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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 doesn't 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.

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 system. 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; and
- a blueprint of strategies to address the identified trends, issues, and needs.

This plan includes two additional key components:

- A 2017 Washington State Freight Investment Plan that describes key funding sources, networks eligible for funding, and projects identified on those networks; and
- A 2017 Washington State Marine Ports and Navigation Plan 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. These ten requirements, and how they are addressed within this plan, are as follows:

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.

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 section 70101(b) of title 49, United States

Code 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 state requirements in RCW 47.06.045²,
which states the following: “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,

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² https://app.leg.wa.gov/rcw/default.aspx?cite=47.06.045
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 freight 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 daily necessities of life to residents. 
Goods are shipped into, out of, within, and through Washington on the 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.\(^3\) 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.\(^4\) 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.\(^5\) In the 
same period, $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, construction, transportation, and agriculture/timber and wood products), and 
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; and
- **Delivering Goods to You**, representing local freight delivery for business and residents.

1.4.1 Global Gateway

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.

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.\(^8\) The top 
commodity group exported to Asia by value includes transportation equipment, accounting for

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\(^3\)Trade dependence is defined as the total international import and export value through the state 
divided by the state population.

\(^4\) United States Census Bureau, Foreign Trade State data: [https://www.census.gov/foreign-

\(^5\) U.S. Department Trade of Commerce, International Trade Administration, Export Product Profile 

\(^6\) [https://www.census.gov/foreign-trade/statistics/state/data/imports/wa.html](https://www.census.gov/foreign-trade/statistics/state/data/imports/wa.html)

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

\(^8\) U.S. Department Trade of Commerