastern Washington relies on first-mile and last-mile connections to intermodal facilities on the rail and marine transportation systems. Aerospace and milk supply chains rely on the I-5 corridor, and the I-5 corridor provides access to export facilities for many commodities. Industries in Washington rely on well-maintained infrastructure to transport products by truck to processing and packaging facilities, to urban markets in Washington, to neighboring states and to Canada, and to intermodal terminals that provide access to global markets. Supply chains for timber and major agricultural commodities in Washington are described and shown in the Introduction chapter.

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[112] *WSDOT. Statewide Pavement Performance. https://www.wsdot.wa.gov/NR/rdonlyres/83E21B35-9862-4857-B194-9910A00DF6D6/0/2012StatewidePavementPerformance.pdf*

[113] *Congressional Budget Office. Pricing Freight Transport to Account for External Costs. https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/presentation/51722-presentation.pdf*

Condition of State-Owned Bridges

WSDOT's state-owned inventory consists of 3,294 bridges. Many state-owned bridges have exceeded their life expectancy. There are 223 WSDOT-owned bridges that are 80 years or older, including six that are 100 years old or older and exceeding the average service life span of 75 years. The replacement cost of all 223 bridges would be nearly $2.5 billion over the next 20 years, and only a small number of replacement projects have received funding.[114] There is a higher risk for old bridges on secondary freight routes to become load restricted in the next ten years.

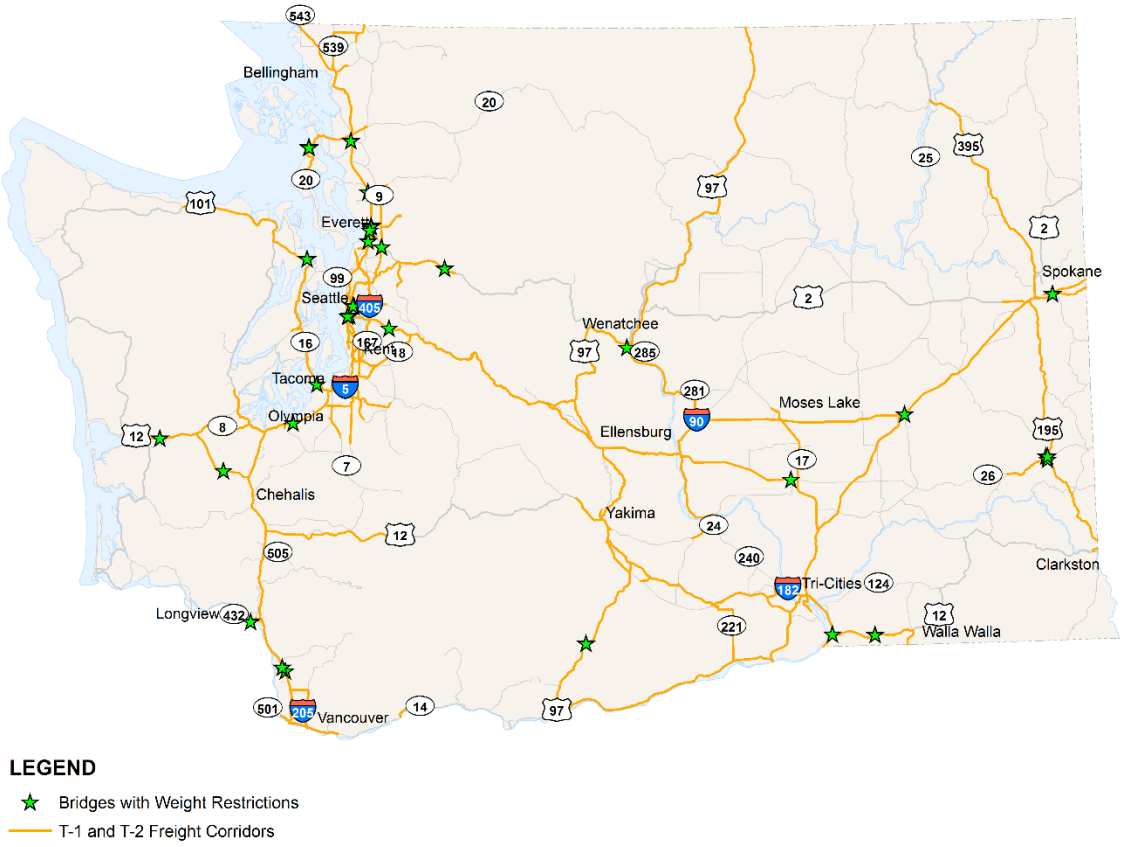
As of June 2016, 91 percent of WSDOT-owned bridges by deck area were in fair or better structural condition. Measuring bridge conditions by deck area incorporates bridge size, giving a more comprehensive picture of conditions than counting the number of bridges. WSDOT uses this measure to align with federal performance measures, and Washington has met the federal performance goal of having no more than ten percent of bridges measured by deck area in poor condition.

WSDOT classifies bridges as being in good, fair, or poor condition based on the National Bridge Inspection Standard's bridge superstructure, substructure, and deck codes. Bridges in poor condition have advanced deficiencies, such as section loss, deterioration, scour, or seriously affected structural components that may result in truck weight restrictions. Bridges in poor condition also are considered structurally deficient. In 2016, 37 percent of state-owned bridges by deck area were in good condition, 54 percent in fair condition, and nine percent in poor condition. This translates into 154 bridges in poor condition, of which 99 are located on the National Highway System (NHS).[115] Bridges in poor condition are still safe for travel, but they require necessary work to repair, or in some cases replace, a bridge element or the entire bridge.

A total of 121 WSDOT-owned bridges had weight restrictions in 2017, and 41 of these bridges are located on T-1 and T-2 high volume truck corridors. Some bridges are weight-restricted because they were designed and built at a time when the standard truck weight was less. Weight restrictions on bridges may increase truck transportation costs, since truckloads above allowable weight are required to use longer detour routes. Exhibit 6-2 illustrates the locations on T-1 and T-2 truck corridors where bridges have weight restrictions.

[114] *WSDOT.* The Gray Notebook Edition 62. *August 2016.* http://wsdot.wa.gov/publications/fulltext/graynotebook/Jun16.pdf
[115] *WSDOT.* The Gray Notebook Edition 62. *August 2016.* http://wsdot.wa.gov/publications/fulltext/graynotebook/Jun16.pdf

Exhibit 6-2: Weight-Restricted Bridges on High Volume Truck Corridors



A functionally obsolete bridge is one that was built to standards that are no longer used today, including substandard bridge widths, low vertical clearance that can lead to repeated damage from over-height trucks, load-carrying capacity, or flood potential. Functionally obsolete bridges are a problem on truck freight corridors when they prevent truckloads with legal heights from passing. There are 866 WSDOT bridges rated as functionally obsolete, and several of them are located on I-5 and I-90, two important freight corridors that carry the highest truck volume in the state. Functionally obsolete bridges also affect truck operating costs since over-height truck loads need to take detours to pass through the state, which adds additional miles to the trip. WSDOT maintains an online resource of bridge restrictions for oversize/overweight vehicles for planning and permitting purposes.[116]

Bridges face several types of major risks that affect service life, including over-height truck impacts. When a bridge is damaged, Washington State Patrol (WSP) issues citations to responsible parties, and WSDOT recovers the costs for the emergency response and repairs. The damage can result in bridge collapse, bridge closure, or lane restrictions. In May 2013, a portion of the Skagit River Bridge on I-5 collapsed after being struck by an oversized load, severing this major freight corridor carrying an average of nearly 8,000 trucks each day. The collapse shut down I-5 near Mount Vernon for 26 days, until a temporary bridge span was

[116] *WSDOT. Bridge Restrictions for Oversize/Overweight Motor Vehicles. http://www.wsdot.wa.gov/commercialvehicle/restrictions/bridgelist.aspx*

installed. WSDOT conducted an analysis to evaluate the direct road-user cost of the 26-day bridge closure, and estimated that the total direct cost for all users was $8.3 million.[117] Between 2015 and 2016, 50 state-owned bridges were struck by over-height trucks, and seven of those strikes caused an emergency restriction (e.g., closure, posting) on the affected route. In December 2015, the Koontz Road Bridge over I-5 near Napavine was closed due to damage caused by an unpermitted oversized load. The bridge was closed until May 2017, due to the severity of the damage. In July 2016, the Chamber Way Bridge over I-5 in Chehalis was severely damaged by an oversized load that led to the demolition of the damaged span and placement of a temporary bridge that is currently in place. WSDOT funding in the 2015-2017 biennium to address bridges damaged by truck impacts was nearly $7.7 million.

Condition of Locally-Owned Roads and Bridges

Cities, counties, and tribal governments are responsible for maintaining the regional road and bridge infrastructure. City and county agencies collectively manage a network of more than 116,000 lane miles of roadway, which accounts for 86 percent of the total lane miles of pavement in the state. Of the locally-owned lane miles, about 3,340 (almost 3 percent) are located on the NHS.[118]

The pavement performance targets in federal requirements apply specifically to pavement on the NHS. In 2015, about 13 percent of locally-owned NHS pavement, as a percentage of vehicle miles traveled, was in poor condition. This has decreased from 15 percent in 2014. While Connecting Washington funding will help local jurisdictions improve pavement condition on their roadways, there still will be a backlog of pavement preservation needs.

Of the 7,335 bridges across the state, 4,041 are locally-owned and support an average of 10 million crossings per day. Approximately 93 percent of all local bridges by deck area were in fair or better condition as of March 2016. Of the locally-owned bridges, 189 (5 percent) are located on the NHS network, and about 10 percent of those NHS local bridges were in poor condition in 2016.

Cities and counties have struggled to fund basic road maintenance over the past decade. This has made it difficult to make the necessary improvements on urban corridors with heavy bus and truck traffic. Additionally, severe weather events disproportionately affect locally-owned roadways; an aging drainage infrastructure coupled with an already stressed roadway system is a major concern, particularly in the Puget Sound area. Maintaining and upgrading a network of all-weather roadways is important for rural supply chains. For up to two months per year, agricultural growers and processors, manufacturers, and timber/lumber businesses have difficulty transporting their products to market due to weight restrictions on some county roads. In a global marketplace, the inability to meet demand will reduce the state's competitive advantage. The 2007 Washington State Freight Transportation Report called for identifying, establishing, and funding statewide a core all weather county road system to minimize the economic impacts of freeze- and thaw-related road closures. This recommendation has not

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[117] I-5 Skagit River Bridge – Estimate of the Direct Cost of Closure https://www.wsdot.wa.gov/NR/rdonlyres/983F3385-A349-4372-9493-1C21E033DEC0/0/SkagitRiverBridge_DirectCost_1082013.pdf

[118] WSDOT. The Gray Notebook Edition 60. February 2016. http://wsdot.wa.gov/publications/fulltext/graynotebook/Dec15.pdf

been fully funded. A decline in county pavement conditions would increase the likelihood of weight restrictions for existing all-weather local roadways on Truck Freight Economic Corridors.

Addressing pavement and bridge preservation needs on major truck routes

Transportation partners should continue to address pavement and bridge needs on Truck Freight Economic Corridors and the National Highway Freight Network (NHFN). Pavement and bridge deterioration affects the efficient movement of freight, especially on Truck Freight Economic Corridors. In addition to major routes, intermodal connector routes provide connectivity between truck routes and other modal systems that are important for ensuring freight can be moved between the modes. Improvements that may be required to reduce or impede the deterioration of pavements in these areas are included in WSDOT's overall pavement and bridge preservation programs. WSDOT is responsible for highway infrastructure condition, while local governments are responsible for local infrastructure condition.

WSDOT will continue to consider freight volume when prioritizing preservation work. The annual number of trucks on a highway segment is a factor in determining priority for preservation investments. The higher number of trucks per year indicates an importance to commerce and a higher potential for rapid deterioration. If all other factors are equal, a lower number of trucks per year will reduce the priority. The result of using this factor as a part of prioritizing pavement preservation is the most optimal allocation of planned funding.[119] Funding for these projects comes from multiple sources. In the 2017-2019 biennium, WSDOT specifically will address preservation of structurally deficient bridges or bridges that are at risk of becoming structurally deficient.

Local governments continue to address pavement and bridge needs. State funding to assist local governments is provided by programs such as those offered by the County Road Administration Board and the Transportation Improvement Board. WSDOT also will work with the Washington State Association of Counties to expand reporting and collection of short-span bridge and culvert data, evaluate and report on the impact of increased freight traffic on county roads, and other requirements in state law.

WSDOT and transportation partners continue to identify funding for preservation projects. In 2015, the Washington State Legislature enacted Connecting Washington, a 16-year transportation revenue package that provides $1.225 billion for highway preservation. The increased funding level is expected to improve the long-term outlook for pavement performance and decrease the backlog of pavement preservation projects. However, there are still substantial pavement preservation needs without identified funding. The remaining service life of pavement, which measures the average remaining pavement life across the roadway network, also is projected to remain steady through 2020 due to the new revenue package funding. In the outer years, anticipated cost savings from practical design will be used to fund preservation projects.

WSDOT and partners can assess opportunities to develop a statewide core all-weather county road system. This system would minimize the economic impacts of freeze- and thaw-related

[119] *WSDOT. Pavement Asset Management. https://www.wsdot.wa.gov/NR/rdonlyres/E93CF754-0452-4FDE-92BA-02A7BC4CB98A/0/WSDOTPavementAssetManagement2816.pdf*

road closures. These opportunities may include research and coordination activities at a regional or statewide scale.

WSDOT will work with partners to track weight restrictions on Truck Freight Economic Corridors. Load limits and weight enforcement are used to limit infrastructure deterioration. Infrastructure owners, including WSDOT, cities, counties, and tribal governments, may reduce the allowable weights on roadways and bridges if infrastructure deteriorates. This lengthens the life of the infrastructure, but creates a restriction in freight transportation. This may create a competitive disadvantage for businesses in Washington.

Transportation partners should continue to address effects of heavy trucks on pavement. Weight enforcement is an effective tool to reduce pavement and bridge deterioration. Reducing the illegal overweight loads on roadways can extend the life of existing infrastructure. On the state highway system, the Washington State Patrol (WSP) is responsible for enforcing weight laws, and WSDOT constructs and maintains weigh stations for WSP use. Improving weight enforcement can benefit infrastructure preservation and freight mobility. WSDOT and WSP currently are collaborating on a Weigh Station Strategic Plan. WSDOT will consider joining other states to create a national weigh station bypass system.

6.2 Deferred maintenance threatens sustainability of the rail system

The vast majority of the rail infrastructure in Washington is owned by private companies, such as BNSF Railway (BNSF) and Union Pacific Railroad (UP), the two Class I railroads in the state. Each railroad functions as an integrated business, including marketing and pricing services, operating and dispatching trains, maintaining assets, and allocating capital for rolling stock and infrastructure. Class I railroads hold critical importance for rail operations throughout the state. However, private railroads typically do not release network-level data on infrastructure conditions. Therefore, WSDOT does not have an accurate assessment of the Class I rail system condition.

The *2013 Washington State Rail Plan*[120] found that deferral of even modest maintenance spending can lead to equipment and track deterioration that requires substantial investment to repair. The failure to update track to handle modern rolling stock hurts connectivity by limiting the ability of customers to access newer, heavier cars (more efficient and cost effective), which have become an industry standard. As Class I railroads have emphasized investment in their highest-priority lines, other corridors have been abandoned or are now under operation by a Class II or Class III (short-line) railroads.

Abandonment of a rail line can mean the permanent loss of a valuable transportation asset. This can result in economic loss to industries or cities that rely on it and preclude any future rail service. Many short-line railroads were created from lines that were determined as “no longer viable” by their previous Class I owners. Some short-line railroads continue to struggle to overcome decades of deferred maintenance along their right of way. Maintenance needs often compound over time, making deferred repairs costlier than if railroads had addressed them in a timely manner. In addition, substandard or nonexistent maintenance programs do little to instill

[120] *WSDOT. Washington State Rail Plan. http://www.wsdot.wa.gov/NR/rdonlyres/F67D73E5-2F2D-40F2-9795-736131D98106/0/StateRailPlanFinal201403.pdf*

confidence in attracting new businesses or encouraging past shippers to return to rail transportation.

WSDOT completed a short-line rail study[121] in 2015 to evaluate the condition and needs of the entire short-line rail system in the state. The study found that railroad industry trends facing the short-line system and the efficiency needs of the Class I rail lines are creating a need for short-line railroads to upgrade infrastructure. Much of the existing short-line rail system in Washington currently only can accommodate cars with gross weights of less than 263,000-pounds, which does not meet the current or future capacity and velocity needs for efficient operations. Over 55 percent, more than 700 miles, have less than 112-pound rail, the recommended weight to operate 286,000-pound railcars efficiently. Additionally, one quarter of short-line miles have a rail weight of 90 pounds or less, a minimum rail weight that may operate 286,000-pound cars. Failing to meet new standards set in place by mainline railroads could make portions of the short-line rail system obsolete and unavailable to shippers in the state.

Car weight and operating speed are closely related. Track capable of handling 286,000-pound cars is usually Class 2 or higher track where railroads can operate trains at least 25 miles per hour. Track classified as either Class 1 or excepted track, where a crew person "walks" trains, operates at 10 mph. This type of operation can take at least twice as long to service customers, which increases operating costs. Additionally, maintenance costs are generally higher with lighter rail and risks of derailments are increased.

Bridges and trestles constitute another significant cost of short-line railroads. Railroads had to meet new Federal Railroad Administration compliance guidelines that required reporting on the load rating, safe operating weight, and condition of all rail bridges by September 2017. With the railroads completing this reporting, a more accurate estimate of bridge rehabilitation or replacement needs will be available throughout the state.

WSDOT completed a strategic plan for the state-owned Palouse River and Coulee City (PCC) rail system in 2015.[122] Because this system of three branches is owned by Washington state, and managed by WSDOT, system conditions are available. The plan identified and prioritized $58 million in infrastructure projects needed to preserve and maintain rail service. This included a set of priority projects to increase the capability of handling 286,000-pound rail cars. In addition, several segments need track rehabilitation work, located in moderate and sharp curves, to allow for increased speeds. Finally, the plan highlighted the need to identify and replace defective rail through integrity testing.

Addressing rail infrastructure needs

Transportation partners continue to preserve rail service in Washington. State law[123] states that the state, counties, local communities, ports, railroads, labor, and shippers all benefit from continuation of rail service and should participate in its preservation. Lines that provide benefits to the state and local jurisdictions, such as avoided roadway costs, reduced traffic congestion,

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[121] *WSDOT. Washington State Short Line Rail Inventory and Needs Assessment. June 2015. https://www.wsdot.wa.gov/research/reports/fullreports/842.1.pdf*

[122] *WSDOT. Palouse River and Coulee City rail system Strategic Plan. https://www.wsdot.wa.gov/NR/rdonlyres/936F27B0-8F84-49C4-AF4E-33E7216E1A23/105893/2015PCCStrategicPlan1.pdf*

[123] *Rail preservation program. http://app.leg.wa.gov/RCW/default.aspx?cite=47.76.240*

economic development potential, environmental protection, and safety, should be assisted through the joint efforts of the state, local jurisdictions, and the private sector.

Major railroads continue to invest, as needed, to maintain and improve infrastructure condition. The Class I railroads in Washington have upgraded track to accommodate cars with a maximum gross rail load of 286,000 pounds, up from an earlier standard of 263,000-pound cars, with the expectation that railcars will become even larger and heavier in the future. Class I railroads create industry standards that Class II and Class III railroads need to meet in order to interchange with and remain interoperable with Class I railroads. In 2016, BNSF invested approximately $200 million in Washington for capital projects. In 2017, BNSF invested approximately $175 million in Washington.[124] The Union Pacific Railroad capital investments totaled $20.1 million.[125]

Short-line railroads continue to invest, as able, to maintain and improve infrastructure condition. The future of short-line railroads in Washington is very much tied to the success of the Class I railroads and the entire national rail network. Successful short-line railroads need to align with Class I railroads in implementing new technology, increasing efficiency, and streamlining marketing. This only can be achieved if short-line railroads are able to overcome the deferred maintenance of their infrastructure and profitably succeed in growing their businesses. Some short-line railroads continue to struggle to overcome decades of deferred maintenance along their right of way.

WSDOT will continue to support the short-line rail system in Washington. WSDOT will continue to manage the programs that support short-line rail freight, such as the Freight Rail Investment Bank (FRIB) program, the Freight Rail Assistance Program (FRAP), and the Grain Train program. WSDOT will continue to manage and make improvements to the state-owned PCC rail system. The Washington State Legislature passed new funding for preservation of the PCC in the 2017-2019 biennium. The new funding level of $6,696,000 is a significant increase from previous biennia. The Legislature plans to sustain this funding for the next five biennia as well. WSDOT will use this funding to preserve the infrastructure of the PCC rail system.

6.3 The marine system requires regular maintenance

The infrastructure of the marine system requires regularly scheduled maintenance and replacement to preserve the navigability of the system for ships and barges carrying freight. The lock and dam structures on the Columbia-Snake River System and in Ballard require regular inspection and maintenance to prevent a failure or unplanned closure. The eight navigation locks on the Columbia-Snake River System need funding for critical repairs ranging from replacement of mechanical gear to new gates. Navigation infrastructure also needs maintenance, such as the rubble-mound jetties at the mouth of the Columbia River. These structures help maintain the depth and orientation of the navigation channel. Dolphins, which are structures used to cushion ship impacts, need to be refurbished or replaced. Priority locations for preservation work include Ft. Rains, just above Bonneville Dam, and the Hard

[124] *BNSF Railway in Washington. https://bnsfnorthwest.com/washington/*
[125] *Union Pacific in Washington. https://www.up.com/cs/groups/public/@uprr/@corprel/documents/up_pdf_nativedocs/pdf_washington_usguide.pdf*

Rock Dolphins above Ice Harbor Dam. These vital pieces of infrastructure ensure the most efficient movement of cargo through the dams on the Columbia-Snake River System.

A major factor in marine system performance is the maintenance of adequate water depth. Dredging to maintain the channel depth requires continuous investment. As sediment deposits in the navigation channel and in harbors, it needs to be dredged and relocated to a location that does not affect commercial navigation. Dredging will continue to be required to maintain existing navigable channels and waterways on the marine system. The U.S. Army Corps of Engineers (USACE) maintains federal navigation channels. The Columbia River Channel Improvement Project deepened the channel to 43 feet. However, sustained high river flows have made maintaining the 43-foot depth a challenge. Priority projects along the Snake River include maintenance dredging for the 14-foot federal navigation channel depth to maintain safe and efficient navigation and completion of the Lower Snake River Programmatic Sediment Management Plan. USACE estimates for dredging in these areas was $87.7 million in 2016. In 2016, USACE dredging costs in the Portland district were $34.8 million, and $52.9 million in the Seattle District, which includes the Salish Sea and Grays Harbor.

Public ports and private terminals maintain other marine infrastructure. Dredging outside of the federal navigation channel is an ongoing maintenance need. Additionally, changes in the shipping industry challenge some ports with the need to accommodate larger vessels by creating longer and deeper berths and turning basins. Other ongoing maintenance needs include upkeep of docks, piers, and bulkheads, anchorages, dolphins, and other infrastructure. Terminals need infrastructure in adequate condition to maintain and improve freight activities. Infrastructure has aged, in some cases, for several decades without significant preservation activities. Ports also have land-side infrastructure in need of preservation. This includes roadways, highways, and rail infrastructure that directly serve ports. Some infrastructure has aged to the point where regular maintenance is inadequate and ports need to replace it. Some ports lack the funding to rehabilitate or replace their infrastructure. There currently is not a statewide inventory of port infrastructure condition in Washington to assess preservation needs comprehensively.

Addressing port and terminal infrastructure and navigation aides

Ports and terminal owners continue to preserve infrastructure condition, as needed. Ports and terminal owners are typically responsible for maintaining their own infrastructure. Capital investments are important to all port operations in order to sustain and grow business. To meet this need, ports and terminal operators can improve system conditions, as needed, on an individual basis. This may include programmatic repairs to improve infrastructure, but the cost of emergency repairs and upgrades present financial challenges.

Transportation partners continue to preserve navigation channels, as needed. Channel maintenance and navigation aids are important for commercial navigation of the marine system. The U.S. Army Corps of Engineers is responsible for maintaining the federal navigation channel and structures. Adjacent landowners are responsible for maintaining areas adjacent to the channel, if needed for commercial navigation. Dredge material disposal sites may not meet current or future needs. WSDOT will consider options for using dredged material in land-side infrastructure projects, if feasible.

WSDOT will consider compiling a statewide marine ports infrastructure needs inventory. Part of this work may include collaboration with the Washington Public Ports Association and individual ports to compile individual infrastructure needs inventories. In addition, a statewide inventory will help champion the role of port preservation to the state economy.

6.4 Air cargo pavement needs repair

In general, preventive maintenance activities keep airport pavement in good condition. Runway pavement condition has improved at the few large airports with significant paved area, while pavement condition has worsened at small airports with less paved area. Additional information related to the system condition of air cargo airports is available in the *2017 Washington Aviation System Plan*. WSDOT conducts a system-wide study of airport pavement condition approximately every five years to identify pavement needs and to provide information for programming and decision making in the maintenance of facilities statewide. Pavement preservation and maintenance is one of the largest capital investments in the aviation system. According to the *2013 Washington State Airport Pavement Management System* report,[126] primary airports have shown improved condition in pavement since 2005, while non-primary airports show a significant decrease in condition. The *2017 Washington Aviation System Plan* [127] states that approximately 71 percent of the pavement area needed preventative maintenance and 29 percent had deteriorated to a condition that would require either major rehabilitation or possibly reconstruction, which is far more costly than preventative maintenance.

Addressing air cargo pavement conditions

WSDOT will assess air cargo pavement conditions. The condition of runway, taxiway, and apron pavement is an important performance measure of the system's safety and cost effectiveness. The pavement condition index combines several measures of pavement distress, such as cracking and weathering, into one rating. WSDOT monitors airport pavement conditions so the agency can work with airport owners and the Federal Aviation Administration (FAA) to identify and prioritize preservation needs. As mentioned, WSDOT conducts a statewide study of airport pavement condition approximately every five years to identify pavement needs and to provide information for programming and decision making in the maintenance of facilities statewide. WSDOT plans to complete the next study in 2018. When complete, WSDOT and partners will have more accurate pavement condition information. The *2017 Washington Aviation System Plan* identifies pavement preservation and maintenance as one of the largest capital investment needs of the aviation system. Airport owners improve pavement conditions at air cargo airports based on need and available funding.

[126] *WSDOT. Washington State Airport Pavement Management System: 2013 Executive Report.* https://www.wsdot.wa.gov/NR/rdonlyres/8B79C556-2389-4EFA-900A-4AE4D8FCF784/0/2013WashingtonAPMSExecutiveSummaryReport.pdf
[127] *WSDOT. 2017 Washington Aviation System Plan.* http://www.wsdot.wa.gov/aviation/Planning/wasp.htm

7 SAFETY

The Washington state transportation system policy goal of Safety is: "To provide for and improve the safety and security of transportation customers and the transportation system." The freight objective defined in this plan is to improve the safety of freight transportation. Safety and security of the freight transportation system is important to support transportation system goals.

2017 Freight Plan Requirement: 49 U.S.C. 70202

This section of the U.S. Code lists ten required elements that all State Freight Plans must address for each of the transportation modes. This section discusses elements of the following requirements, related to **safety**:

(1) an identification of significant freight system trends, needs, and issues with respect to the State;

(2) a description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State;

(5) a description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of freight movement, were considered;

Washington has adopted "Target Zero," a goal to reduce traffic fatalities and serious injuries on roadways in Washington to zero by the year 2030. To guide the state towards safer highways, WSDOT completed the Strategic Highway Safety Plan in 2016[128] that identifies data driven strategies that are aimed to reduce traffic deaths and serious injuries. It is intended to complement and be incorporated into the plans and programs of key state traffic safety agencies, as well as cities, counties, tribal governments, and private organizations. The plan helps partners coordinate traffic safety programs, better align priorities and strategies, and build a common language and approach to traffic safety efforts across Washington.

This chapter identifies the significant trends, issues, and needs related to safety. Likewise, the strategies in this section aim to improve safety and to implement operational enhancements and technology improvements to improve the safety and security of transportation customers and the transportation system in Washington.

7.1 Heavy truck-involved crashes are increasing

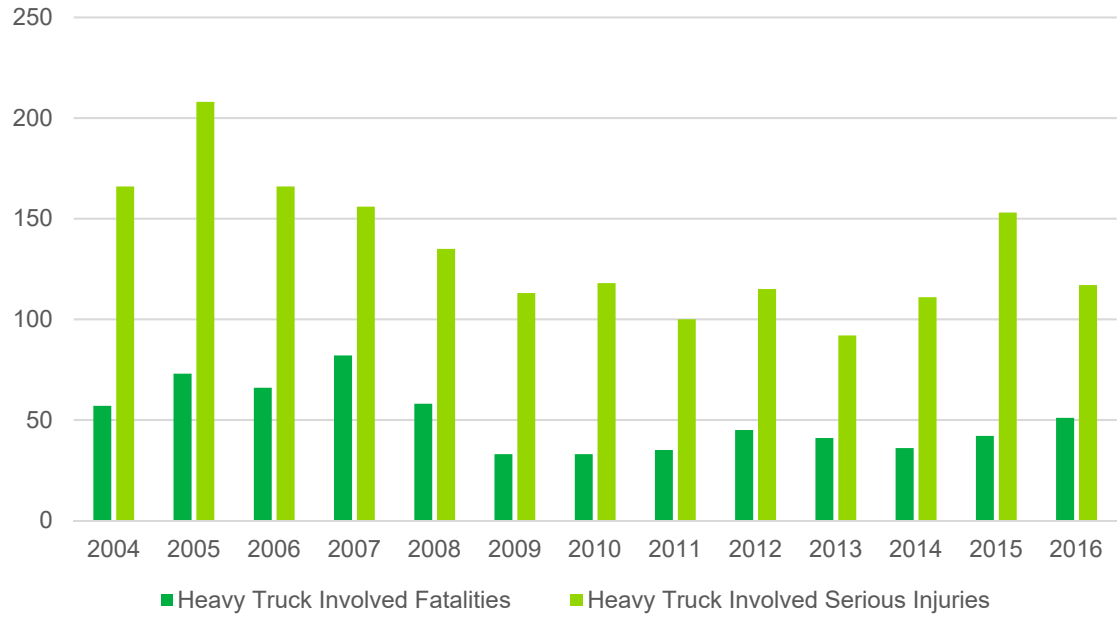
Reducing truck-involved crashes is a safety priority directly related to freight movement and is an emphasis area in the Strategic Highway Safety Plan. Due to their size and weight, heavy trucks pose higher risks of death and serious injury in crashes, particularly for the other involved drivers. This also is true for other roadway users, especially in urbanized areas, where trucks have greater exposure to pedestrian and bicycle activity.

Heavy trucks, or vehicles weighing more than 10,000 pounds, carry freight in Washington and play a vital role in the state's economy. From 2014 to 2016, heavy trucks in Washington were involved in 129 traffic fatalities and 381 serious injuries. Analysis of fatal crashes involving

[128] *Washington Traffic Safety Commission.* Washington State Strategic Highway Safety Plan 2016. http://www.targetzero.com/PDF2/targetzero.pdf

heavy trucks during this time showed that passenger cars and motorcycles caused 59 percent of the crashes. Heavy trucks accounted for 30 percent, and the remaining 11 percent were due to other causes.[129] Between 2014 and 2016, fatalities increased by seven percent and serious injuries increased 24 percent, when compared to the period between 2011 and 2013, likely due to an increase in heavy trucks on roadways. Exhibit 7-1 shows truck related fatalities and serious injuries by year.

Exhibit 7-1: Truck-Related Fatalities and Serious Injuries



** Fatality Analysis Reporting System ARF data as of April 2017 (Washington Traffic Safety Commission).*
*** Source: WSDOT Crash Data Mart as of April 8, 2017 (WSDOT TDGMO Crash Data and Reporting Branch).*

Truck-related crashes in urban areas are a particular concern, because of the multimodal nature of urban areas and the effect on congestion. In urbanized areas, trucks have greater exposure to pedestrian and bicycle activity, which is a safety concern seen in crash statistics. In Seattle, these areas include the Center City, the University District, and other neighborhood centers such as Fremont, Belltown, and SODO. More than 60 percent of fatal truck crashes and nearly 35 percent of serious injury truck crashes in Seattle involved pedestrians or bicyclists.[130] In addition, more than 60 percent of truck-related crashes were associated with single-unit trucks, which account for approximately two-thirds of the truck vehicle miles traveled within the city. Other urbanized areas in Washington also are challenged with this concern. Vancouver is experiencing rapid growth along the SR 501 freight corridor, and many trucks that access the port area travel through downtown to access I-5. WSDOT catalogs maps showing locations of

[129] *Ibid.*
[130] *City of Seattle. Freight Master Plan.* http://www.seattle.gov/transportation/docs/fmp/FMP_Report_2016E.pdf

bicycle and pedestrian infrastructure; many freight-intensive areas and corridors also are identified as bicycle and pedestrian routes.[131]

WSDOT identifies and funds safety projects to reduce fatal and serious injury collisions involving trucks in the same manner as those that involve passenger vehicles, particularly within highway segments that have a high-collision frequency. These projects provide solutions to address the infrastructure issues that are contributing factors for collisions, thereby reducing the potential for fatal and serious injury collisions.

Reducing truck-related fatalities and serious injuries

WSDOT will address speed-related fatalities and serious injuries. The Target Zero plan[132] identifies strategies for reducing fatalities and serious injuries. The plan states that WSDOT will build partnerships to increase support for speed-reducing measures. WSDOT will continue to work with the Washington Trucking Association and the Washington State Patrol (WSP) Commercial Vehicle Enforcement Bureau to encourage company policies which, when backed with speed monitors or speed regulators, can reduce speeding in commercial vehicles. Other strategies to reduce truck-related fatalities and serious injuries include those that reduce crashes through driver and vehicle education, inspections, or enforcement, and those that improve roadway infrastructure to reduce heavy truck/commercial vehicle crashes.

WSDOT will address freight safety with innovative technologies and operational improvements. Transportation systems management and operations[133] (TSMO) refers to multimodal transportation strategies and technologies intended to maximize the efficiency, safety, and utility of the transportation infrastructure. TSMO activities improve person and freight mobility by maximizing the performance of available facilities, taking advantage of low-cost improvement alternatives, and informing travelers and shippers of expected travel performance and their options. By improving mobility, TSMO activities have a wide-ranging impact on travel accessibility, safety, and reliability, as well as economic vitality, and environmental quality. WSDOT will continue to plan and implement operational enhancements and technology improvements to address freight safety.

WSDOT will address low-height bridges with signage. WSDOT gives priority to low-cost enhancement projects that improve safety or provide congestion relief. Signage for low-height bridges is a high priority in the 2017-2019 biennium.

Washington State Patrol continues to address fatigued driving. WSP focuses enforcement on fatigued heavy truck drivers by participating in four statewide fatigue driving campaigns each year. In addition, at the local level, officers use heavy truck crash data to develop location-specific efforts that focus on heavy truck drivers exhibiting driving behaviors, such as inattention and fatigue. WSP uses this data to identify high-risk carriers at roadside and weigh station inspection facilities, and to prioritize compliance reviews. Despite the increased focus on crash-causing violations, in 2014 Washington enforcement officers were only able to inspect 89,204

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[131] *WSDOT. Maps for Local Bicycle Paths and Pedestrian Accessible Trails. https://www.wsdot.wa.gov/bike/localmaps.htm*
[132] *Washington State Strategic Highway Safety Plan 2016. http://www.targetzero.com/PDF2/targetzero.pdf*
[133] *WSDOT. Transportation Systems Management and Operations. http://fratis.trac.washington.edu/TSMO/?loc=Home.html*

trucks, a decrease of 10,885 inspections compared to 2013. The reduction in total inspections was the result of a 6 percent decrease of WSP personnel over the past three years.

Transportation partners continue to promote industry safety outreach. For example, partners perform safety consultations with carrier safety management, as well as provide ongoing education and outreach using "Share the Road" information for all drivers. Similar safety outreach has been conducted in other states to promote safe interactions when operating vehicles near large trucks, which can be used in Washington. For example, the Utah Department of Transportation has initiated Truck Smart, an initiative that aims for drivers to incorporate safe behaviors and increase safety on the highway system.

WSDOT will consider opportunities to research the causes of truck-related crashes. Research could support efforts to reduce truck-related fatalities and serious injuries. This includes consideration of multi-state corridor partnerships.

7.2 Truck drivers have difficulty finding parking

A lack of truck parking can contribute to fatigued driving and illegal parking by truck drivers, creating a safety hazard on highways and greater community impacts, such as parking in neighborhoods. With 64.3 percent of freight in Washington transported by truck, it is crucial that drivers have safe and available parking options to support economic competitiveness. A survey of the national highway system, required by the federal 2012 Jason's Law, found Washington has some of the most severe truck parking challenges in the nation.

There are 14 high-volume Truck Freight Economic Corridors in Washington, each carrying at least four million tons of freight per year. Washington's economy is growing rapidly and freight is growing along with it; truck freight volume by weight is forecast to grow 65 percent between 2015 and 2035 in Washington, at an average annual growth rate of 1.5 percent. Continued growth in truck traffic volume will put more demand on current truck parking facilities.

Congestion and slow border crossings decrease the productivity of truck drivers within their hours-of-service regulations, subsequently affecting demand for parking. Industry changes, such as just-in-time logistics, operational costs, and driver detention, all have significant effects on truck-parking demand. State and federal regulations also can influence demand, such as insurance requirements and hours-of-service protocols. Two Washington cities, Seattle and Auburn, are in the top 25 most-congested freight locations in the United States.[134] Both cities experience significant freight bottlenecks and increased demand for parking. Washington also has five international border crossings, two that are in the top 15 international border crossings with the slowest speeds.

Based on extensive outreach and engagement efforts, WSDOT identified key truck parking issues in Washington. Safety issues related to inadequate truck parking are a major concern; 46 percent of WSDOT survey respondents said they frequently drive fatigued because of insufficient parking. In addition, 59 percent of drivers frequently do not feel safe while parked overnight in Washington. WSDOT's truck parking survey also found that the top three corridors with unmet parking demand are I-5, I-405 and I-90. WSDOT found that parking issues are most

[134] *American Transportation Research Institute. http://atri-online.org/2015/11/18/ congestion-impact-analysis-of-freightsignificant-highway-locations-2015/ (November 2015)*

prevalent in urban areas, as well as at border crossings and mountain passes. WSDOT also determined that driver parking preferences do not always match with actual use. For example, highway exit and entrance ramps are one of the least preferred parking options of drivers, but they are third most used. The truck parking shortage in Washington is likely getting worse, with demand increasing and supply not growing fast enough to meet demand. Other key truck-parking issues include trucking industry concerns, environmental effects, infrastructure constraints, and communication and coordination needs.

Assessing opportunities to improve truck parking

WSDOT will conduct additional research on truck parking availability systems. This research will help WSDOT determine the most appropriate technology and location for using such systems in Washington. Multi-state partnerships can provide benefits, as states on major truck routes (e.g., I-5, I-90) are also considering similar approaches to addressing truck parking issues. As demand for truck parking continues to increase and budgets continue to feel constraints, options that optimize existing truck parking will become more important. One potential solution to inadequate truck parking is to better match supply and demand using technology, such as real-time truck parking availability. Surveys have found that knowing real-time parking availability is valuable to truck drivers and that the majority would use this information to make parking decisions. Real-time technology has the potential to improve safety by helping tired drivers find a secure place to rest, reduce emissions by decreasing driving time spent looking for parking and provide financial benefits by improving delivery reliability and shipping time. By providing real-time parking availability information, truck drivers are better able to locate safe parking in a fast and convenient manner. Truck parking availability can be conveyed to drivers in several ways. Commonly explored methods include variable message signs, websites, in-cab communication systems, and mobile device apps. At this time, real-time truck parking availability information systems are not available in Washington.

WSDOT will continue to improve the WSDOT app to enhance information for the freight industry. Until WSDOT or another organization implements a real-time truck parking information system in Washington, WSDOT can pursue other methods to improve access to truck parking information for drivers. WSDOT currently has an app for mobile devices that provides traffic and travel information. Under the traffic section, users can view locations of safety rest areas on the map, as well as information about each site. While the location and amenities available at each safety rest area is available on the app, truck parking availability is not currently listed.

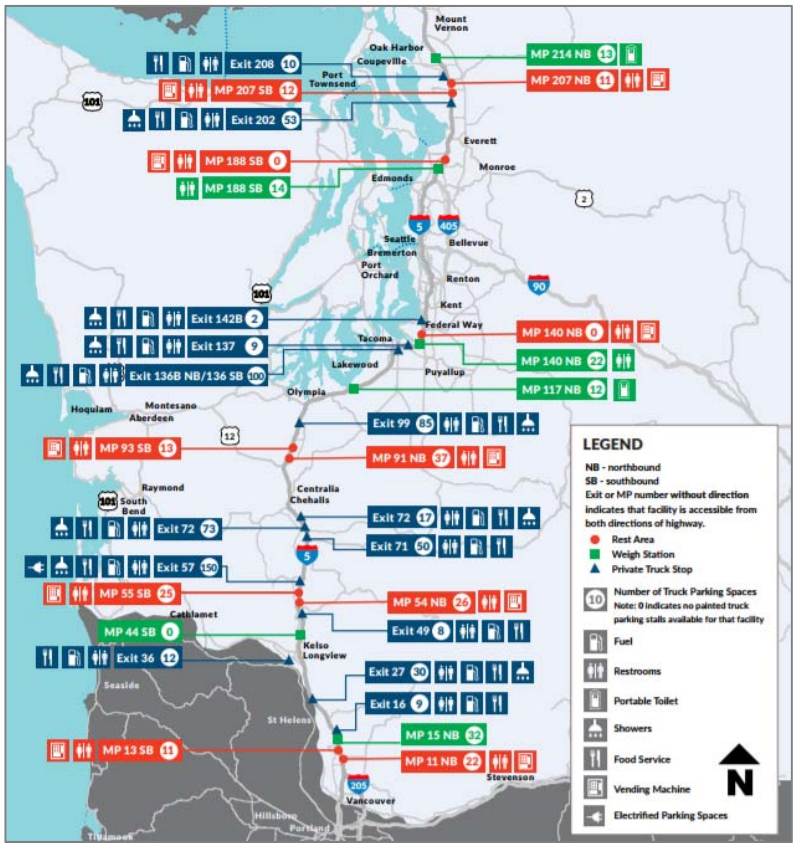
WSDOT will continue to improve statewide truck parking maps. WSDOT published a set of truck parking maps in 2017,[135] with the purpose of identifying locations of safe places for truck drivers to take rest breaks. These maps (see Exhibit 7-2 for example), which show truck parking at safety rest areas, weigh stations, and private truck stops, supplement information available to drivers online and from other sources. WSDOT will continue to work with the trucking industry to identify improvements to the information made available to support truck parking in Washington.

WSDOT will assess truck parking expansion opportunities at safety rest areas. While improving access to information will optimize the use of existing truck parking areas, it doesn't completely

[135] *WSDOT. Truck Parking.* http://www.wsdot.wa.gov/freight/

address the need to increase capacity. Adding truck parking to existing safety rest areas is one option. WSDOT will assess the rest areas it identified in the 2016 Truck Parking Study that have a high potential for truck parking expansion[136] to recommend future projects. In addition, safety rest areas currently have an 8-hour parking limit while truck drivers must park for 10 hours to abide by their hours-of-service requirements. WSDOT will work with partners and review state law to develop recommendations for extending the 8-hour limit for truck parking in safety rest areas. WSDOT will collaborate with partners to promote proper enforcement of safety related freight policies including hours-of-service regulations and chaining requirements.

Exhibit 7-2: Truck Parking Map



WSDOT and transportation partners will assess truck parking opportunities at weigh stations to determine how they can be improved. State law does not currently allow for truck parking at most weigh stations beyond what is necessary to weigh and inspect the trucks. However, trucks still often park at weigh stations for longer periods, so that drivers can take their 10-hour rest breaks. WSP generally allows this practice due to the lack of truck parking supply, so long as it does not interfere with operations. New weigh stations can be designed to include official truck parking and sites could be strategically located in the state to create the most benefit. One such site under consideration is near North Bend, just west of the Cascades mountain pass on I-90, a key area of concern for truck parking. WSDOT and WSP are currently collaborating on a Weigh Station Strategic Plan, which will include information on truck parking. In January 2016, the Joint

[136] *WSDOT. Truck Parking.* http://www.wsdot.wa.gov/Freight/truckparking.htm

Transportation Committee of the Washington State Legislature (JTC) published the *Efficiency and Effectiveness of Weigh Station Management in Washington State* report,[137] which suggested creating an interagency working group to better address weigh station management. This interagency working group could address truck parking at weigh stations.

WSDOT will assess truck parking opportunities on state land. As WSDOT continues to develop highway projects on major truck routes, additional land can be purchased and set aside for truck parking. WSDOT's Puget Sound Gateway Program on state routes 167 and 509, and other major projects that serve critical freight activities (e.g., ports, warehouse and distribution centers) are ideal opportunities, due to their proximity to major truck routes and to the Ports of Seattle and Tacoma. Additional parking could be provided on surplus real estate in other parts of the state. In addition, WSDOT has identified potential for providing truck parking at mountain pass chain-up areas and park and ride lots, although these ideas need further analysis by WSDOT.

WSDOT will update the Target Zero plan to include truck parking as a strategy. To address fatigued truck drivers and to provide parking for federally mandated hours of service requirements, the state safety plan should include truck parking as a strategy. Doing so will create funding eligibility for projects that increase truck parking under the National Highway Freight Program.

Transportation partners should assess opportunities for new and expanded truck parking. The *2016 Washington State Truck Parking Study*[138] identifies numerous opportunities for public and private partners to address the statewide shortage of truck parking. Some opportunities are low cost or zero cost to the public. For example, truck stop owners can expand existing truck stops and build new facilities, although such endeavors can be capital-intensive and face legal obstacles from local governments. The study identifies the need to better understand the roles and responsibilities of private truck stops in communities, including local government involvement in encouraging truck parking. WSDOT will identify opportunities to work with partners to address truck parking.

7.3 Railroad safety incidents are trending down

Rail incidents can cause property damage, injuries, and fatalities. Given the potentially severe outcomes of rail incidents, rail safety is a serious consideration for state and federal agencies. Exhibit 7-3 provides a summary of freight rail crash data collected and reported by the Federal Railroad Administration's (FRA's) Office of Safety Analysis.[139] The total number of freight rail accidents in Washington declined significantly since 2010, but increased in 2016. One possible factor in the rise of incidents in 2016 is increased train traffic, but train volume statistics for Washington are not available to confirm this.

[137] *Washington State Joint Transportation Committee.* http://leg.wa.gov/JTC/Documents/Studies/Weigh%20Station_2015/FinalReportWeighStationStudy_January2016.pdf
[138] *WSDOT. Truck Parking.* https://www.wsdot.wa.gov/Freight/truckparking.htm
[139] *Federal Railroad Administration. Safety Analysis.* http://safetydata.fra.dot.gov/OfficeofSafety/default.aspx

Exhibit 7-3: Freight Rail Incidents, 2010 to 2016

Category	2010	2011	2012	2013	2014	2015	2016
Freight Train Incidents	**49**	**39**	**30**	**34**	**38**	**28**	**40**
Collisions	1	8	6	3	7	5	5
Derailments	39	27	20	19	22	15	26
Other types, e.g., obstructions	9	4	4	12	9	8	9

Emerging technologies will continue to improve the safety of shipping freight on railroads. Positive Train Control (PTC) is required on Class I railroad mainlines that handle poisonous-inhalation-hazardous materials, and any railroad mainlines over which regularly scheduled intercity passenger or commuter rail services are provided. PTC is advanced technology designed to automatically stop or slow a train before certain accidents can occur. In particular, PTC is designed to prevent train-to-train collisions, derailments caused by excessive speed, and unauthorized movement of trains onto sections of track where repairs are being made or track switches are misaligned.

The Rail Safety Improvement Act of 2008 mandated that PTC be implemented across a significant portion of the nation's rail industry by December 31, 2015. In late 2015, Congress extended the deadline by at least three years to December 31, 2018, with the possibility for two additional years, if certain requirements are met. The new legislation, the PTC Enforcement and Implementation Act, required that railroads submit a revised PTC Implementation Plan (PTCIP) by January 26, 2016, outlining when and how the railroad would have a system fully installed and activated. One of the biggest obstacles to implementing PTC has been the lack of available spectrum for two-way data.

There are many organizations, such as private railroad companies, Washington State Utilities and Transportation Commission, WSDOT, and others, that contribute to railroad safety in the state. Rail safety is a priority, and partners continue to invest in rail improvements to enhance safety.

Improving rail safety

WSDOT will work with partners to implement PTC technology in the Amtrak Cascades fleet. Emerging technologies will continue to improve the safety of shipping freight on railroads in Washington. The Class I freight railroads (BNSF and UP) along with Amtrak and Sound Transit, are continuing work to implement PTC systems within the state by December 31, 2018.

7.4 Injuries and fatalities persist at rail crossings

A major community concern throughout the state is the reliable and safe movement of rail and truck freight, general traffic, and emergency vehicles over the more than 2,700 public, active at-grade railroad crossings. Highway-rail grade crossings are intersections involving two very different modes of transportation, with different sizes and speeds. In addition, these intersections are multi-jurisdictional, involving both highway and railroad authorities responsible for different aspects of design and maintenance. The Washington Utilities and Transportation Commission (UTC) has regulatory authority over public safety at these intersections; roadway owners include WSDOT, local governments, and private parties.

With the growth in road and rail traffic, conflicts at these crossings have a potential to grow. In 2015, the Legislature directed its Joint Transportation Committee to conduct a study evaluating the impacts of prominent road-rail conflicts and to develop a corridor-based prioritization process for addressing the impacts on a statewide level.[140] The study[141] identified 50 top-priority crossings. Almost two-thirds (62 percent) of these crossings are on a designated freight corridor and all but two of them have gates and flashing lights, yet there was at least one incident between pedestrians and/or vehicles and trains at nearly half the crossings in the last five years. Two-thirds (66 percent) of these crossings are in close proximity to emergency responders, which leads to potential delays for emergency vehicles that must wait for trains to pass before proceeding. Half of the 50 top-priority crossings have identified solutions with total estimated costs of $830 million. Of the $830 million, only $170 million is funded and $100 million of that is for a single project. This leaves at least $660 million in unfunded freight project needs just for the 25 crossings with identified projects. That level of unmet funding, coupled with additional needs at crossings not making it onto the priority crossings list, means the amount needed to address unfunded safety concerns is quite high. The UTC and WSDOT receive more applications for funds from their rail crossing safety programs than can be funded, pointing to the need for additional investments in grade-crossing improvements across the state.

The UTC tracks incident data across the state by year. In 2016, there were 40 collisions at crossings, resulting in 13 injuries and 7 fatalities. While the number of collisions and injuries at crossings is trending down, fatalities at crossings has not decreased much. In 1991, the earliest year for data provided,[142] there were 102 collisions at crossings, resulting in 23 injuries and 10 fatalities. Trespass fatalities are slowly decreasing over time. The current 5-year average of 13.2 trespass fatalities per year has decreased from 16.8 per year. Exhibit 7-4 provides a summary of rail crossing and trespass data collected and reported by UTC.

Exhibit 7-4: Rail Crossing/Trespass Incidents, 2010 to 2016

Category	2010	2011	2012	2013	2014	2015	2016
Crossing Collisions	**36**	**29**	**33**	**20**	**35**	**37**	**40**
Injuries	10	4	18	10	10	7	13
Fatalities	4	8	2	4	5	4	7
Trespass Fatalities	15	22	10	17	9	23	7

Enhancing rail crossing safety

The UTC continues to manage its Rail Safety Program.[143] The UTC monitors all fatalities and injuries involving trains, including those occurring at private crossings, such as crossings at

[140] *Second Engrossed Substitute House Bill 1299 (2015), Section 204(3) https://app.leg.wa.gov/ReportsToTheLegislature/Home/GetBillPdf?displayNumber=1299-S&biennium=2015-16*
[141] *Joint Transportation Committee. Study of Road-Rail Conflicts in Cities. http://leg.wa.gov/JTC/Pages/Road-Rail-Study.aspx*
[142] *Washington Utilities and Transportation Commission. Rail Crash Stats. https://www.utc.wa.gov/publicSafety/railSafety/Pages/WARailCrashStats.aspx*
[143] *Washington Utilities and Transportation Commission. Rail Safety. https://www.utc.wa.gov/publicSafety/railSafety/Pages/default.aspx*

residential driveways or service roads, or on industrial properties. The program implements engineering, education, and compliance programs that reduce deaths, injuries, and property damage on or around railroads. The program oversees rail operations, protects railroad crossings, resolves complaints, ensures railroad employee safety, and funds rail safety projects. It also promotes public awareness in partnership with the national Operation Lifesaver program.

Transportation partners will identify a statewide list of rail crossing safety projects. In 2017, the Legislature directed UTC and the Freight Mobility Strategic Investment Board (FMSIB) to address at-grade rail crossing locations, based on results of the study and tool. In addition, FMSIB will manage and update the road-rail conflicts database produced by the Joint Transportation Committee Road-Rail Study. FMSIB will update the database using data from the most recent versions of the Freight and Goods Transportation System update, Marine Cargo Forecast, and other relevant sources. The database will continue to identify prominent road-rail conflicts that will help to inform strategic state investment for freight mobility statewide. FMSIB will form a committee including, but not limited to, representatives from local governments, WSDOT, UTC, and relevant stakeholders to identify and recommend a statewide list of projects using a corridor-based approach. The board will provide the list to the transportation committees of the Legislature and the Office of Financial Management by September 1, 2018. WSDOT will participate on the rail crossing safety committee.

Transportation partners continue to pursue funding for rail crossing safety projects. The Freight Action Strategy for Seattle-Tacoma (FAST) Corridor Partnership, established in 1998, involves WSDOT, Puget Sound Regional Council (PSRC), cities, ports, and railroads. To date, 19 projects that benefit the freight transportation system have been completed, many of which are railroad grade separation projects. The partners continue to pursue funding for high-priority projects for transportation improvements in the central Puget Sound, between Everett and Tacoma. WSDOT will continue to participate on PSRC's FAST Committee. FMSIB proposes projects to the state legislature, including rail crossing safety projects. WSDOT will continue to be an active member of the FMSIB board.

WSDOT will update rail crossing safety in the state rail plan. WSDOT also is involved in vehicle-train safety with long-range planning. In March 2014, WSDOT published the *2013 Washington State Rail Plan*, which provides short- and long-term funding strategies and meets federal and state requirements. The plan serves as a strategic blueprint for future public investment in the freight and passenger rail transportation system, including safety at crossings. WSDOT plans to update the *Washington State Rail Plan* in the 2017-2019 biennium.

WSDOT will continue to support partners to address rail crossing safety. In 2016, the Port of Ridgefield developed a rail safety grant application for the U.S. Department of Transportation's Railroad Safety Grant program, which WSDOT then submitted on the port's behalf. The Pioneer Street Railroad Overpass project was awarded a $900,000 grant for the final phase of a three-phase rail overpass project that will allow safe passage to and from the port's waterfront property and downtown Ridgefield. The project area is a shared rail corridor with over

50 passenger and freight trains each day, including two to three Bakken-sourced crude oil trains.[144]

WSDOT will continue rail crossing safety education efforts. WSDOT is a partner in Washington Operation Lifesaver,[145] a non-profit education and awareness program dedicated to ending tragic collisions, fatalities, and injuries at highway-rail grade crossings and on railroad rights of way. To accomplish its mission the program seeks to educate drivers and pedestrians to make safer decisions at crossings and around railroad tracks. The program also seeks to reduce grade crossing and trespassing incidents, and encourages engineering projects that improve public safety. Partners in the state are very active in the Operation Lifesaver program, with volunteers educating the public at schools, county and safety fairs, malls, clubs, and professional organizations. During the last year, WSDOT staff made more than 100 presentations on behalf of Operation Lifesaver, as well as participating in several community outreach events. WSDOT will continue to participate in the Operation Lifesaver Program to promote rail-related safety.

WSDOT also will continue safety education efforts through outreach activities using its own Stay Back from the Tracks materials, in order to enhance awareness of safe practices near railroad tracks. This campaign recently won a national award from the American Association of State Highway and Transportation Officials (AASHTO) for innovate public outreach. During the last year, more than 4 million contacts were made through social media, special events, videos, community outreach and advertisements.

7.5 The freight system must meet security and defense priorities

Washington is home to the largest Army base on the West Coast, two Air Force bases, six critical Navy facilities, and two military medical centers. Joint Base Lewis-McChord (JBLM) has the only Power Projection Platform on the West Coast, which is an Army installation that strategically deploys high-priority cargo and personnel in the event of a major conflict. If such an event were to occur, military goods from across the nation would surge through I-5 in Central Puget Sound to the Ports of Seattle, Tacoma, Olympia, and Everett. Heavy Army subdivisions, such as the Stryker Brigades stationed at JBLM, are prepared to stage and ship large rolling equipment through the Port of Tacoma. Replenishment goods would ship through the Port of Seattle and other ports in the event of an emergency.

In July and August 2017, military forces hosted Mobility Guardian 2017,[146] a major exercise for U.S. and allied units to train together and improve joint capabilities. The exercise tested interoperability with joint and allied partners, including the transportation of people, planes, and cargo, which will allow participants to share tactics, techniques, and procedures essential to maintaining readiness. JBLM was chosen as the site for this exercise because of its strategic

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[144] Washington Public Ports Association. http://washingtonports.org/wp-content/uploads/2016/02/Port-of-Ridgefield-Rail-Overpass-Project-Reaps-National-Rail-Safety-Grant-Award.pdf

[145] WSDOT. Operation Lifesaver. https://www.wsdot.wa.gov/Rail/TrainSafety.htm#Lifesaver

[146] McChord Air Force Base. http://www.mcchord.af.mil/News/Article-Display/Article/767144/mobility-guardian-exercise-comes-to-jblm-in-2017/

position, where Special Operations units, nearby Navy assets, Washington National Guard, and premier partnership efforts like the Army's I Corps Pacific Pathways can be leveraged. Strategic upgrades to highways, roadways, rail, and ports are important to ensuring national defense readiness. Coordination with the Washington Military Department will ensure transportation partners are able to meet national security needs.

Border crossings play an important role in security. In 2011, the U.S. and Canada agreed upon bi-national transportation goals for security and economic competitiveness.[147] In Washington, most trucks crossing the international border carry mixed freight owned by multiple parties. However, the U.S. Customs and Border Protection's (CBP) Customs-Trade Partnership Against Terrorism program[148] was designed to quickly process full truck loads owned by a single firm. Additional coordination is needed to better meet our state needs and increase participation in this incentivized pre-clearance, pre-inspection, and compliance program.

Ports play an important role in security. To improve security of cargo entering and exiting port facilities, marine terminal employees, truck drivers, contractors, and others must have a Transportation Worker Identification Credential (TWIC) to gain unescorted access to port facilities. TWIC is federally mandated and the U.S. Coast Guard carries out enforcement. In addition, the SAFE Port Act of 2006 requires 100 percent of U.S.-bound ocean containers be scanned through non-intrusive inspection and radiation detection equipment in a foreign port prior to being loaded onto a U.S.-bound ship. The original deadline for achieving this goal was in 2012, but the U.S. Department of Homeland Security (DHS) has now delayed implementation until 2018.

Industry experts believe that implementing across-the-board container inspections are unrealistic due to the large volume of containers moving through U.S. ports each year. The Congressional Budget Office has estimated it would cost $22 billion to outfit foreign ports with the necessary equipment. Freight that is transshipped (e.g., ship-to-ship, rail-to-ship) has to be handled multiple times to go through inspection stations, and most ports and railyards do not have on-site capacity for inspection equipment and truck queueing. To broaden freight security, the DHS is now considering 100 percent scanning for both containerized and non-containerized (e.g., dry/liquid bulk, breakbulk, roll-on/roll-off, etc.) maritime cargo bound for the U.S.

Enhancing freight security and defense capabilities

WSDOT will ensure that highways are available to meet military needs in the event of a national security emergency. Transportation partners, such as county and city transportation agencies, perform similar functions. During a national security emergency involving a military deployment, WSDOT plays a primary role by coordinating with the Washington Military Department (WMD) to ensure strategic routes are passable for the types of equipment and volumes needed, including issuing permits to oversize and overweight military vehicles. WSDOT will continue to coordinate with WMD through training and preparedness activities. WSDOT also is upgrading strategic highways that benefit national defense. WSDOT plans to complete Highway 167 and Highway 509 corridor projects that are needed to support the JBLM Power Projection Platform.

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[147] Department of Homeland Security. Beyond the Border. https://www.dhs.gov/xlibrary/assets/wh/us-canada-btb-action-plan.pdf

[148] U.S. Customs and Border Protection. https://www.cbp.gov/border-security/ports-entry/cargo-security/c-tpat-customs-trade-partnership-against-terrorism/mutual-recognition

Ports should continue to support overseas military logistics. In 2004, the military began using the Port of Olympia for shipments out of Fort Lewis (now JBLM). In response, the Port of Olympia spent $1.4 million to add a rail line on its docks closer to where ships berth. The Port of Seattle, designated a sustainment port, will be used to ship consumable supplies to troops in the event of a major overseas conflict. In the past, military logistics officials have expressed concern about potential bottlenecks when accessing Terminals 5, 18, and 46 at the intersection of East Marginal Way and South Spokane Street, and the single railroad track access under the Spokane Street Bridge to the Port's terminals. The Port of Seattle completed the East Marginal Way grade separation project in April 2012, providing a new overpass to that grade crossing.

The International Mobility and Trade Corridor Program (IMTC) identifies and promotes improvements to mobility and security for the border crossings that connect Whatcom County with the lower mainland of British Columbia. The IMTC works to improve the U.S. Customs and Border Protection's (CBP) Customs-Trade Partnership Against Terrorism program.[149] WSDOT will continue participating as an active partner with IMTC.

Port partners should continue to play an important role in enhancing security. Port partners implement the Transportation Worker Identification Credential (TWIC) programs that limit access to ports. The TWIC is used at all U.S. Coast Guard-regulated marine facilities throughout the Pacific Northwest. Ports also implement safe and efficient cargo screening processes. The role ports play in freight security enhances security of the larger community. Transportation partners should strive to achieve an appropriate balance between safety and security at ports and promote efficient supply chains. WSDOT will work with partners, as appropriate, to balance port safety and security with efficiency.

The Department of Commerce can work with partners to develop and promote military-civilian partnerships that help advocate and advance the sector nationally, regionally, and in local communities all across the state. Commerce also can work to promote a business climate that enhances an innovative military and defense industry. Commerce identifies military and defense as a major economic sector in Washington. The sector is the second-largest public employer, and a key industry that cuts across many other sectors in Washington, and helps create the backbone for a strong economy.[150]

[149] *U.S. Customs and Border Protection. https://www.cbp.gov/border-security/ports-entry/cargo-security/c-tpat-customs-trade-partnership-against-terrorism/mutual-recognition*
[150] *Department of Commerce. Military & Defense Sector. http://www.commerce.wa.gov/growing-the-economy/key-sectors/military-defense/*

8 MOBILITY

The Washington state transportation system policy goal of Mobility is: "To improve the predictable movement of goods and people throughout Washington state, including congestion relief and improved freight mobility." The freight objective defined in this plan is to improve freight mobility, which is important to support transportation system goals. The multimodal freight transportation system has congestion, capacity, and bottleneck concerns affecting efficient freight movement. This chapter identifies the significant trends, issues, and needs related to mobility. Likewise, the strategies in this section aim to improve the predictable movement of goods and address freight mobility.

2017 Freight Plan Requirement: 49 U.S.C. 70202

This section of the U.S. Code lists ten required elements that all State Freight Plans must address for each of the transportation modes. This section discusses elements of the following requirements, related to **mobility**:

(1) an identification of significant freight system trends, needs, and issues with respect to the State;
(2) a description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State;
(5) a description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of freight movement, were considered;
(7) an inventory of facilities with freight mobility issues, such as bottlenecks, within the State, and for those facilities that are State owned or operated, a description of the strategies the State is employing to address the freight mobility issues;
(8) consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay;

8.1 Traffic congestion and bottlenecks create delay

Bottlenecks occur on Truck Freight Economic Corridors, affecting trucks and general traffic. These bottlenecks result in highway and road congestion that delay the movement of freight. Increases in population across the state, especially in crowded urban centers, generates more freight and general purpose trips on already congested highways. The reliability of the highway system is critical for retailers and manufacturers as they streamline their processes, shipping smaller amounts of freight at more frequent intervals to stores and factories. This will drive ever-increasing demand for on-time truck deliveries in very short appointment windows. This level of service depends on much more reliable truck freight corridors in congested urban areas. With most freight relying on highways for the first or last mile of a trip, highway congestion also affects freight movement on other modes. For example, cherries moving from eastern Washington to Seattle-Tacoma International Airport (Sea-Tac) by truck may get stuck in traffic and miss an international flight.

WSDOT's study on the impact of truck congestion on the state economy[151] projected that a 20 percent increase in congestion would cause over 21,700 job losses, as well as decreased regional output of over $3.6 billion in the central Puget Sound region alone. Congestion also adds cost to goods made in rural areas, as most of these goods must be shipped to, from, or through congested urban centers. An increase of 20 percent in truck congestion across the state would result in over $14 billion of increased operating costs to freight-dependent industries in Washington.

The Truck Freight Economic Corridors in Washington lack enough highway capacity to handle population and business growth. There is significant congestion throughout the day in central Puget Sound, particularly along I-5, I-405, and state routes 167, 509, and 99. I-5 near the Joint Base Lewis-McChord complex is congested during peak hours, as are I-5 and I-205 in southwest Washington. Additionally, the I-90 corridor in the Spokane area experiences moderate daily peak-hour commute congestion.

Border crossings into Canada can be bottlenecks, especially in Whatcom County, as freight and passenger vehicles queue to gain clearance and continue their journey. The U.S. Customs and Border Protection's Vehicle and Cargo Inspection System (VACIS)[152] screening facility is intended to improve border security, but it also creates a bottleneck for freight. Trains slowing to be inspected by VACIS not only create a bottleneck on the railroad, but also cause congestion on local streets as well by blocking grade crossings for extended periods. Border crossings with adjacent states are also an issue for trucks, because policies and laws change when trucks enter Washington from Oregon or Idaho. For example, in Oregon and Idaho, triple trailers are allowed, whereas in Washington they are not. Therefore, state border crossing areas often experience high demand for trailer parking. When this demand is not met, trailers will be left in unofficial locations. Overall, this regulatory difference between the states creates inefficiency in supply chains.

WSDOT is undertaking an initiative called the Corridor Sketch Initiative to engage agency partners and define the context and performance information for all highway corridors in the state. The goal of this initiative is to identify performance expectations, what is working well, what needs to change now and in the future, and strategies to achieve performance expectations and sustain what works well.

To identify the performance gap in mobility, WSDOT developed a mobility screening process[153] to identify corridors with congestion. The screening process provides focus areas for multi-agency, multidisciplinary, multimodal (M3) teams to do further analysis and to develop strategies to address root causes of congestion. The congestion screening process includes the following steps:

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[151] WSDOT. The Economic Impact of Increased Congestion for Freight Dependent Businesses in Washington State. https://www.wsdot.wa.gov/NR/rdonlyres/4D53B6C5-D1DF-4A3C-9B67-FD90D4847A66/0/June2012_Impact_Freight_Congestion.pdf
[152] Leidos. FullScan Integrated Cargo Inspection System. https://www.leidos.com/products/security/vacis-ip6500-fullscan
[153] WSDOT. Strategic Planning & Research 2015-2017 Biennium Work Program. https://www.wsdot.wa.gov/sites/default/files/2006/02/14/2015_Strategic_Plan_and_Research1.pdf

Step 1: Determine peak hour volume/capacity ratio and screen out locations with peak hour ratios below 0.5. This process is intended to identify congestion associated with high traffic volume and remove locations where the traffic volume is too low to be the cause of slow speed, such as locations where congestion could be due to long grade or other physical restraints.

Step 2: Calculate average hourly speed for each segment, choose appropriate congestion threshold for different types of facility, and determine whether a segment is congested based on that threshold. For example, an urban freeway with an operating speed below 40 mph is classified as congested, while the congestion threshold for a rural freeway is 45 mph.

Step 3: Analyze the duration of congestion for segments meeting congestion criteria.

Step 4: Analyze the severity of congestion by calculating the total number of hours per year congestion occurs.

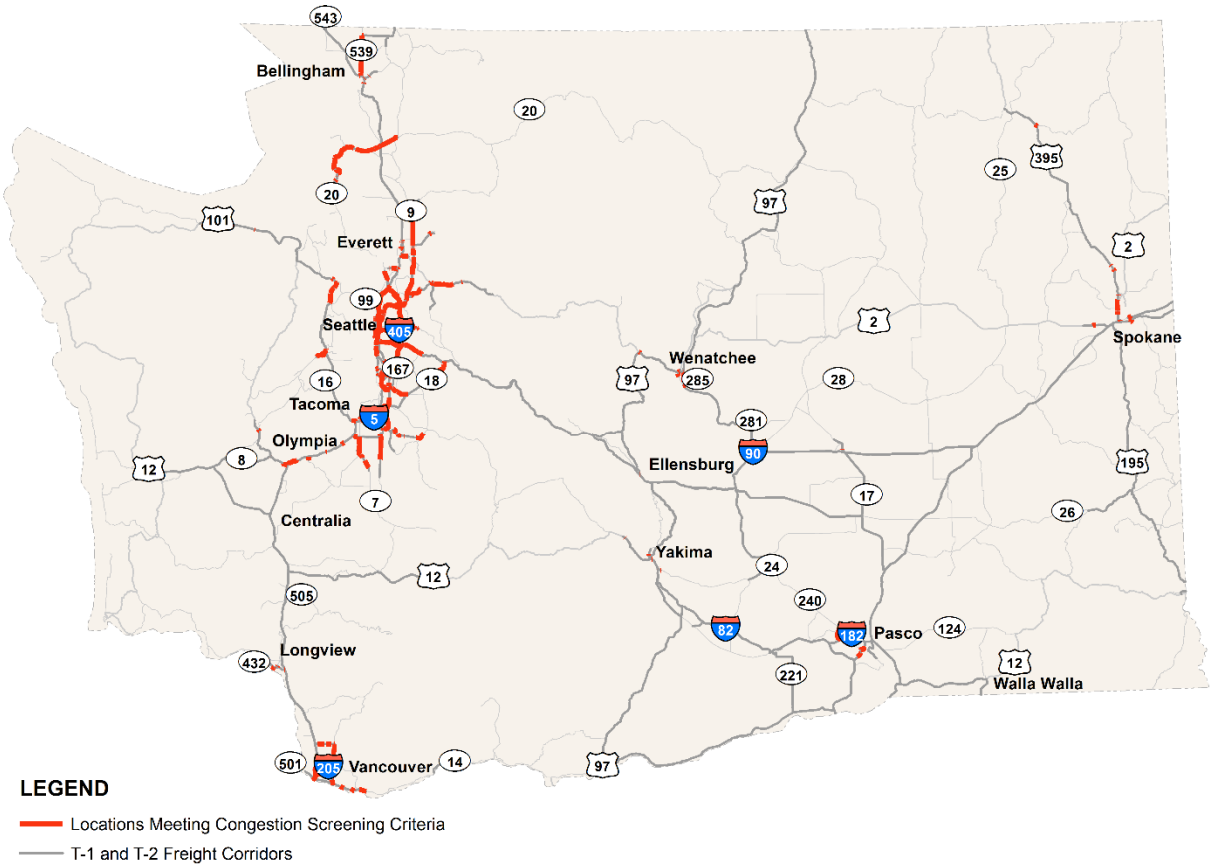
Step 5: Calculate travel time reliability.

WSDOT has completed steps one through three and is currently working with WSDOT regions, Metropolitan Planning Organizations (MPOs), and local jurisdictions to review the initial congestion screening results, validate the results based on their inputs, and conduct root cause analysis. The National Performance Management Research Data Set (NPMRDS) was used for analyzing National Highway System (NHS) routes; WSDOT's Transportation Information and Planning Support legacy mainframe database, which includes roadway geometric data and traffic volume data, was used to supplement the NPMRDS for non-NHS routes. Steps 4 and 5 will be conducted by the end of 2017.

During the root cause analysis, WSDOT regions will identify congestion caused by freight, or where freight is a major contributor to congestion, and consider strategies developed by the M3 teams to reduce congestion. While trucks sometimes contribute to traffic congestion, at other times trucks are simply stuck in traffic congestion generated by all vehicles. Freight congestion can be seen as a sign of a healthy economy because freight haulers are moving freight to gateways, moving agricultural products and raw materials to production facilities, and moving goods to market.

Exhibit 8-1 shows identified segments experiencing at least one hour of congestion during the 5 a.m. to 8 p.m. hours on an average weekday in 2016 along high-volume truck corridors. These segments are the inventory of facilities with freight mobility issues, such as bottlenecks, within Washington.

Exhibit 8-1: Congested Highway Segments on Truck Freight Economic Corridors



Truck bottlenecks can be categorized in various ways. To be consistent with the *FHWA Freight Bottleneck Study*,[154] this section breaks out truck bottlenecks into two general types based on the type of delay. Congestion-based delay bottlenecks are defined by highway congestion, where congestion is caused by several factors. Non-congestion-based delay is caused by policies or conditions that cause trucks to travel slower or deviate from their intended route. Trucks may not experience congestion; however, truck travel times increase over what they would have been without the deviation. These two bottleneck types are further broken down into subcategories based on the causes, as shown in Exhibit 8-2. Contributing factors of congestion identified in the congestion screening process will continue to identify bottlenecks of these types that can inform mobility strategies specific to each corridor. As congestion worsens by extent or duration, bottlenecks affecting trucks also will worsen.

[154] *Federal Highway Administration. Freight Performance Measure Approaches for Bottlenecks, Arterials, and Linking Volumes to Congestion Report. August 2015.* https://ops.fhwa.dot.gov/publications/fhwahop15033/fhwahop15033.pdf

Exhibit 8-2: Highway Bottlenecks by Type

Congestion-Based Delay Bottlenecks	
Geometric-Related Bottlenecks	Caused by a reduction in roadway capacity, as compared to the prevailing capacity of the highway section. Related to the physical characteristics of the highway, such as lane drops, weaving, ramps, interchanges, change in highway alignment.
Volume-Related Bottlenecks	Caused by too much traffic volume even if there no geometric restrictions. Examples include commuter peak period traffic, seasonal vacation traffic, and special event traffic.
Disruption-Related Bottlenecks	Caused by a temporary loss of capacity due to disruption. These are also commonly referred to as "non-recurring" bottlenecks, caused by incidents, severe weather, work zones, etc.
Processing-Related Bottlenecks	Caused by legal or safety/security reasons. Examples include international border crossings, vehicle weigh and inspection stations, terminal gates, etc.
Non-Congestion-Based Delay Bottlenecks	
Restrictions Requiring Rerouting	Restrictions that require trucks to reroute, such as low bridge heights for standard or oversize loads, truck weight restrictions for standard or overweight loads, or hazardous material restrictions.
Restrictions Requiring Changes in Timing of Trip	Time-of-day restrictions for trucks, such as the time window that standard or oversize/overweight loads can travel over a route, or the time available to make a delivery.
Restrictions Requiring Other Logistics Changes	Capacity limitations or operational inefficiencies that lead to waiting or circling around an area to access a destination, such as parking, terminal gates, or loading zones.

There are other studies conducted by research institutes to identify truck bottleneck locations using different datasets and methodologies. The American Transportation Research Institute (ATRI) has been collecting and analyzing truck GPS data in support of FHWA's Freight Performance Measures initiative[155] since 2012. ATRI monitors and assesses 250 freight-significant locations nationwide to identify truck bottlenecks and quantify their impacts. ATRI's 2017 top 100 truck bottleneck list identified and reported nine truck bottlenecks in Washington.[156] Two of them, both in Central Puget Sound, are among their top 10 worst truck bottlenecks: SR 18 at SR 167 and I-5 at I-90. The City of Seattle used a different methodology to identify freight bottlenecks within the city for its 2016 Freight Master Plan. They identified freight bottlenecks in locations where multiple roadways funnel into one facility (e.g., at bridges), or where capacity on a facility is reduced (e.g., where three lanes taper down to two lanes in

[155] *Federal Highway Administration. Performance Measurement.* https://ops.fhwa.dot.gov/freight/freight_analysis/perform_meas/
[156] *American Transportation Research Institute. 2017 Top 100 Truck Bottleneck List.* http://atri-online.org/2017/01/17/2017-top-100-truck-bottleneck-list/

each direction). Using this definition, they identified 18 freight bottlenecks on roadways in Seattle.

Truck traffic is increasing, and can cause congestion and delays that affect others. Transportation partners that own infrastructure and operate in the state have a stewardship role for that infrastructure. Freight trucks are the tallest, widest, longest, and heaviest vehicles on the roadway system. The operating characteristics of trucks sometimes result in slower speeds, such as while climbing a steep grade or when accelerating from a complete stop. As a result, trucks can cause or worsen congestion. In three distinct areas of the state, these attributes are a concern: metropolitan and urban areas, mountain passes, and international border crossings. In urban areas, trucks contribute to existing traffic. In certain locations where tight turning radii or curves cause trucks to travel at slower speeds, the problem worsens. When a truck-related incident occurs, it takes longer to clear the roadway, compounding the impact to mobility. At mountain passes, trucks need to travel at slower speeds to climb or descend an incline. Winter weather often requires trucks to use traction devices on mountain passes. Chain-up requirements are common during winter months, which require trucks to park along the pass to install chains, affecting travel speed. More than 3,000 trucks cross through the system of border crossings in northwest Washington every day. International borders slow trucks because of the regulatory activities conducted by U.S. Customs and Border Protection and the Canada Border Services Agency. This delay affects overall traffic congestion.

Size and weight restrictions cause higher operational costs to trucks, because detour routes are usually longer and take more time to navigate. However, the rehabilitation or replacement of infrastructure bottlenecks is costly. WSDOT prioritizes these activities based on structural condition, truck volumes, and load restrictions, with higher priority given to structurally deficient bridges located on high volume truck corridors. Weight restriction is considered a secondary criterion in the prioritization process. These restrictions especially affect mobility for oversize and overweight loads.

Addressing traffic congestion and truck bottlenecks

WSDOT will use a screening process to address congestion on the state highway system. WSDOT is using a congestion screening process as part of the Corridor Sketch Initiative to gain a better understanding of congestion on highway corridors around the state. This information provides focus areas to multi-agency, multidisciplinary, multimodal (M3) teams that will conduct further analysis. Several Corridor Sketch summaries have been completed, based on WSDOT's Practical Solutions approach, and are available for review.[157] Results show current and future function, what works well, and what needs to change. Strategies are specific to each corridor, and are aligned with the state transportation system policy goals. Mobility strategies include operational improvements, demand management, and policy changes. WSDOT regions will continue to collaborate with local and regional partners to conduct root cause analysis and develop strategies to address congestion issues.

WSDOT will address traffic congestion with innovative technologies and operational improvements. This approach will help reduce the severity of congestion at truck bottlenecks.

[157] *WSDOT. Corridor Sketch Initiative.* http://www.wsdot.wa.gov/planning/corridor-sketch-initiative

Transportation systems management and operations[158] (TSMO) refers to multimodal transportation strategies and technologies intended to maximize the efficiency, safety, and utility of the transportation infrastructure. TSMO activities improve the mobility of people and goods by maximizing the performance of available facilities, taking advantage of low-cost improvement opportunities, and informing travelers and shippers of expected travel performance and their options. By improving mobility, TSMO activities have a wide-ranging impact on travel accessibility, safety, and reliability, as well as economic vitality and environmental quality. Examples relevant to freight mobility are freight vehicle priority and weigh-in-motion systems.

WSDOT will implement several major capital projects to improve freight mobility in congested corridors. The Puget Sound Gateway Program is an example that will aid the movement of trucks between the port terminals in Seattle and Tacoma and the extensive warehouse and manufacturing area located along SR 167. The Gateway Program, by including variable-priced, open road tolling, will provide sustainable capacity for efficient operations of all lanes of the new SR 167 and SR 509 segments and will yield consistent and reliable travel times in both corridors. The I-90 Snoqualmie Pass East project currently under construction will reduce bottlenecks on this critical corridor caused by high traffic volumes and inclement winter weather. The I-5 Mounts Road to Thorne Lane interchange project will provide additional capacity near Joint Base Lewis-McChord. The US 395 North Spokane Corridor will provide for the efficient movement of north/south freight through eastern Washington.

WSDOT will continue to monitor and manage congestion incidents, particularly through its Traffic Management Centers[159] and Incident Response Program.[160] To address congestion related to severe incidents involving trucks, WSDOT will continue to work with local jurisdictions to implement and improve contingency plans.

WSDOT will continue to improve mobility of oversize and overweight loads on the highway system. To provide information to the trucking industry, WSDOT has developed a bridge vertical clearance trip planner application to help the public identify bridges with restricted vertical clearances up to 16 feet on the state highway system.[161] In addition, WSDOT regularly updates a website that identifies roadway and bridge restrictions due to construction or maintenance activities.[162] WSDOT will continue the use of these tools and work with partners to consider options for improving oversize and overweight mobility, such as identifying corridors and impediments to ideal routing.

WSDOT will consider assessing the feasibility of allowing triple-trailer combination vehicles in Washington. To reduce the bottlenecks along the borders with Oregon and Idaho, WSDOT will need to work with these states and safety partners, such as the Washington Traffic Safety Commission and Washington State Patrol, to review federal and state regulations and develop

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[158] *WSDOT. Transportation Systems Management and Operations.* http://fratis.trac.washington.edu/TSMO/
[159] *WSDOT. Traffic Management Centers.* http://www.wsdot.wa.gov/Operations/Traffic/tmc.htm
[160] *WSDOT. Incident Response Program.* https://www.wsdot.wa.gov/Operations/IncidentResponse/
[161] *WSDOT. Bridge Vertical Clearance Trip Planner.* https://www.wsdot.wa.gov/Bridge/Structures/BVCTP.htm
[162] *WSDOT. Restrictions for Oversize/Overweight Motor Vehicles.* http://www.wsdot.wa.gov/commercialvehicle/restrictions/

recommendations for harmonizing state regulations with adjacent states regarding truck combination vehicles.

Transportation partners continue to monitor congestion at border crossings. Increasing freight activity and security screening have led to inefficiencies in the freight system. The Corridor Sketch Initiative has identified the international border crossings as a contributing factor to congestion. Northbound truck delay on I-5 and truck parking on shoulders significantly affect corridor operation and local traffic mobility. To address growth in freight tonnage through borders and gateways, additional staff and new technology should be considered. U.S. Customs and Border Protection (CBP) is the agency responsible for screening freight at the international border and at ports. WSDOT is a participating member in the International Mobility and Trade Corridor Program (IMTC), a U.S.-Canadian coalition of business and government agencies that identifies and promotes improvements to mobility and security for the four Cascade Gateway ports of entry border crossings. To support bi-national trade, WSDOT will continue to work with the IMTC to identify opportunities to improve efficiency at the international border, including improving and expanding border infrastructure, and increasing CBP staffing and operating hours. WSDOT will investigate ways to leverage these resources to gain more insight into how freight causes congestion.

WSDOT will continue to improve maintenance and operations of mountain passes to reduce mobility issues. Mountain passes are important routes to keep open, due to a lack of alternate routes. WSDOT closes some mountain passes during the winter when weather, snow removal, or avalanche control makes travel too hazardous. I-90 on Snoqualmie Pass and US 2 on Stevens Pass are maintained to be kept open all winter; however, WSDOT will close these mountain passes if conditions and circumstances warrant it. If there is heavy snow in a short amount of time, road crews may close the pass to clear ice and snow from the travel lanes. Rock blasting and avalanche control work is scheduled at night when traffic volumes are low. WSDOT attempts to provide advance notice, but in an emergency it is not always possible. Avalanche control is a winter-long activity on Snoqualmie Pass (3,022 feet) and Stevens Pass (4,061 feet). These mountain passes average more than 450 inches of snowfall each winter. Typical daily truck traffic volume over Snoqualmie Pass is approximately 5,600, and approximately 450 over Stevens Pass. Traffic delay is typically less than one hour during avalanche control, but can extend to several hours during severe conditions. WSDOT provides updated mountain pass information, including webcam images, to assist drivers of road and weather conditions.[163] WSDOT is testing and evaluating whether remote-controlled drone aircraft could successfully deliver explosive charges under severe mountain weather conditions. Truck chain-up areas at Snoqualmie Pass create congestion during the approximately 70 times each winter that weather conditions require chains on vehicles using I-90. WSDOT is implementing an organized chain-up program to improve safety by providing a buffer area between moving traffic and those chaining up, and by defining paths for vehicle movement. Mobility benefits include increased throughput in the chain-up area and reduced delay by minimizing double parking.

[163] *WSDOT. Mountain Passes. https://www.wsdot.wa.gov/traffic/passes/*

WSDOT will continue to provide information to truck drivers using technology. WSDOT uses many methods to communicate with truck drivers, including several tools to provide information about traffic delays and other incidents. WSDOT reaches a large audience by using many tools, including Facebook, Twitter, a WSDOT blog, a YouTube channel, and Freight Alerts (a subscription email/text messaging service). The WSDOT website also provides region-specific travel alerts, including information about mountain pass conditions and closures, as well as traffic congestion. WSDOT regularly updates its social media tools in order to best respond to the needs of users and to take advantage of new opportunities to communicate with drivers.

8.2 Growth in rail volume may strain capacity and access

The freight rail system is critical to the ongoing vitality of major freight intensive industries in Washington, notably forest products, agriculture, construction, wholesale and retail trade, and even high-tech sectors, such as aircraft manufacturing. Rail plays an important role in increasing market share for Washington products. The rail system in Washington has adequate capacity to meet its current demands. However, uncertain and rapidly changing industries (e.g., coal, crude oil, agricultural products) can have extreme peaks that can create challenges for the rail network.

Ensuring adequate east-west capacity on the BNSF Railway's (BNSF's) three existing east-west corridors is vital to meeting the future needs of rail service in the Puget Sound region. The most highly used rail corridor in the state is BNSF's Spokane to Pasco segment, which operates at 87 percent of practical capacity.[164] The Columbia River Gorge corridor is significant for current and future freight rail mobility. The corridor avoids the steep gradients of the more northern rail routes, and trains often run loaded through the Gorge and return empty on a more northern route. BNSF operates along the Washington side of the river, and moves loads in both directions, but mostly westbound including double stack container service. The Columbia River route eastbound volumes primarily originate in southwest Washington and Oregon. The Stampede Pass route near the center of the state cannot handle double stack container cars in the tunnel, and therefore BNSF uses it almost entirely for eastbound empty grain and bulk product cars, as well as manifest traffic. The Stevens Pass route, the most northern route, handles trains in both directions, but primarily eastbound. It can handle double stack container cars, but is limited in the number of trains it can handle primarily due to a long tunnel that has to be cleared of diesel exhaust between trains. The Union Pacific Railroad's (UP's) primary east-west corridor is in Oregon, running between Portland and Hinkle on the south bank of the Columbia River. At Hinkle, near Hermiston, Oregon, the line forks. One line runs northeast from Hinkle to Spokane, linking up with the Canadian Pacific near Eastport, Idaho. The other line runs southeast from Hinkle to Granger, Wyoming, and Ogden, Utah, connecting with UP's historic Central Corridor that links the San Francisco Bay Area with Chicago. Along the I-5 corridor, UP has trackage rights on BNSF between Seattle and Tukwila, its own line between Tukwila and Tacoma, trackage rights over BNSF between Tacoma and Portland, and its own rails southward through Oregon and California.

Freight rail tonnage is expected to double by 2035. Some of the growth in demand will be handled by longer trains and cars with greater capacity. This freight growth projection suggests

[164] *WSDOT. Washington State Rail Plan. http://www.wsdot.wa.gov/NR/rdonlyres/F67D73E5-2F2D-40F2-9795-736131D98106/0/StateRailPlanFinal201403.pdf*

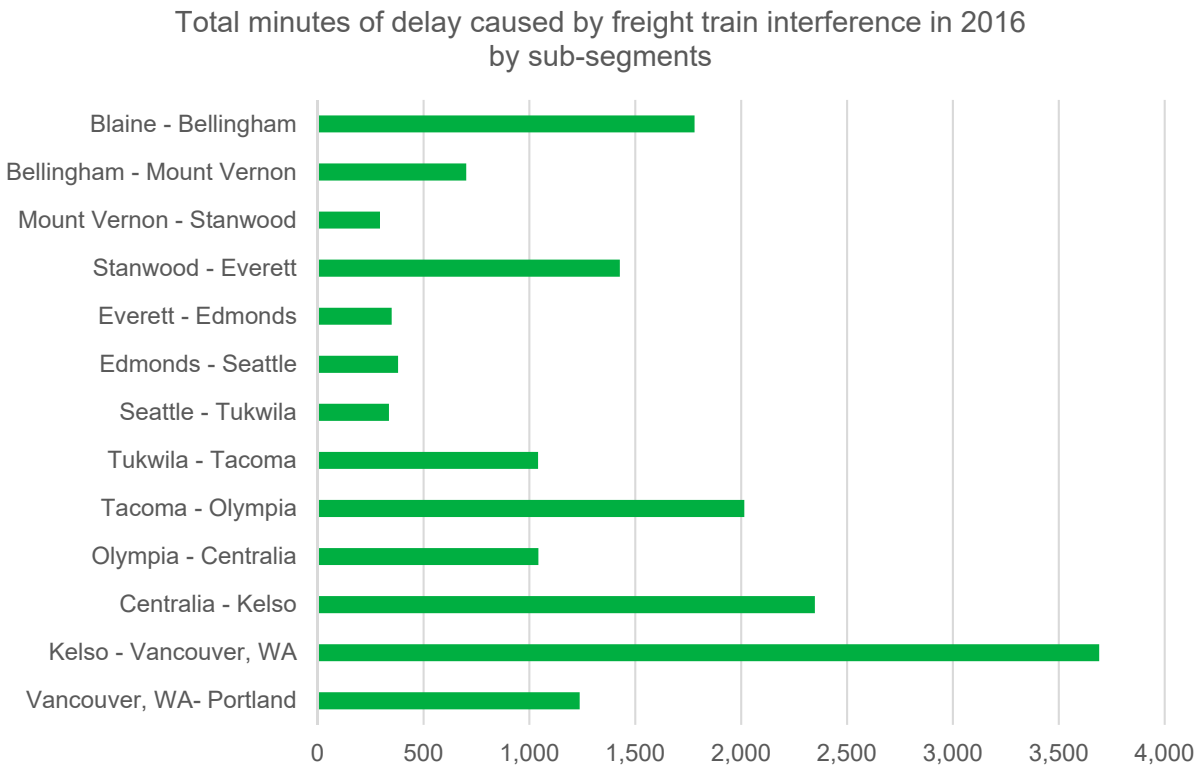
that railroads will need to implement capacity improvements on nearly all R1 Rail Freight Economic Corridors to ensure the system continues to function efficiently. Sidings of 10,000 feet may be needed in some locations, and double track sections may be needed in other areas. More directional running also could provide capacity (e.g., running full trains on one route, and empty trains on another route).

Rail pricing fluctuations and service frequency adjustments are major risks associated with rail service in Washington. During development of the *2013 Washington State Rail Plan*, stakeholders voiced concern about how growth in rail volumes affected pricing in the past; based on rail volume projections, this continues to be an issue into the future. Railroads seek a return on investment on their capital investments that exceeds a threshold, which varies based on the cost and availability of capital. Often, the risks associated with a new investment exceed likely benefits, and the railroads will choose to adjust their business practices instead. Most commonly, these adjustments take the form of pricing actions and changes in service frequency. Shippers often see these decisions as limiting their access to the rail system. The impacts of these decisions can negatively affect shippers and short-line connections by increasing their costs.

Freight rail traffic can cause congestion and delay for freight and passenger trains on the rail system. Limited right of way forces passenger and freight trains to use the shared track, introducing delays and conflicts. Delays to one train can lead to a cascading effect of delays to other trains, and the amount of delay increases significantly as freight train volume grows. As Amtrak, WSDOT, and Sound Transit add passenger rail trips, freight railroads typically require infrastructure improvements to ensure there is adequate capacity for freight movement. This can include additional track, new crossovers to allow trains to change tracks, and other infrastructure investment. Additional infrastructure can reduce the likelihood of delays, but does not eliminate the possibility. WSDOT does not have train performance data for the entire rail network in Washington, due to the private nature of rail infrastructure data. WSDOT does have some data on the BNSF mainline between Vancouver, British Columbia and Eugene, Oregon, because it oversees the operations of Amtrak Cascades passenger rail service in this corridor and tracks the on-time performance and delays of these passenger trains. In 2016, an average of 74.2 percent of Amtrak Cascades trains were on time, below the 80 percent performance goal. The top two causes of delay identified as affecting on-time performance in 2016 were slow order delay (i.e., a local speed restriction on a rail line which is set below the track's normal speed limit) and freight train interference (i.e., delays from freight trains). Amtrak Cascades service currently includes four daily round trips between Seattle and Portland, and two daily round trips between Seattle and Vancouver, British Columbia. WSDOT is starting two additional Amtrak Cascades daily round trips between Seattle and Portland. Beginning December 18, 2017, an additional morning and evening train will run in both directions – resulting in two more roundtrips, for a total of 12 trains daily.

Exhibit 8-3 shows the total delay minutes caused by freight train interference for Amtrak Cascades trains in 2016 by sub-segments within Washington. The sub-segment between Kelso and Vancouver has experienced the most delays from freight trains, accounting for about a quarter of total delay minutes along the corridor. Sound Transit also operates passenger rail service for commuters in the Seattle area on a portion of the same corridor used by Amtrak Cascades. Delay minutes to the service operated by Sound Transit that was caused by freight train interference are not included in Exhibit 8-3.

Exhibit 8-3: Passenger Rail Service Delay



At-grade crossings cause unpredictable congestion and delays for both motorists and freight carriers. In 2017, the Joint Transportation Committee of the Washington State Legislature completed a study that evaluated the impacts of road-rail conflicts and developed a prioritization process to address the impacts on a statewide level. The prioritization approach included a preliminary screening of the 4,174 total crossings statewide, followed by two steps: filter out crossings that did not meet defined thresholds, and sort the remaining crossings by the evaluation criteria to create a ranked list of crossings. This process identified the top 50 at-grade crossings that experienced substantial conflicts. The key findings of those top 50 crossings included:

- They are closed to vehicle traffic for an estimated average of two hours per day, which is expected to increase in the future as train volume grows;
- The median number of trains and vehicles using these crossings each day are 49 trains and 12,000 vehicles;
- Almost two-thirds (62 percent) of these crossings are on a designated freight corridor;
- Approximately two-thirds (66 percent) are near emergency providers leading to potential delays for emergency service providers; and
- There is a significant need for additional funding to address crossing improvements.

Improving rail system capacity

Transportation partners continue to address rail capacity, as needed. Capital improvements and/or operational changes can enhance the capacity of the rail system in Washington. Class I railroads address key capacity issues as they emerge. Typical capacity improvements may

include construction of additional main track, and new and/or lengthened passing sidings, or expansion of industry, yard, and terminal facilities. Class I railroads also can make operational improvements. In 2012, when BNSF began directional running of their Auburn to Pasco corridor, rail capacity increased on that corridor by about 300 percent over bidirectional operations. Other potential operational changes include operation of longer trains, schedule and train speed adjustments, and application of advanced operational management systems and signaling systems. Railroads typically implement operational changes before pursuing major capital investments.

WSDOT will continually monitor on-time performance of the Amtrak Cascades passenger rail service. This includes coordinating with BNSF and Amtrak to minimize delays caused by freight trains. WSDOT has invested nearly $800 million of the American Recovery and Reinvestment Act High-Speed Intercity Passenger Rail program funding[165] to deliver critical rail infrastructure improvements that also improves freight capacity on BNSF.

The Freight Mobility Strategic Investment Board (FMSIB) will manage and update the state database of road-rail conflicts. The Legislature has directed FMSIB to manage and update the database of road-rail conflicts in the 2017-2019 biennium. The database will continue to identify prominent road-rail conflicts that will help to inform strategic state investment for freight mobility statewide. Public and private stakeholders can build upon the road-rail conflicts prioritization work done by the Joint Transportation Committee of the Washington State Legislature as they work towards developing solutions that address crossings with the greatest needs.

WSDOT will update the State Rail Plan to meet federal[166] and state[167] requirements. WSDOT plans to update the current *2013 Washington State Rail Plan*[168] in the 2017-2019 biennium, to address changes in the rail industry and changing market forces that affect freight and passenger rail.

8.3 Marine congestion is concentrating

Currently evolving alliances in the West Coast shipping lines are causing delays at ports. These three new ocean alliances represent approximately 77 percent of global container capacity. The vessel rotations introduced in early 2017 by new shipping alliances have generated terminal congestion, longer truck-turn times, and delays in spotting and releasing intermodal trains at on-dock rail facilities, as well as chassis dislocations in Tacoma.[169] While delays are a temporary issue that is resolvable in the short term, a larger problem with the evolution of these alliances is with the number of terminals that will be served. Ocean alliances have existed for many years, either formally or informally. The alliances have reformed from previous groupings due to an unprecedented number of mergers and acquisitions in 2016. The goal of the alliances is to reduce empty space on ships, and to achieve other efficiencies, such as reducing the number of ships calling at the same port. As a result of the new alliances, some terminals will likely

[165] *WSDOT. High-Speed Rail Program.* https://www.wsdot.wa.gov/Rail/highspeedrail.htm
[166] *Federal Railroad Administration. State Rail Plan Guidance.* https://www.fra.dot.gov/Page/P0511
[167] *Freight rail plan.* http://app.leg.wa.gov/RCW/default.aspx?cite=47.06.080
[168] *WSDOT. Washington State Rail Plan.* http://www.wsdot.wa.gov/NR/rdonlyres/F67D73E5-2F2D-40F2-9795-736131D98106/0/StateRailPlanFinal201403.pdf
[169] *Journal of Commerce.* http://www.joc.com/port-news/us-ports/alliances-cause-us-west-coast-port-delays_20170509.html

experience increased volume at the expense of other terminals that may become idle. This concentration of activity could result in congestion during loading and unloading of the ships. It also results in underused infrastructure and real estate at idle terminals.

Some ports face capacity limits, as marine freight volumes increase and available land at terminals and in ports diminishes. Marine container ports are looking to partner with inland ports as satellite facilities to meet capacity concerns. In 2016, the Northwest Seaport Alliance (NWSA) received the largest container ship in its history, the Ben Franklin, with an 18,000 twenty-foot equivalent unit (TEU) capacity. This single ship can move nearly one percent of the NWSA's 2015 international container volume. While no one anticipates that the largest cargo vessels will be visiting Puget Sound ports, as new, extremely large ships enter service they trigger a cascading effect of large ships displacing smaller ships on other routes. Instead of a dozen vessels per month, ports expect fewer but larger ships to dock each month. This will result in spikes of activity to unload/load ships potentially affecting highway congestion as trucks move to service less frequent arrivals. This also may require the need for longer trains and space, and the ability to load and unload longer trains efficiently.

At waterway locking structures, commercial and recreational traffic can sometimes be greater than the capacity of the locks to handle traffic, resulting in delay. The U.S. Army Corps of Engineers (USACE) monitors and reports delay using its Lock Performance Monitoring System.[170] Lock queue data is available by waterway and lock structure, showing the number of vessels, number of barges, and delay minutes.

At river bridges, commercial vessels are required to navigate through narrow passages between piers in the navigation channel. In some locations, the commercial navigation channel passes underneath two nearby structures, creating navigation challenges that relate to mobility and safety. One such location is on the Columbia River in Vancouver, where barge traffic must pass underneath a highway bridge and a rail bridge in close proximity, resulting in a sharp S-curve maneuver if the lift section on the primary channel is lowered.

Use of the marine system for freight transportation increases impacts to the roadway and railway systems when bridges need to be moved to allow a ship or barge to pass through the waterway. Movable bridges are locations where unpredictable congestion and delays occur on the road and rail system. When a bridge over the marine system turns or lifts, it is due to either commercial or recreational traffic. Federal law[171] gives marine traffic priority over surface traffic, and when bridges open for ships and barges to pass through, this causes delays to trucks and passenger cars. WSDOT operates 17 movable bridges on state routes.[172] WSDOT works with the U.S. Coast Guard to create reasonable restrictions on marine openings for vessels under 5,000 gross tons during peak travel times to ease congestion for drivers when possible. One example is the I-5 Interstate Bridge between Vancouver and Portland, Oregon, which serves bi-state traffic and freight movement. On average 132,000 vehicles crossed the bridge per day in 2015. The average lift can take between 15 and 20 minutes, causing miles of traffic backups

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[170] *U.S. Army Corps of Engineers. Lock Performance Monitoring System.* *http://corpslocks.usace.army.mil/lpwb/f?p=121:3:0:::::*

[171] *Drawbridge Operation Regulations 33 C.F.R § 117.5 (2012)* *https://www.gpo.gov/fdsys/pkg/CFR-2012-title33-vol1/xml/CFR-2012-title33-vol1-part117.xml*

[172] *WSDOT. Moveable Bridges on State Routes.* *http://www.wsdot.wa.gov/bridge/reporting/moveablebridges.htm*

and taking time to dissipate. WSDOT does not regularly track the number of bridge lifts or the overall impact to traffic congestion or delay at this bridge or others in the state. There are numerous movable bridges on highways and railways in Washington, some of which are over commercially navigable waterways.

Improving marine system congestion

The NWSA is deploying a Vehicle Wait Time Awareness system to address land-side congestion. Congestion at terminal gates leads to inefficiencies as truck drivers wait to gain entry to drop or pick up freight. The NWSA is in the process of deploying a system to display wait times and turn times at the Ports of Seattle and Tacoma. This data is available to truckers and dispatchers via the DrayQ mobile device app. The technology works by tracking truck wait and turn time at the ports via Bluetooth or Wi-Fi readers. The availability of real-time information should increase efficiency and reduce truck idling at the ports. Because drivers will be able to know how long wait times are at the terminals, this information could help them better plan their parking options in advance of departing for the terminals. WSDOT assisted in securing Freight Advanced Traveler Information System (FRATIS) funding for this project and is committed to partnering with the ports to ensure this system is beneficial to the freight industry.

Transportation partners continue to enhance port mobility. Ports may choose to implement automation and technology to take advantage of opportunities to reach new markets or to find efficiencies in operations. For example, the Port of Tacoma is considering funding a new maintenance crane to work on straddle carriers in 2017. This will improve efficient operations. Marine fleet owners continue to identify new logistical efficiencies on the marine system. As markets change, carriers work with shippers and forwarders to meet new demand. For example, global retailer Amazon has been in the marine freight forwarding industry for less than one year. Nonetheless, it has now become a non-vessel operating common carrier for international freight to and from China, shipping 150 containers in their first month.[173] Port and Terminal operators need to continue to improve terminals to remain competitive. WSDOT will improve connections between the rail system and ports through the Freight Rail Investment Bank program (FRIB) and Freight Rail Assistance Program (FRAP), and with the National Highway Freight Program (NHFP).

WSDOT will continue to work with transportation partners on moveable bridge restrictions. To ease congestion for drivers, WSDOT works with local governments and the U.S. Coast Guard to create reasonable restrictions on marine openings for vessels under 5,000 gross tons during peak travel times, when possible. WSDOT and the City of Seattle are reducing congestion by working with the U.S. Coast Guard and other marine partners to limit openings of their bridges for vessels during times that have the greatest impact on other modes.

8.4 Air cargo volume is experiencing significant growth

Air cargo activity in Washington is highly concentrated, primarily occurring at Sea-Tac International Airport (Sea-Tac). Air cargo service there provides access to domestic and global markets for the Seattle region, as well as the remainder of Washington and the entire Pacific

[173] *Flexport.* https://www.flexport.com/blog/amazon-ocean-freight-forwarder/

Northwest. King County International Airport and Spokane International Airport handle the remaining majority of air cargo activity in the state, with much lower volumes of cargo handled at various smaller airports. Several factors work together to concentrate air cargo. These include the size of the local market for air cargo service, the availability of wide-body commercial air service (particularly international service) to a variety of destinations, and the presence of warehouse and logistics company operators. Together, these factors focus the volume of air cargo into a few airports in Washington, with the large majority of air cargo moving through the two Seattle-area airports. Businesses in Washington located outside the metropolitan Seattle market are served by road feeder service through Sea-Tac and King County International or Portland International Airport in Oregon. Portland is one of the main shipping hubs for southwest Washington, particularly for the high tech industries in Clark County. Shippers in Washington also use road feeder service to move cargo through major Midwest and West Coast airports, such as Los Angeles, San Francisco, Chicago, or Dallas. Capacity and congestion information in this chapter is from the *2017 Washington Aviation System Plan*.

The ability to accommodate growth in air cargo volumes at Sea-Tac is constrained by the limited amount of land available for development and the growth in both passenger and cargo volume over the past five years. Sea-Tac currently has 14 on-airport cargo warehouses. Thirteen warehouses, interspersed throughout a ramp area on the north end of the airport, primarily serve as “pass-through” facilities. There is also one 58,000-square-foot lower-deck cargo (belly cargo) facility on the southeast side of the airport and 20 cargo area freighter hardstands for wide-body aircraft. A capital improvement project, completed in 2015, expanded five cargo aircraft parking areas to accommodate the increasing frequency and use of the Group VI Boeing 747-8 nose load freighters. Studies prepared for the 20-year *Sustainable Airport Master Plan* (SAMP), currently under development by the Port of Seattle, have identified the inefficient configuration of air cargo facilities at Sea-Tac as an issue to address. Compounding the seriousness of the existing resource constraints for air cargo is the possibility that the forecast of air cargo volumes in later years may be very conservative. Volumes are projected to grow at an average annual growth rate of 1.6 percent, but Sea-Tac has seen two years of 10 percent or more growth in the past three years. Factors that could drive future air cargo volumes higher include the growth of international wide-body passenger service at the airport and the Port of Seattle’s strategic objective to triple air cargo volume to 750,000 metric tons by 2037 as part of its Century Agenda.[174] The expected expansion of air passenger and maintenance, repair, and overhaul activities at Sea-Tac also presents challenges for meeting future air cargo demand, requiring space and other resources. Accommodating future air cargo volumes will require major investments.

According to projections in the *2017 Washington Aviation System Plan*, King County International Airport will experience moderate growth in air cargo demand and has adequate resources to accommodate the increase in air cargo volume. United Parcel Service (UPS) accounts for the majority of the air cargo tonnage handled there. In June 2016, ABX Air, operating on behalf of DHL, moved its air cargo operations from the airport to Sea-Tac. The move reduced the air cargo activity of Boeing 757 and B767 freighter aircraft at King County International Airport by about 20 flights per week. Results of working papers prepared for the

[174] *Port of Seattle. Century Agenda.* https://www.portseattle.org/About/Commission/Pages/Century-Agenda.aspx

2017 update of the *King County International Airport Master Plan*, the *King County International Airport Strategic Plan 2014–2020*, and a comparison of available facilities at the airport, indicate that sufficient land and runway capacity is available to accommodate future air cargo demand at the airport.

Spokane International Airport will experience moderate growth in air cargo demand and has adequate resources to accommodate increasing air cargo volumes, according to the *2017 Washington Aviation System Plan*. The two dominant cargo carriers are FedEx and UPS. They both serve the local air cargo market and use Spokane as a regional transload hub for aircraft originating and departing to other destinations. A significant volume of the cargo handled at Spokane is transloaded between airplanes. Spokane International Airport has a 26,400-square-foot joint-use building at the airport that accommodates the belly freight of passenger carriers. Two single-user cargo buildings adjacent to each other are located within the terminal area, northeast of the joint-use facility. East of the runways, the airport has over 80 acres of land available for future airside development. There are no documented capacity or congestion concerns at the airport.

Snohomish County, Pasco, Yakima, Bellingham, Wenatchee, Moses Lake, Port Angeles, Pullman-Moscow, and Skagit all have relatively small cargo operations, and on-site capacity does not seem to be an issue.[175] FedEx, UPS, and belly cargo in commercial airline aircraft, generate nearly all of the air cargo activity at these small commercial service airports, with very small quantities of enplaned and deplaned belly cargo by Alaska/Horizon Airlines. Belly cargo capacity at smaller airports in the state is limited due to the regional aircraft used to serve these markets. Beyond space for FedEx and UPS airport operations, the need for air cargo facilities at most non-hub commercial service airports is limited. Air cargo tendered at these airports is typically same-day express cargo under 150 pounds in weight. Most of these small packages have limited dwell time. An exception to this profile is Snohomish County Paine Field. The surge in air cargo at Paine Field in 2014 was generated by the Boeing Company's 787 airplane manufacturing and assembly program, with airplane parts carried in modified wide-body freighters.

The rapidly growing volume of air cargo handled at Sea-Tac, which handles more than half of all air cargo in the state, has increased growth pressures on surrounding properties. Accommodating this continuing growth at Sea-Tac will be a challenge within the constraints posed by existing development and topography. Sea-Tac is now in the process of master planning the last remaining parcels of property on site, including those accommodating air cargo activities. Should Sea-Tac be unable to keep up with demand, it is not clear if other airports within the state would be able to attract air cargo that Sea-Tac is unable to accommodate. Economic activity dependent on air cargo could move or be developed outside Washington, if Sea-Tac reaches a point where it is unable to handle additional growth. The viability of other airports in Washington to meet the growing demand for air cargo in the state needs to be better understood.

For time-critical deliveries and high-value internationally traded commodities, cost-efficient access to airports and air cargo facilities is increasingly crucial. Due to limited on-airport land

[175] *WSDOT. Washington Aviation System Plan. July 2017.* http://www.wsdot.wa.gov/aviation/Planning/wasp.htm

availability and higher prices, a significant portion of the air cargo logistics chain activity takes place outside the immediate airport boundaries. However, since transportation costs can be significantly larger than real estate costs, and due to congestion-related uncertainty in travel times, many users of air cargo services want to be as close as possible to the airport. Close proximity to an airport allows third-party logistics providers -- particularly freight forwarders, consolidators, and pick-up and delivery services -- the ability to dependably offer later drop-off times for shippers to their facilities and provide earlier delivery times to the consignee. As a result, the ability to provide sufficient access to an airport is critical to its function.

Airport access roads provide connectivity between major highways and interstates and key facilities located at airports throughout the state. Commercial service airports depend on accessibility to/from these roadways to provide their passengers with access to public parking, pick-up/drop-off, and the delivery of goods, such as cargo, time-sensitive packages, and mail. Highways maintained by WSDOT typically provide accessibility to airports. Airports throughout the state are clearly identified using airport location signs posted along key routes to the airport. According to the *2017 Washington Aviation System Plan*, approximately 88 percent of airports have adequate access roads and 74 percent have adequate airport signage. Among the major airports, all have adequate access roads.

Evaluating air cargo capacity statewide

The Joint Transportation Committee will study air cargo movement at airports in the state. Air cargo in Washington is projected to grow at an average annual rate of 1.9 percent, with most of this growth being driven by air cargo activity at Sea-Tac. Sea-Tac is challenged by aggressive expansion of air passenger traffic, as well as maintenance, repair, and overhaul activities.-The Legislature has directed its Joint Transportation Committee to study air cargo movement at airports in the state in the 2017-2019 biennium. This study will define air cargo congestion metrics; identify market forces determining demand for cargo service; and make recommendations regarding how to efficiently meet the demand for air cargo in Washington. WSDOT will monitor the statewide air cargo study for future actions.

Airports continue to develop master plans that consider air cargo needs. The Federal Aviation Administration (FAA) provides guidance for the preparation of airport master plans that range in size and function from small general aviation to large commercial service facilities. The Port of Seattle is currently developing its SAMP for Sea-Tac. King County International Airport and other airports in Washington have master plans in varying stages of completion. Plans should include improvement of signage and access roads that benefit air cargo.

8.5 Changing manufacturing practices affect supply chains

Regional manufacturers report a trend towards re-shoring of advanced and other manufacturing to the U.S. in the near-to-midterm, as labor costs are on the rise in China. This would result in an increase in manufacturing in parts of the U.S. and Mexico. Managing transit time for supply chains originating in Mexico is less complex than from Asia due to the elimination of overseas shipping logistics. One large retailer distributing hard goods from the Yakima River Valley said that many companies are looking for U.S. or North American-made products, rather than those from overseas markets. The labor cost differential between China and the U.S. is still very large, and other Southeast Asian countries have increased manufacturing production in recent years because their wages are still very low.

Addressing changing supply chain dynamics

WSDOT will monitor changes to global supply chains. Additional demand will occur on major truck and rail routes with increased manufacturing occurring in North America. More time-sensitive freight services will be needed to move goods manufactured domestically, especially in urban areas. As manufacturers shift production, traffic on major north-south routes is expected to grow, increasing the importance of the I-5 corridor. WSDOT will continue to monitor and address capacity needs on major freight routes.

8.6 Emerging technologies could change deliveries

E-commerce continues to grow more rapidly across the country than overall retail growth. The U.S. Census Bureau releases quarterly reports on U.S. retail e-commerce. Sales for the first quarter of 2017 totaled $105.7 billion, an increase of 4.1 percent from the fourth quarter of 2016.[176] This trend is shifting freight distribution towards more point-to-point shipments from warehouses to homes and businesses. This will create more short trips in urban areas via parcel trucks.

Consumers are increasingly purchasing goods on websites for direct delivery to their home instead of going to traditional “brick and mortar” stores. As a result, the type of delivery trucks and their travel patterns are shifting. Because consumers are increasingly expecting deliveries in as little as one hour after ordering their merchandise, there is a trend towards more, but smaller, distribution centers serving smaller territories, resulting in a higher proportion of short trips and fewer long-distance trips by delivery trucks. Another consequence of the expansion of e-commerce is a challenge referred to as “the final fifty feet.” This is the last leg of a delivery that begins at the point where a delivery driver leaves a truck or vehicle to bring a package to a customer. With people increasingly having goods shipped directly to their homes, delivery of these goods is straining delivery zones in dense urban areas not designed with delivery parking in mind.

The transformational technologies for connected and autonomous trucks is developing rapidly. In 2016, the first commercial autonomous truck delivery occurred in Colorado. Both types of technology have the potential to provide a range of benefits to freight movements in Washington. Connected vehicles, which make use of sensors that communicate with other vehicles and roadway infrastructure show promise for realizing improved safety, fuel savings, increased lane capacity, and enhanced traffic flow stability. Autonomous vehicles additionally have the potential to reduce operating costs and help alleviate the shortage of truck drivers and truck parking. While widespread adoption of these new technologies is not imminent, it is getting closer. “Truck platooning,” which is multiple trucks traveling in-line while equipped with support systems, has been tested in California and Texas. The integration of connected and autonomous vehicles into the transportation system will require adjustments to federal and state regulations governing the licensing, testing, and operation of vehicles.

An emerging trend that could transform the delivery of goods is the development of Unmanned Aircraft Systems, also commonly referred to as drones. An estimated 80 to 90 percent of

[176] *U.S. Census. https://www2.census.gov/retail/releases/historical/ecomm/17q1.pdf*

deliveries weigh five pounds or less and these could technically be carried by a drone. While there have been successful small-scale tests of drone delivery, the technology needs to be refined and scaled up to the size and complexity of a commercial fleet. The National Airspace System (NAS) is not tailored to accommodate manned and unmanned aircraft operating in the same environment. The FAA's vision for a modernized air transportation system, referred to as NextGen, has been under development and implementation for many years. There is an evolving schedule for full implementation dependent on federal funding and a commitment by system users. However, the initial NextGen system did not anticipate accommodating drone activity, especially at the levels currently experienced and expected to be reached in the next 10 years. For drones and manned aircraft to operate safely and efficiently in an integrated system within the NAS, continued study is needed that may affect policies at all levels. The potential economic benefits of drone delivery are driving the effort to resolve the technical and regulatory challenges. UPS estimates that a reduction of just one mile per driver per day over one year can save the company up to $50 million.[177] More broadly, some analysts calculate that large-scale deployment of drones to deliver goods could result in $2 to $10 billion in annual cost savings nationally.[178]

The United States Department of Transportation's (USDOT's) Volpe National Transportation Systems Center is studying the feasibility of the commercial use of Hyperloop technology.[179] The technology, which includes capsules in partial-vacuum tubes, would allow ultra-high-speed travel exceeding 700 mph on a grade-separated system. The research found that the use for freight is a logical first step to prove the viability of the technology, since passenger safety issues do not need to be addressed, and ultra-fast speeds are not necessarily needed for most freight. The capsules can be designed to carry standard container sizes, providing seamless intermodal transfers. In addition, weather and energy efficiency are minor issues compared to other modes. Numerous issues about this technology need further research.

Monitoring emerging technologies

Transportation partners should monitor changes in technology. Due to a shift in e-commerce, there is a trend towards more, but smaller, distribution centers serving smaller territories, with more and smaller trucks. This results in a higher proportion of short trips and fewer long-distance trips by delivery trucks on the highways and local roadways in Washington. Land-use regulations preventing large trucks from entering cities will put many smaller straight trucks, a type that carries cargo on the same chassis as the power unit and cab, into operation in urban areas. Some companies are testing smaller vehicles to make deliveries in highly congested urban areas. For example, UPS has tested using electric cargo bicycles in Portland, Oregon.[180] WSDOT and other infrastructure owners can address this trend with capital, operational, and technological solutions. Due to the rapid development of unmanned aircraft systems, WSDOT

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[177] *UPS. https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=PressReleases&id=1487687844847-162*

[178] *Forecast of the Commercial UAS Package Delivery Market. http://nebula.wsimg.com/28ad8975cfef999798fa4b20e7238f67?AccessKeyId=02FB2B5A65F7EC056121&disposition=0&alloworigin=1*

[179] *Volpe National Transportation Systems Center. https://ntl.bts.gov/lib/59000/59300/59393/Hyperloop_Commercial_Feasibility_Report.pdf*

[180] *Oregon Live. http://www.oregonlive.com/commuting/index.ssf/2016/12/ups_debuts_delivery_by_electri.html*

and others may need to assess federal and state regulations and policies that do not currently address the potential for deployment of large fleets of drone delivery aircraft. Additional research will be needed as Hyperloop technology advances, offering an opportunity for transportation partners to collaborate. WSDOT will consider working with partners, such as the University of Washington's Urban Freight Lab, to monitor emerging technologies.

Transportation partners are collaborating on an Autonomous Vehicle Workgroup. In June 2017, Governor Inslee's Executive Order[181] on autonomous vehicles helped prepare Washington for the trend of connected and autonomous vehicles. The order creates a work group to examine emerging automated transportation technology in several modes, including freight, and assess state government's role in cultivating the safe development of automated technology in vehicles on public roads. WSDOT will continue to participate on the state Autonomous Vehicle Workgroup. WSDOT, along with partners that include the Department of Commerce, Department of Licensing, Washington State Patrol, Washington Traffic Safety Commission, and others will support the safe testing and operation of autonomous vehicles on public roads in Washington through the authorization and support of autonomous vehicle pilot programs.

[181] *Office of the Governor. Executive Order 17-02.* *http://governor.wa.gov/sites/default/files/exe_order/17-02AutonomouVehicles.pdf*

9 ENVIRONMENT

The Washington state transportation system policy goal of Environment is: “To enhance Washington's quality of life through transportation investments that promote energy conservation, enhance healthy communities, and protect the environment.” The freight objective defined in this plan is to reduce environmental impacts. Environmental impacts to and from the freight system are important to support transportation system goals. This chapter identifies the significant trends, issues, and needs related to the environment. Likewise, the strategies in this section aim to address environmental impacts.

2017 Freight Plan Requirement: 49 U.S.C. 70202

This section of the U.S. Code lists ten required elements that all State Freight Plans must address for each of the transportation modes. This section discusses elements of the following requirements, related to **environment**:

(1) an identification of significant freight system trends, needs, and issues with respect to the State;
(2) a description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State;
(5) a description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of freight movement, were considered;

9.1 The freight system is vulnerable to climate impacts

Washington has developed an integrated state climate change response strategy,[182] which identifies several potential risks to transportation infrastructure:

- Sea-level rise and storm surge will increase the risk of major coastal impacts, including temporary and permanent flooding of roads and transportation facilities in low-lying areas.
- More intense downpours will increase the risk of flooding, erosion, landslides, and damage. Travel disruptions and delays could increase and have serious impacts to the state’s economy and public safety.
- An increase in extreme heat could negatively affect rail tracks and other materials in the summer, but warmer winters could offer benefits from reduced road closures and snow and ice removal costs
- Larger and more severe wildfires could cause temporary road closures and increased risk of erosion due to loss of vegetation, which stabilizes soil.

WSDOT has examined climate risks to state transportation assets using climate projections from the University of Washington Climate Impacts Group. WSDOT completed a statewide

[182] *Department of Ecology. http://www.ecy.wa.gov/climatechange/2012ccrs/infrastructure.htm*

qualitative risk assessment[183] to identify which state-owned roads, bridges, and other facilities throughout the state are most vulnerable. In general, areas showing high-vulnerability are highways in the mountains or either above or below steep slopes, in low-lying areas subject to flooding or coastal areas vulnerable to rising sea levels, and along rivers fed by glaciers where the glacial melt deposits rocks in the riverbed and causes the river to change course. The assessment also identified fire as a high risk to the state-owned PCC rail system in eastern Washington. More than 140 wooden trestle bridges are on these lines, and some are over 100 years old. These bridges are vulnerable to wildfires. The trestles are made of creosote-coated timber that can burn for weeks. This vulnerability will increase under a scenario that has more wildfires. The Washington State Ferries system was found to be mostly resilient, though some ferry terminals may need to accommodate rising sea levels or storm surge.

Assessing vulnerability of climate impacts

WSDOT will use results of the 2011 Climate Impacts Vulnerability Assessment[184] to inform corridor studies and plans. The multimodal freight transportation system is vulnerable to climate impacts, including flooding, wildfires, and extreme heat. Identified vulnerabilities will be evaluated during the planning and design phase of projects, and WSDOT will identify opportunities to address those risks.

Transportation partners should assess infrastructure for climate impact vulnerability. This includes infrastructure, such as local roads and bridges and rail infrastructure, not included in the 2011 assessment. For example, Seattle's 2016 Climate Action Plan[185] identifies actions to evaluate effects on the movement of goods, including development of a Freight Master Plan. The plan encourages support of alternative freight modes, such as bicycle deliveries, that help reduce emissions. The plan also identifies the need for system resiliency to allow for disaster relief and response to extreme events. WSDOT will work with partners, as appropriate, in assessing infrastructure for climate impact vulnerability.

9.2 Freight diesel emissions affect human health

Diesel exhaust is considered a hazardous air pollutant by the U.S. Environmental Protection Agency (USEPA), and contains several air pollutants, including particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), nitrogen oxides, volatile organic compounds, and carbon dioxide. $PM_{2.5}$ from diesel emissions are associated with adverse health conditions like cardiovascular and respiratory disease. Diesel exhaust puts healthy people at risk for respiratory disease and worsens the symptoms of people with health problems such as asthma, heart disease, and lung disease.

Washington State Department of Ecology estimates that more than four million people in Washington live or work very near highways and other major roads where they may be exposed to diesel exhaust. Freight diesel emissions can create more problems for urban areas where diesel emissions are more concentrated and a higher density of population live nearer freight

[183] *WSDOT. Climate Change - Adapting and Preparing.* http://www.wsdot.wa.gov/SustainableTransportation/adapting.htm
[184] *Ibid.*
[185] *City of Seattle. Seattle Climate Action Plan.* http://www.seattle.gov/Documents/Departments/OSE/2013_CAP_20130612.pdf

traffic. In 2011, diesel engines emitted 6,474 tons of $PM_{2.5}$ in Washington. Multiple sources contribute to the total amount of $PM_{2.5}$ from diesel engines. The key sources include: on-road vehicles, marine vessels, construction equipment, agricultural equipment, and locomotives. On a statewide basis, on road vehicles, marine vessels, and construction equipment dominate the contribution to diesel $PM_{2.5}$, accounting for 76 percent of the total. Agricultural equipment and railroad locomotives also are substantial contributors of total diesel $PM_{2.5}$, contributing 9 percent and 6 percent, respectively. These sources are in both urban and rural areas, with more populated areas typically contributing a higher portion of the emissions. For example, 42 percent of the total statewide diesel $PM_{2.5}$ emissions occur in Snohomish, King, Pierce, and Kitsap counties, which contain the majority of the state's population. The relative amount that different sources contribute to diesel $PM_{2.5}$ emissions varies across the state, as well. More than 89 percent of the total output of diesel $PM_{2.5}$ emissions in the central Puget Sound is from on road vehicles, construction equipment, and marine vessels. In the U.S., long-duration truck idling alone is estimated to emit 11 million tons of carbon dioxide, 180,000 tons of NO_X, and 5,000 tons of PM each year.[186]

Several forms of idle reduction technologies are available, including direct-fired heaters, auxiliary power units (APUs), thermal storage systems, on-board batteries, and truck electrified parking (TEP). These technologies have a range of use and acceptance by truck drivers. The cost to retrofit can be prohibitive to acquiring idle reduction technologies, as they can range in price from $1,400 to over $8,000. While the initial investment may be expensive, most idle reduction technologies allow truck owners to break even within two to three years due to diesel savings. APUs are well-suited for trucks, especially long-haul rigs, as they provide all of the power needs for the vehicle. However, they are also expensive and bulky. Nonetheless, APUs are a popular option for idle reduction in the trucking industry. Most APUs run on diesel, although battery powered options also are available.[187] APUs use less than 5 percent of the fuel that an idling engine does, significantly reducing emissions in trucks, especially those from before 2010. TEP is another increasingly popular technology associated with truck parking. TEP allows trucks to plug into an electricity source, typically at a truck stop. TEP requires significant start-up costs, hindering the development of a comprehensive network of electrified truck stops. TEP may require drivers to adapt their trucks to use this technology.

Reducing diesel emissions

Transportation partners should continue to apply for federal grant funds to reduce freight-related diesel emissions. The EPA's Clean Diesel program is funded through the Diesel Emissions Reduction Act (DERA) of 2005. The program provides grants and appropriations to programs that promote clean diesel. Cities, counties, ports, tribal governments, and others are eligible recipients. The Clean Diesel Program provides support for projects that protect human health and improve air quality by reducing harmful emissions from diesel engines. Washington recently was awarded DERA funds,[188] including $213,467 in 2015 and $327,908 in 2016. Examples of

[186] *U.S. Environmental Protection Agency. Verified Technologies for SmartWay and Clean Diesel.* https://www.epa.gov/verified-diesel-tech/learn-about-idling-reduction-technologies-irts-trucks
[187] *U.S. Department of Energy. Long-Haul Truck Idling Burns Up Profits.* https://www.afdc.energy.gov/uploads/publication/hdv_idling_2015.pdf
[188] *U.S. Environmental Protection Agency. Clean Diesel State Allocations.* https://www.epa.gov/cleandiesel/clean-diesel-state-allocations#alloc2

freight-related uses of DERA funds include projects to reduce diesel emissions from trucks and tugboats. Since 2011, six tribal governments in Washington have used DERA funding.[189] Many of these projects were to replace diesel engines on fishing vessels. In addition, the Confederated Tribes of the Colville Reservation installed 18 truck stop electrification units in 2016.

Washington State Department of Ecology uses its Diesel Particulate Emission Reduction Strategy to guide its work on reducing diesel exhaust. Ecology has identified diesel exhaust as the air pollutant most harmful to public health in Washington. In addition, Ecology administers the Clean Diesel Grant Program in Washington that provides about $2.5 million annually to fund projects that reduce emissions from heavy-duty diesel vehicles and equipment.[190]

Ecology administers Volkswagen settlement funds. In 2015, Volkswagen violated the Clean Air Act by manufacturing diesel vehicles with software installed to evade emissions tests. Volkswagen has agreed to pay about $3 billion into a trust that be used to pay for past, present, and future harm caused by the excess nitrogen oxide emissions released by the affected vehicles. Washington will receive $112.7 million. Ecology is developing its mitigation plan and will begin dispersing funds in 2018. Ecology provides information about this opportunity, including eligible uses, on its website.[191]

The Northwest Seaport Alliance is working to reduce seaport-related air emissions through the Northwest Ports Clean Air Strategy. The aim is to reduce diesel particulate emissions per ton of cargo by 80 percent by 2020, and greenhouse gas emissions per ton of cargo by 15 percent by 2020. The NWSA is one of seven port authorities in the U.S. recognized in 2017 for its efforts to reduce seaport-related emissions.[192]

The Puget Sound Clean Air Agency administers an ongoing Diesel Solution Program to reduce diesel emissions. This program has enlisted cities and counties, ports, private businesses, and others to work voluntarily to reduce diesel emissions from off-road equipment, on-road vehicles, maritime vessels, and rail locomotives in the Puget Sound region.[193]

Businesses should take advantage of incentives provided by the Washington State Legislature to reduce diesel emissions. In 2006, the Legislature passed SSB 6512[194] to encourage private entities to address air pollution by providing incentives to those who provide the infrastructure and services that support the use of auxiliary power through onboard or stand-alone electrification systems. Ecology has been investigating environmental concerns associated with trucks idling while parked and has worked with Shorepower, a TEP provider, as well as the EPA

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[189] *U.S. Environmental Protection Agency. Tribal Awarded Grants.* https://www.epa.gov/cleandiesel/tribal-awarded-grants
[190] *Department of Ecology. Diesel Exhaust.* http://www.ecy.wa.gov/programs/air/cars/diesel_exhaust_information.htm
[191] *Department of Ecology. Air Quality.* http://www.ecy.wa.gov/programs/air/cars/vw_fedsettfunds.htm
[192] *Northwest Seaport Alliance. Environmental Stewardship.* https://www.nwseaportalliance.com/stats-stories/environmental-stewardship
[193] *Puget Sound Clean Air Agency. Diesel Solutions.* http://www.pscleanair.org/245/Diesel-Solutions
[194] *Washington State Legislature.* http://lawfilesext.leg.wa.gov/biennium/2005-06/Pdf/Bills/Senate%20Passed%20Legislature/6512-S.PL.pdf

and Climate Trust, in order to install 76 TEP spaces at two truck stops in Washington. In the 2015 Connecting Washington transportation funding package, the Legislature authorized business and occupation tax and public utility tax credits for businesses and utilities that buy or convert certain alternatively-fueled commercial vehicles. Increasing the number of alternatively fueled vehicles will help reduce diesel emissions.

WSDOT will promote use of alternate fuels in major corridors to reduce emissions. USDOT designates national alternative fuel corridors to promote the use of alternative fuel vehicles. These vehicle types include plug-in electric vehicle charging, hydrogen, propane, and natural gas. WSDOT, in conjunction with Oregon Department of Transportation, has nominated the Interstate 5 corridor as a National Alternative Fuel Corridor. Designations in Washington include the full length of I-5 (for electric vehicle charging), from Everett to the Vancouver (for compressed natural gas), and from Burlington to Lakewood (for liquid petroleum gas). TEP is another vehicle technology that will be considered in the designation of the Alternative Fuel Corridors. State law[195] requires WSDOT to install electrical outlets to charge electric vehicles at each state-operated rest stop, to the extent practicable. Although this law does not extend to electrification for commercial vehicles, such regulations provide an opportunity for eventual TEP at safety rest areas.

Truck owners are reducing emissions as they purchase new trucks. EPA and the USDOT's National Highway Traffic Safety Administration jointly finalized standards for medium and heavy-duty vehicles in 2016. The final phase two program promotes a new generation of cleaner, more fuel-efficient trucks by encouraging the wider application of currently available technologies and the development of new and advanced cost-effective technologies through model year 2027. As innovations to reduce emissions also improve fuel efficiency, truck owners have a financial incentive to buy newer, cleaner trucks. The buyer of a new long-haul truck in 2027 could expect to recoup the investment in fuel-efficient technology in less than two years through fuel savings.[196] WSDOT will continue to partner with the EPA's West Coast Collaborative and trucking industry partners. Government regulations and private sector innovation can accelerate innovative technologies.

Manufacturers are working to improve electric trucks. Electric trucks are expected to be more expensive and have shorter range than diesel trucks, but are also likely to have a high return on investment over time, due to fuel savings. Cummins has developed a prototype electric truck designed for urban deliveries. It has a maximum payload of 44,000 pounds and takes one hour to charge. Ford also has developed a prototype electric truck for urban delivery. Tesla is developing an electric truck capable of hauling 34,000 pounds and travelling up to 300 miles on a charge. Trucking companies have an incentive to purchase electric trucks because they can market the environmental benefits to shippers seeking to minimize negative environmental effects from their supply chain.

The Northwest Seaport Alliance is deploying a Vehicle Wait Time Awareness system to address diesel emissions. A lack of freight travel information has negative effects on the efficient

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[195] *RCW 47.38.075. Electrical outlets for electric vehicles at rest areas.* https://app.leg.wa.gov/rcw/default.aspx?cite=47.38.075

[196] *U.S. Environmental Protection Agency.* https://www.epa.gov/newsreleases/epa-and-dot-finalize-greenhouse-gas-and-fuel-efficiency-standards-heavy-duty-trucks-0

movement of freight, planning of daily work activities, the environment of nearby communities, energy consumption, and safety of the traveling public. The system will display wait times and turn times at the Ports of Seattle and Tacoma. This data is available to truckers and dispatchers via the DrayQ mobile device app. The technology works by tracking truck wait and turn time at the ports via Bluetooth or Wi-Fi readers. The availability of real time information should increase efficiency and reduce idling at the ports, with a corresponding decrease in diesel fuel use and emissions. Drivers will be able to know how long wait times are at the terminals and use this information to help them better plan their parking options before departing for the terminals. WSDOT assisted in securing Freight Advanced Traveler Information System (FRATIS) funding for this project and is committed to partnership with the ports to ensure this system is beneficial to the freight industry.

WSDOT will work to reduce emissions on the PCC rail system. WSDOT will work with rail line operators to implement strategies in the Palouse River & Coulee City Rail System Strategic Plan with the goal of ensuring continued maintenance and operations on the system and increasing car-loadings to reduce freight emissions.

WSDOT will continue to address Environmental Justice. Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The Washington State Board of Health is committed to reducing health disparities, including those related to environmental justice.[197] For more than 20 years, WSDOT has been working with USDOT to address environmental justice. Recently, WSDOT updated its guidance on how to conduct a thorough analysis of potential impacts. WSDOT is continuing to improve and expand its work to be even more inclusive. Environmental justice at WSDOT is integral to all of WSDOT's work from planning through maintenance. The goal is to ensure WSDOT's plans and projects reflect the needs and priorities of the communities it serves.[198]

9.3 Shipping oil by rail requires better preparedness

Controversies over pipeline expansions, combined with rapid increases in petroleum production has led to the movement of petroleum products by rail in recent years. Washington has seen a shift in crude oil transportation to refineries and ports. Virtually all oil received in Washington previously had been received by ship or pipeline. The development of the Bakken oil fields in North Dakota, Montana, and Canada, has resulted in oil also now arriving by rail.

Rail shipment has provided a quicker, more flexible alternative to new pipeline projects. In 2014, nearly nine percent of the oil shipped to Washington moved by rail. While regulatory agencies and first responders have been prepared for the potential risks associated with shipping oil by ship or pipeline, shipment of oil by rail presented new risks. The Legislature passed the Oil Transportation Safety Act, ESHB 1449, to help protect the environment and Washingtonians from new oil spill risks, such as transporting oil by rail. The bill specifically directed the

[197] *Department of Health. Environmental Justice Issues.* http://www.doh.wa.gov/DataandStatisticalReports/EnvironmentalHealth/WashingtonTrackingNetworkWTN/Resources/EnvironmentalJusticeIssues
[198] *WSDOT. Environmental Justice.* https://www.wsdot.wa.gov/Environment/EJ/

Department of Ecology's Spills Program[199] to undertake multiple policy initiatives to help address these new risks. These initiatives include advanced notice of oil transfer; railroad contingency planning, Geographic Response Plans, equipment cache grants, and Vessel Traffic Safety Evaluation and Assessment for the Columbia River. In addition, the Operating Budget provided funding for a Puget Sound Vessel Traffic Risk Assessment update. The success of these policy initiatives will require cooperation among stakeholders and continued funding.

New railcar construction technologies will increase the safety of oil train operations through Washington. Tank cars of the DOT category 111 (DOT 111) are considered far less safe for shipping flammable materials than newer cars built specifically for carrying crude.

Monitoring the safety and security of fuel supply chains

The Washington State Department of Ecology is monitoring crude oil transportation. Ecology is implementing the policy initiatives in the Oil Transportation Safety Act of 2015.[200] Controversies over pipeline expansions, combined with rapid increases in petroleum production, has led to the movement of petroleum products by rail in recent years. This includes monitoring and reporting the volume of crude oil transported in Washington. As part of the monitoring role, Ecology has developed a map of oil movement in and out of the state.[201] WSDOT will work with Ecology, as needed, to monitor oil transportation.

[199] *Department of Ecology. Spills.* http://www.ecy.wa.gov/programs/spills/index.html
[200] *Washington State Legislature.* http://lawfilesext.leg.wa.gov/biennium/2015-16/Pdf/Bills/Session%20Laws/House/1449-S.SL.pdf
[201] *Department of Ecology.* http://www.ecy.wa.gov/programs/spills/OilMovement/OilMovementConceptualModel.png

10 STEWARDSHIP

The Washington state transportation system policy goal of Stewardship is: "To continuously improve the quality, effectiveness, and efficiency of the transportation system." The freight objective defined in this plan is to enhance freight transportation system stewardship. WSDOT and freight transportation partners are stewards of the freight transportation system, continuously working to improve the quality, effectiveness, and efficiency of the transportation system. This chapter identifies the significant trends, issues, and needs related to stewardship. Likewise, the strategies relate to system stewardship.

2017 Freight Plan Requirement: 49 U.S.C. 70202

This section of the U.S. Code lists ten required elements that all State Freight Plans must address for each of the transportation modes. This section discusses elements of the following requirements, related to **stewardship**:

(1) an identification of significant freight system trends, needs, and issues with respect to the State;

(2) a description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State;

(5) a description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of freight movement, were considered;

10.1 The freight system needs to be resilient to disruptions

As stewards of the transportation network, it is WSDOT's responsibility to ensure freight system resiliency. System resilience is the capacity of a system to absorb disturbance and retain its basic function and structure. For the freight system, these disturbances can be sudden (e.g., earthquake, flood) or can be more gradual, permanent changes (e.g., change in sea level) that affect freight mobility. Natural disasters like landslides, fires, volcanic eruptions, earthquakes, and flooding can affect freight operations in the state. An important WSDOT objective is to ensure that state highways will be able to provide emergency responders access to damaged portions of the community quickly to provide essential life-saving services. State highways also need to provide economic growth opportunities and to ensure the movement of freight and goods is restored as quickly as possible.

Extreme flooding of the Chehalis River severely affects the movement of freight on the I-5 corridor, with alternate routes unable to absorb the diversion of traffic. The Chehalis River Basin of western Washington is the second largest in the state, second only to the Columbia Basin. In the last two decades, four 100-year floods have occurred there. These extreme flood events severely affected transportation. In 1990, I-5 was closed for one day; in 1996, four days; and in 2007, four days. In 2004, the U.S. Army Corps of Engineers estimated that transportation delay costs for the freeway were $3.4 million per day of closure, and that a 100-year flood would bring 4.5 days of closure costing $15.3 million.[202]

[202] *U.S. Army Corps of Engineers. Centralia flood damage reduction project, Chehalis River, General Re-Evaluation Study: Environmental Impact Statement. 2004.*

Highway closures due to avalanche control, landslides, or bad weather can result in costs to the regional economy. Unexpected closures interfere with commerce, disrupt travel, delay delivery of freight, and increase uncertainty for manufacturers and shippers. Closure-related effects on commercial trucking operations may include violation of mandated curfew hours, increased overtime costs, and missed shipping connections. Mountain pass closures in the winter due to intense snowfall can be very disruptive to the movement of freight. The mountain passes at I-90 Snoqualmie Pass and US 2 Stevens Pass average more than 450 inches of snowfall each winter. Typical traffic volume over Snoqualmie Pass is about 28,000 vehicles per day including approximately 5,600 freight trucks. The typical traffic volume over Stevens Pass is about 4,500 vehicles daily, including approximately 450 freight trucks.

While landslides can disrupt the movement of trucks on the highway system, they can be especially troublesome for freight on the rail system. The rail system has fewer detour options than the highway system and available detours can sometimes add many hours of travel time. Railroads often can clear landslides to allow resumption of freight traffic movement in a few hours, but those delays can sometimes mean a shipment misses a connection. Many landslide-prone slopes can be easily identified and some locations have recurrent slope failures, which can help focus preventative measures. Some historically stable slopes can suddenly fail. In those cases, land development at the top of the slope is often a factor leading to landslide issues.

Washington has a long record of major earthquakes and is one of the five states facing the greatest seismic hazards in the United States. Earthquakes can happen in Washington at any time, and history indicates there may be substantial shifting of land during a seismic event. Historically, the state has experienced earthquakes as high as a 6.8 magnitude, notably the Nisqually earthquake on February 28, 2001. Seven of the ten active faults in Puget Sound are most likely to affect the main roadways that run through the heavily populated urban areas of that region. One of the agency's objectives is to ensure that state highways will be able to provide emergency responders access to damaged portions of the community quickly to provide essential life-saving services. State highways also will need to support restoration of the state's economy and the movement of freight and goods as quickly as possible.

In 2012, the Washington State Seismic Safety Committee published a report[203] that provides the framework for improving resilience when earthquakes occur by proactively reducing critical vulnerabilities. The framework is intended to facilitate long-term implementation of seismic risk reduction policies and activities across the state. Following that framework, WSDOT established a vision to refine its phase-three tier and create an interconnected lifeline of highways[204] with built-in redundancy to provide alternate routes if a segment of highway becomes impassable after an earthquake. To retrofit all the phase-three seismic lifeline routes completely, costs were estimated at well over $1 billion. With limited funding, it would not be possible to secure essential lifeline routes in a timely manner. WSDOT set priorities by focusing on the areas with the highest ground motion, population density, and freight movement (i.e., Puget Sound). Within the greater Puget Sound area, WSDOT evaluated several potential routes. The goal is to

[203] *Emergency Management Division. Seismic Safety Committee.* https://mil.wa.gov/other-links/seismic-safety-committee-ssc
[204] *WSDOT. Seismic Retrofit Program.* https://www.wsdot.wa.gov/Bridge/Reporting/SeismicRetrofitProgram.htm

provide or restore essential services within three to seven days and be fully operational within three months. WSDOT identified a network of mainline routes that can provide the critical corridors needed to get emergency responders into damaged areas rapidly and the state economy moving again as quickly as possible. The Seismic Lifeline[205] routes map shows the corridors needed to provide these essential services with primary routes being I-5, I-405, and I-90. Due to the high costs to retrofit the bridges in downtown Seattle, SR 99 provides an important north/south alternate route with connections to I-5 at the north and south ends.

Improving freight system resiliency

WSDOT will continue to conduct exercises at the WSDOT Emergency Operations Center to prepare for emergencies. Cascadia Rising 2016[206] was an emergency response exercise that tested the life-saving and life-sustaining response operations in the aftermath of a Cascadia Subduction Zone disaster. The exercise hinged on the effective coordination and integration of governments at all levels – cities, counties, state agencies, federal officials, the military, tribal nations – as well as non-government organizations and the private sector. One of the primary goals of Cascadia Rising was to train and test disaster operations together as a joint team. Partners may choose to prepare for emergencies that impact transportation, including avalanches, earthquakes, landslides, and flooding; WSDOT's Emergency Operations Center is critical for planning, testing, and ensuring that WSDOT is ready to respond to all disasters, whether natural disaster, accident or terrorist. WSDOT also will continue to work with partners to improve the resiliency of the freight system (e.g., Resilient America).

WSDOT will update the Freight Economic Corridors system. This designated system of important truck corridors recognizes the importance of freight system resiliency by identifying alternate routes to primary cross-state freight routes during severe weather or other disruptions. The corridors are based on the Freight and Goods Transportation System classifications and are intended to be updated on a regular schedule. WSDOT is making Truck Freight Economic Corridors more resilient as it implements preservation and improvement projects. For example, the I-90 Snoqualmie Pass East project, currently under construction, has been designed to minimize closures because of avalanches and rockslides. Bridge replacement projects are increasing the number of bridges built to current seismic standards. WSDOT also is continuing to retrofit bridges as funding allows. WSDOT will work to use the Freight Economic Corridors system as part of planning and programming activities to advance preservation, safety, and mobility projects.

WSDOT will work to make the BNSF Railway route used by Amtrak Cascades more resilient to landslides. These improvements will benefit the movement of freight as well. The state-supported Amtrak Cascades passenger rail service has experienced service disruptions due to landslides in recent years and sought ways to address the most landslide-prone routes along the corridor. WSDOT's federally funded capital program stabilized six landslide prone sites near Mukilteo and Everett between 2014 and 2016. Since the work was completed, no landslides have reached the railroad tracks in those six locations. Two additional sites are currently

[205] *WSDOT. Seismic Lifeline Routes.* http://www.wsdot.wa.gov/publications/fulltext/Bridge/Seismic.pdf
[206] *Department of Homeland Security. Cascadia Rising 2016 After Action Report.* https://www.fema.gov/media-library/assets/documents/128345

undergoing slope stabilization using state monies and WSDOT plans to take a similar approach at other landslide prone locations affecting Amtrak Cascades service as funding allows.

WSDOT will improve the Commercial Vehicle Emergency Detour Pass system. WSDOT will continue to work with the Washington Military Department (WMD) on the coordination of the system with WMD's Business Re-Entry Pass[207] system. WMD's system provides statewide consistency in the credentials necessary for business representatives to re-enter an impacted area in the event of an emergency, while WSDOT's pass is implemented if a road closure is still in place after three days.

10.2 Regulations may affect supply chain efficiency

Some regulations and policies may have a negative effect on the freight system and supply chains in Washington. Cities that contain the largest warehouse districts in the state, which are essential for distributing food and other consumer goods in urban areas, have seen sales tax revenues decline, increasing the gap between funds needed and available to maintain heavily used truck routes. This was an unintended consequence of the sales and use tax streamlining law passed in 2008.[208] Under this law, retailers in Washington began collecting sales tax based on the point of sale of the shipment instead of the point of origin. The change has significantly decreased tax revenues collected by cities containing warehouse districts. For example, before this change, when a customer in Seattle bought a couch from a Seattle retailer that was shipped to the customer from a warehouse in Kent, the City of Kent received the local sales tax revenue. Now, the tax on this transaction is collected by the City of Seattle. Cities have been receiving mitigation payments to offset lost tax revenue, but those payments will end in 2019. Some cities that have been negatively affected by the change are considering halting or slowing permitting of new warehouse facilities, which would push this essential function further from major population centers.

Counties and cities that plan under the Growth Management Act (GMA) are required to balance industrial land uses with multiple elements such as parks and housing in their comprehensive plans. Limited right-of-way and decreasing developable land in some urban areas can produce conflicts about its highest and best use. These conflicts are most acute with industrial, water dependent freight terminals and other cargo-oriented development areas. Conflicts also can arise when jurisdictions develop bicycle and pedestrian facilities in industrial areas, where users of those facilities interact with large trucks that have limited visibility. Ensuring that warehousing and industrial lands are preserved and protected from local urban development pressures is important to maintain the economic vitality of the state. The issue is most acute with irreplaceable land adjacent to freight infrastructure along waterways, rail lines or near airports.

The Columbia-Snake River System is an important marine freight corridor, but it can be difficult to manage the competing needs and functions involved, such as flood risk management, hydropower, irrigation, fish and wildlife, and recreation functions. In 2016, The U.S. Army Corps of Engineers, Bureau of Reclamation and Bonneville Power Administration began preparation of

[207] *Washington Military Department. Business Re-Entry Pass.* https://mil.wa.gov/form/business-re-entry-pass
[208] *RCW 82.32.730. Sourcing—Streamlined sales and use tax agreement.* http://app.leg.wa.gov/rcw/default.aspx?cite=82.32.730

an environmental impact statement (EIS) on the Columbia-Snake River System operations and configurations for 14 federal projects in the interior Columbia Basin.[209] Changes to the operation of the Columbia River System that affect navigation would also affect the movement of freight.

Current truck size and weight standards are a combination of federal and state regulations and laws. Federal law controls maximum gross vehicle weights and axle loads on the Interstate System. Federal limits are 80,000 pounds gross vehicle weight, 20,000 pounds on a single axle, and 34,000 pounds on a tandem axle group. There are also federal standards for length and width on the National Network (NN). The NN comprises the Interstate and certain roadways designated by the states. There are no federal vehicle height limits. The state laws governing truck size and weight are found in RCW 46.44.041.[210] Washington has a provision under federal law to allow vehicles to operate up to 105,500 pounds on the Interstate Highway System and on non-Interstate highways. Washington has authorized higher weight limits for trucks, but cannot implement them due to the federal limits. Federal law prohibits states from increasing the size and weight of combination vehicles on the Interstate Highway System beyond that allowed in 1991. Similarly, combination vehicles in Washington are limited to two trailers, but Idaho and Oregon allow three trailers. Drivers entering Washington must stop and break down the freight from three trailer combinations, which takes time and reduces delivery efficiency. Truck-trailer length is limited to 28 feet in Washington, with larger combinations limited to intrastate travel and short connections from off-ramps. Other states allow 33 feet, which results in greater utilization and fewer trucks needed to haul goods. Changes to additional length would require appropriate number of axles to minimize roadway damage.

Addressing regulatory challenges

The Washington State Legislature can revise laws that affect cities with warehouse districts. The sales and use tax streamlining law passed in 2008[211] significantly decreased tax revenues collected by cities containing warehouse districts. Cities that contain the largest warehouse districts in the state have experienced decline in sales tax revenues. Mitigation payments offsetting those declines will end in 2019.[212] The Legislature could consider remedies to assist these cities. Cities should continue to inform the Legislature on how this law affects them.

WSDOT will provide local planning guidance to address regulatory requirements. Local governments regulate land uses through the development of comprehensive and transportation plans. WSDOT will continue to encourage inclusion of freight elements in local planning by regularly updating its *Local Planning Resources*[213] document. It details transportation-related requirements, recommendations, and resources for local planning. WSDOT will also continually

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[209] *Columbia River System Operations EIS http://www.crso.info/*
[210] *RCW 46.44.041. Maximum gross weights—Wheelbase and axle factors.* *http://app.leg.wa.gov/RCW/default.aspx?cite=46.44.041*

[211] *Washington State Legislature.* *http://lawfilesext.leg.wa.gov/biennium/2007-08/Pdf/Bills/Senate%20Passed%20Legislature/5089-S.PL.pdf*
[212] *Washington State Legislature.* *http://lawfilesext.leg.wa.gov/biennium/2017-18/Pdf/Bills/Session%20Laws/House/2163.SL.pdf*
[213] *WSDOT Local Planning Guide. http://www.wsdot.wa.gov/sites/default/files/2017/11/14/GMAResource-WSDOTLocalPlanningResources.pdf*

update the Community Planning Portal,[214] which provides access to state transportation data to help local and regional planners, decision-makers, and citizens to better understand the state transportation system.

WSDOT will monitor development of the Columbia River System Operations EIS. The EIS will be addressing changes to the operation of the system that affect navigation and these same changes would affect the movement of freight. Transportation partners have provided comments on the scope of the study, including the Port of Lewiston.[215]

WSDOT will monitor implementation of connected and autonomous vehicles. These vehicles may allow for improvements in travel time for freight and general traffic. As connected and autonomous vehicles get closer to appearing on highways in Washington, WSDOT will need to review how current Washington laws and regulations apply to these vehicles. The National Highway Traffic Safety Administration released the Federal Automated Vehicles Policy in September 2016, which provides a model state policy and describes a framework for the regulation of vehicle testing that Washington can use for guidance.

WSDOT will monitor size and weight regulations on highways. Federal and state laws restrict increasing the size and weight of combination vehicles on the highway system. Changes to size and weight limits may require new laws. Consideration should be made to ensure revisions do not result in significant roadway damage. WSDOT will monitor this issue to determine possible opportunities to harmonize size and weight regulations with bordering states. Improvements to regulations can address truck traffic efficiency in Washington and improve freight access and mobility across borders.

10.3 Freight funding is limited and unpredictable

Stewardship of the state transportation system includes ensuring funding mechanisms are in place to bear the costs of future maintenance and construction of the freight network. Appendix D provides an overview of the roles and responsibilities of transportation partners, including current freight funding mechanisms.

On state highways and bridges, the current levels of funding for maintenance, preservation, and operations may not be enough to keep the Truck Freight Economic Corridors in good condition. With declining conditions, funding for preservation would have to be limited to the highest-priority needs on the most heavily traveled corridors. Therefore, maintenance service levels would need to be reduced. As a result, critical roadway maintenance may have to be deferred to future, allowing smaller problems to become more extensive and more expensive. Truck speed, reliability, and safety also would be affected, due to slower travel and road or bridge closures from flooding and landslides.

The Federal Harbor Maintenance Trust Fund and Airport Improvement Program (AIP) are examples of programs where funding has been diverted to support other federal uses. The federal Inland Waterways Trust Fund will need additional funding to maintain aging freight

[214] *WSDOT. Community Planning Portal.* https://www.wsdot.wa.gov/planning/community/CommunityPlanningPortal.htm
[215] *Port of Lewiston.* http://portoflewiston.com/snake-river-dams/

transportation infrastructure. The federal short line tax credit[216], which provides significant relief for short line railroad companies, has not been reauthorized. Effective capital spending and planning for all modes of transportation requires a multi-year horizon to be effective and efficient.

Identifying stable freight funding

WSDOT will use freight funding programs to support investments that benefit the freight transportation system. Numerous programs fund freight projects. Appendix D describes many of the programs that fund projects to benefit freight preservation, safety, and mobility. Two freight-specific federal programs have been made available recently -- the National Highway Freight Program, and the Nationally Significant Freight and Highway Projects program. Funding for freight projects is identified in Appendix A. WSDOT will continue to use available funds from these programs to support investments that benefit the freight transportation system. WSDOT will provide stewardship of the National Highway Freight Program in Washington. WSDOT will continue to work with partners to identify freight funding priorities. In addition, WSDOT will explore opportunities for public/private partnerships.

Transportation partners should research freight funding mechanisms. One of the fuel tax options evaluated as part of NCFRP Report 15, Dedicated Revenue Mechanisms for Freight Transportation Investment, was a diesel fuel tax with non-freight refunds. This option would target freight highway users through an increase in the diesel fuel tax, along with an increase in tax refunds or credits for non-freight vehicles. States could collect this fuel tax surcharge through the existing system with no incremental cost increase. Another option evaluated was both diesel and gas taxes with non-freight refunds. This option would more equitably cover all types of highway freight vehicles. With increased vehicle coverage, the cost of compliance would also increase. The third option evaluated was a diesel fuel tax with vehicle ID. An electronic monitoring device could be placed on freight vehicles so they could be identified at fueling locations. The implementation cost, as well as the collection and enforcement costs, for this type of tax system would be significant. The final fuel tax surcharge option that was considered was a diesel and gas tax with vehicle ID. This would require the tagging of all vehicles to distinguish between freight and non-freight vehicles so that the states could levy the appropriate tax rates at fueling stations. Vehicle Miles Traveled (VMT) fees are a way to charge vehicle drivers based on the number of miles driven on the highway system. Two basic types of VMT fees were evaluated in the report: distance/vehicle VMT fees and time/location VMT fees. Distance/vehicle VMT fees would vary by vehicle class and vehicle owners would be charged by the number of miles driven. Fees would correlate directly with mileage consistent with a user fee. Time/location VMT fees also could incorporate congestion pricing and other demand management into the fee structure. The Washington State Transportation Commission is developing a Road Usage Charge Pilot Project. USDOT awarded $3.8 million for the study. Expanded federal registration fees for all freight trucks would be a relatively simple and effective means to generate revenue for a dedicated freight infrastructure fund. Fees could be set according to a truck's weight and class to recoup the fees based on the impact certain type of trucks are expected to have on highway infrastructure. This type of tax would be easy to collect

[216] *American Short Line and Regional Railroad Association.* *https://www.aslrra.org/web/Advocacy/Representing_the_Short_Line_Industry/45G_Tax_Credit/web/Advocacy/45G_Tax_Credit.aspx?hkey=55c93c8b-a377-49f0-9669-f5d5b36d83e2*

through existing systems with relatively small increases in labor and electronic processing capabilities. WSDOT will consider researching alternate freight funding mechanisms.

Transportation partners should apply for diesel emission reduction grants. The Environmental Protection Agency administers the Diesel Emission Reduction Act grant program. Funds are provided to states and territories to establish clean diesel grant, rebate, and loan programs. The EPA anticipates approximately $8.6 to $14.9 million available for the fiscal year 2017 State Clean Diesel Grant Program. In 2016, Washington was allocated $328,000 in Clean Diesel funds. The Washington State Department of Ecology (Ecology) manages the state Clean Diesel Grant program.[217] The Volkswagen partial settlement is providing additional funding for the state to invest in emissions reduction.

WSDOT will continue to use the Practical Solutions approach.[218] WSDOT's goal is to identify and solve problems as quickly and inexpensively as possible. Practical Solutions is the approach to achieving the WSDOT mission – how to plan, design, build, operate, and maintain the transportation system. This approach uses performance-based, data-driven decision-making and early community involvement to guide the development and delivery of transportation investments. WSDOT will work with transportation partners to develop coordinated strategies for addressing preservation, safety, mobility, economic vitality, and environmental performance goals. Practical Solutions strategies include: lowest lifecycle cost to preserve the system in a state of good repair; Target Zero strategies for safety; transportation system management; demand management; and capital project investments.[219]

10.4 Freight and economic data is limited

Because much of the freight infrastructure and vehicles in Washington are privately owned and operated, owners consider the data as proprietary and do not share it with the public. Planning for the freight system often can be a challenge as a result. To do better planning and align resources to provide the most benefit, improved freight data is required. In addition, datasets from traditional sources, such as the Freight Analysis Framework, do not give an accurate or complete image of freight in Washington. The reporting of air cargo data is inaccurate, because carriers report it as landed weight. This limitation restricts the ability to understand air cargo volume and trends. Freight intermodal connectors are roads that provide the "last mile" connection between major intermodal freight facilities and the National Highway System. The intermodal connector listing for Washington is outdated, containing several errors that affect planning and programming. WSDOT is one of only a few states that does not have a statewide travel demand model. A travel demand model could be used as an input to economic analysis of freight system optimization that can help explore ways to optimize the freight system and freight planning and investments. Data limitations result in a limitation in developing tools and performance measures to address freight issues and trends.

[217] *Department of Ecology. Air Quality.* http://www.ecy.wa.gov/programs/air/cars/DieselGrantPage.htm
[218] *WSDOT. Practical Solutions.* http://www.wsdot.wa.gov/about/practical-solutions
[219] *WSDOT.* http://www.wsdot.wa.gov/Projects/PracticalDesign/

Improving data, transportation models, and performance measures

WSDOT will update the Washington State Freight and Goods Transportation System (FGTS). The FGTS is a classification system for roadways, railways, and waterways based on freight volume. The FGTS is used to establish funding eligibility for Freight Mobility Strategic Investment Board grants, fulfill federal reporting requirements, support transportation planning process, and plan for pavement needs and upgrades. WSDOT uses this data to designate Freight Economic Corridors. WSDOT, with the assistance of the Association of Washington Cities and the County Road Administration Board, updates the FGTS classifications on a periodic basis as required by the Washington State Legislature. Revisions to the FGTS are developed by the agency having jurisdiction over the roadway segment. WSDOT maintains the statewide database and manages the update process.

WSDOT will continue working with USDOT as a partner to improve national freight data and models. Examples include providing feedback to the continuing development of the USDOT Freight Analysis Framework (FAF) model and working with USDOT to improve wait time data collection methods at border crossings.

WSDOT will evaluate various planning applications and options to improve our understanding of freight demands and needs. This will allow WSDOT to explore ways to optimize the existing freight system in Washington, as well as freight planning and investments. Washington is one of the very few states that does not have a statewide freight travel demand model. WSDOT will explore opportunities to develop a statewide travel demand model. This model could provide input to freight optimization tools and provide better understanding of the freight system. Economic Modeling Tools can evaluate total economic effects of changes to transportation systems to better guide decision making, and allow forecasting to describe more fully the far-reaching economic and operational effects of transportation projects and policies. Network Optimization Tools can quantify supply chain performance; use macro/micro level data with greater confidence and reliance; identify infrastructure and economic constraints that would result in practical solutions; and prioritize investment needs within the freight system. These tools could allow WSDOT to develop a Statewide Freight Optimization Strategy that could enhance our understanding of goods movement in the state and inform decisions about the freight system.

Transportation partners will research freight transportation effects on county roads. The Washington State Association of Counties, in cooperation with state agencies, will evaluate and report on the impact of increased freight and rail traffic on county roads in the 2017-2019 biennium. WSDOT also is working on better truck count data and working with partners in the state to make sure data collected is usable for their needs.

Transportation partners should improve pavement data. The FHWA released the pavement condition performance measure final rule on January 18, 2017. It documents the methods and minimum acceptable criteria to be used to measure pavement condition on the NHS. The rule also requires the state to coordinate with local agencies to set pavement performance targets for both interstate and non-interstate roadways. In anticipation of this rule, WSDOT collaborated with Metropolitan Planning Organizations (MPOs) to set up a series of teams to work on setting targets for these measures. These teams will analyze proposed targets and their implications for WSDOT, MPOs, and the 102 cities and counties with pavement on the NHS. The teams also

will make recommendations based on their analyses. WSDOT will continue to work with partners to improve pavement data.

WSDOT and transportation partners continue to improve performance measures. WSDOT is currently tracking the implementation of federal rules that are intended to improve transportation system performance in Washington. WSDOT also is working together with MPOs to develop a collaborative approach in support of data, process, and target setting decision-making. When developing new performance measures, WSDOT will consider important industries in the state, and consider the state's transportation system policy goals. Data availability also will be a key consideration. WSDOT will work with partners to set performance targets and to track and report on federal performance measures over time.

10.5 Communication and coordination are essential

While there is already much communication and coordination between participants in the multimodal freight transportation system, there are opportunities for improvements. WSDOT has several areas where it can improve communication to benefit freight system users. Oversize or overweight permit holders sometimes receive notices of planned highway closures from WSDOT without enough time to plan an alternate route, causing delays. The Commercial Vehicle Emergency Detour Pass system also would benefit from improvements to provide more information and distribute it to users faster. The WSDOT design manual does not always address truck needs to highway engineers clearly. Solving many of the most vexing challenges facing the freight system in Washington will require collaboration across the public and private sectors, across jurisdictions, and across modes. Regional and local partners also coordinate on freight issues. As issues and strategies are identified, communication and involvement with WSDOT can be enhanced.

Enhancing communication and coordination

WSDOT will continue to enhance communication and coordination about freight. WSDOT will report on freight performance in the Gray Notebook on a semi-annual basis. WSDOT staff will participate in webinars on freight topics to improve their knowledge of freight topics and share information about Washington with others. WSDOT will continue to conduct internal Freight Working Group meetings to share information within the organization.

WSDOT will continue to coordinate with multi-state coalitions. These groups provide opportunities to share information across state lines. Examples include the Great Northern Corridor Coalition, the American Association of State Highway and Transportation Officials (AASHTO) Freight Working Group, the Coalition for America's Gateways and Trade Corridors, North/West Passage, and the Western States Freight Coalition. Another example is the AASHTO Special Committee on Freight, which Washington State Secretary of Transportation Roger Millar chairs.[220] WSDOT will coordinate with adjacent states on freight issues and participate in national conversations regarding freight to develop and implement multimodal solutions.

[220] *AASHTO Special Committee on Freight. http://news.transportation.org/Pages/StateDotNewsDetail.aspx?MessageId=54269*

WSDOT will continue to manage and improve the Freight Alerts[221] email service. WSDOT uses the Granicus (formerly GovDelivery) service to send freight-specific email messages (and in some cases text messages) to subscribers, called Freight Alerts. WSDOT's Freight Alerts email service, which currently has nearly 3,000 subscribers, helps truck drivers identify and plan for traffic delays, construction projects and road closures. WSDOT regularly uses Freight Alerts to communicate with the trucking industry. In 2016, WSDOT used the service to communicate emergency response and repair activities related to the I-5 Chamber Way bridge that was struck by an oversized truck. WSDOT used the service to notify freight haulers that traffic was backed up for nearly 12 miles during the initial incident. This information allowed truck drivers to alter routes or travel times to avoid the backup. Several days later, WSDOT used a Freight Alert to notify truck drivers that both directions of I-5 traffic would be detoured overnight onto the exit and entrance ramps at Chamber Way while a contractor installed a temporary bridge. The use of the Freight Alert system – in conjunction with a traffic control plan, advanced notifications and light traffic volumes – helped keep backups to a minimum during this event.

WSDOT will continue to test and enhance the Commercial Vehicle Emergency Detour Pass[222] system. The pass system supports freight movement by authorizing emergency, essential, and other goods delivery through affected areas during emergency highway disruption greater than three days. In 2015, WSDOT tested the system with an exercise that was similar to a major flood event in 2007. The exercise activated the system with a test group of stakeholders located throughout the state that involved participation from drivers, dispatchers, and trucking managers from companies that would need access through a restricted route during an emergency. The system was evaluated starting from the initial activation and notifications, to the end-user being issued their pass. WSDOT operated and monitored the live system from the WSDOT Headquarters Emergency Operations Center in Olympia, while trucking companies received messages about roadway closures and navigated the system to print a pass. An after-action report identified several areas for improvement that WSDOT can address. Continually testing and improving the system will ensure readiness for a major disruptive event in the future.

WSDOT will review and comment on national freight transportation documents. This will improve communication between federal, state, regional, and local partners. WSDOT plans to review and provide comments on the National Freight Strategic Plan and the National Multimodal Freight Network, when these documents are available for review. WSDOT also will encourage transportation partners to review and comment.

Transportation partners should continue to support research and promote adoption of new technologies and best practices. Higher education resources within the state, such as Washington State University or the University of Washington's Urban Freight Lab can be leveraged to advance technologies and practices that improve the movement of freight.

WSDOT will continue to improve the state rail programs. WSDOT and the Ports of Moses Lake, Walla Walla and Whitman County developed a strategic plan for the Washington State Grain Train program[223] in 2017. The program was started in 1994 to provide grain growers and co-ops

[221] *WSDOT. Freight Alerts. http://www.wsdot.wa.gov/freight/*
[222] *WSDOT. Commercial Vehicle Emergency Detour Pass. http://www.wsdot.wa.gov/CommercialVehicle/detourpass.htm*
[223] *WSDOT. Washington Grain Train. https://www.wsdot.wa.gov/Freight/Rail/GrainTrain.htm*

in Washington a rail option that has since moved millions of tons of grain. The study was conducted to ensure that the grain train program continues to evolve to meet shippers changing needs, including: to move grain from smaller elevators to shuttle elevators, barge terminals on the Columbia and Snake rivers, and to deep water ports for ultimate export to markets such as Asia. WSDOT administers the Freight Rail Investment Bank (FRIB) and Freight Rail Assistance Program (FRAP) programs to support freight rail capital needs. WSDOT will enhance the FRIB and FRAP programs to address the most cost-effective investments in the short line rail system utilizing the principals of practical solutions. Administrative improvements to the programs may include the solicitation process, including application questions, criteria, and scoring.

WSDOT will update the *Design Manual*[224] to better address truck needs. The manual provides policies, procedures, and methods for developing and documenting the design of improvements to the transportation network in Washington. It was developed for state facilities and may not be appropriate for all county roads or city streets that are not state highways. Recent updates to integrate current freight information include Chapter 1010: Work Zone Safety and Mobility, Chapter 1102: Context Determination and Chapter 1330: Traffic Control Signals.

WSDOT and partners will continue to identify opportunities to integrate freight in multimodal planning activities. There is a need to coordinate freight planning with other transportation modes, including issues related to truck traffic in relation to pedestrians, bicycles, and buses. These modes sometimes compete for space on primary truck routes. One example is Complete Streets, a multimodal planning initiative that may affect freight efficiency. The Transportation Improvement Board was funded $3.3 million in the 2017-2019 biennium[225] to administer a Complete Streets program described in state law that does not explicitly identify freight users.[226] WSDOT is undertaking an initiative called the Corridor Sketch Initiative to engage agency partners and define the context and performance information for all highway corridors in the state. It also will look at local roadways, particularly in industrial and commercial areas, or other first-mile or last-mile connections. WSDOT will work with partners to integrate freight delivery into plans for livable communities, ensuring that freight and small package delivery is an integral component of complete streets, providing efficient access to jobs, businesses, and residences even in dense, walkable communities.

WSDOT will improve communication of lane restrictions and closures within WSDOT and with the public. During construction or maintenance activities, work crews sometimes reduce lane widths to allow for work activities. WSDOT provided numerous Freight Alerts to notify the freight industry of these activities, such as this one sent in spring 2017: "*Oversized and overweight restrictions on I-90 east of Snoqualmie Pass for the week of May 8 – 12"*. These alerts are intended to provide additional information to the freight industry and allow them to make adjustments to their trips, taking into account the information provided. In this case, while carriers of oversize loads are required to check for vertical or width restrictions, after they receive their permits, they may not be aware of the new restriction until they enter the work zone. These events cause safety and mobility concerns. By ensuring WSDOT staff issuing

[224] *WSDOT. Design Manual.* http://www.wsdot.wa.gov/Publications/Manuals/M22-01.htm
[225] *Washington State Legislature.* http://leap.leg.wa.gov/leap/Budget/Detail/2017/ctbillaspassed_0421.pdf
[226] *RCW 47.04.320. Complete streets grant program.* http://apps.leg.wa.gov/rcw/default.aspx?cite=47.04.320

oversize load permits get timely notifications of lane restrictions, WSDOT can help drivers safely complete their trips with minimal delays.

WSDOT will minimize construction impacts on freight. In 2016, WSDOT conducted a best practices study of construction effects on transit and freight.[227] The report identifies opportunities for improvement largely related to engagement and collaboration. It also makes process recommendations to minimize construction impacts on transit and freight, including improving the construction traffic management program, and reviewing WSDOT guidance documents for consideration of transit and freight.

WSDOT will continue to collaborate with partners on freight initiatives. Regional and local partners also coordinate on freight issues and develop plans and studies to better understand freight trends and issues, and to identify strategies and investments that focus on freight. The PSRC's FAST Freight Advisory Committee[228] and Regional Freight Mobility Roundtable[229] are examples of regional freight work groups in which WSDOT participates. WSDOT also participates on Seattle's Freight Advisory Board.[230] The Cowlitz-Wahkiakum Council of Governments is updating its regional plan, and are including freight as a primary focus area. The Wenatchee Valley Transportation Council's 2014 Urbanized Area Freight Study[231] provides a freight plan for the region and identifies specific truck routes. The Palouse Regional Transportation Planning Organization recently completed a Regional Freight Study.[232] The Southwest Washington Freight & Commerce Task Force, formed by regional business leaders, meets with the Southwest Washington Regional Transportation Council. WSDOT will continue working with FMSIB, cities, counties, tribes, and ports, to identify freight issues and work towards improving freight movement. WSDOT also will work with regional planners to advance work on statewide freight issues individually and through the MPO/RTPO/WSDOT Coordinating Committee. These regional studies, and coordination with the freight industry, advance freight understanding in Washington and can help WSDOT better understand the numerous freight trends and issues statewide.

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[227] WSDOT. Highway Construction and Traffic: Minimizing Impacts to Transit and Freight Through Best Practices. http://www.wsdot.wa.gov/publications/fulltext/LegReports/15-17/HighwayConstructionAndTrafficReport.pdf

[228] Puget Sound Regional Council. FAST Freight Advisory Committee. https://www.psrc.org/committee/fast-freight-advisory-committee

[229] Puget Sound Regional Council. Regional Freight Mobility Roundtable. https://www.psrc.org/committee/regional-freight-mobility-roundtable

[230] City of Seattle. Seattle Freight Advisory Board. https://www.seattle.gov/seattle-freight-advisory-board

[231] Wenatchee Valley Transportation Council. 2014 Freight Study. https://static1.squarespace.com/static/533203c6e4b00ce9525a703e/t/54dba91ce4b0b1cb522780b6/1423681820726/Final+Freight+Study+8-2014.pdf

[232] Palouse Regional Freight Study. http://www.palousertpo.org/index_htm_files/PRTPO%20FINAL_3_8_16.pdf

11 NEXT STEPS

WSDOT intends to update the *2017 Washington State Freight System Plan* in 2022, consistent with state freight plan update requirements described in federal law. That plan update will be informed by the planning work conducted to implement this *2017 Washington State Freight System Plan*. WSDOT will work with transportation partners in these implementation activities.

Freight transportation system strategies were developed using an objective, transparent, and broadly accepted process that links to the goals and objectives set forth at the outset of this plan. The issues, trends, and needs that have been identified correspond to the Washington state transportation system policy goals, including: economic vitality, system preservation, safety, mobility, environment, and stewardship. Exhibit 11-1 presents a summary of the strategies that WSDOT will use to implement this *2017 Washington State Freight System Plan*, including guiding freight planning and informing project investments in the future. Context and details are described in the chapters corresponding to each goal.

Exhibit 11-1: Summarized Areas of Focus

Transportation System Policy Goals	Areas of Focus
Economic Vitality	Promoting international trade
	Improving competitiveness of marine ports
	Protecting freight-dependent industrial sites
	Addressing freight employment needs
	Improving intermodal connections
Preservation	Addressing pavement and bridge preservation needs on major truck routes
	Addressing rail infrastructure needs
	Addressing port and terminal infrastructure and navigation aides
	Addressing air cargo pavement conditions
Safety	Reducing truck-related fatalities and serious injuries
	Assessing opportunities to improve truck parking
	Improving rail safety
	Enhancing rail crossing safety
	Enhancing freight security and defense capabilities
Mobility	Addressing traffic congestion and truck bottlenecks
	Improving rail system capacity
	Improving marine system congestion
	Evaluating air cargo capacity statewide
	Addressing changing supply chain dynamics

Transportation System Policy Goals	Areas of Focus
	Monitoring emerging technologies
Environment	Assessing vulnerability of climate impacts
	Reducing diesel emissions
	Monitoring the safety and security of fuel supply chains
Stewardship	Improving freight system resiliency
	Addressing regulatory challenges
	Identifying stable freight funding
	Improving data, transportation models, and performance measures
	Enhancing communication and coordination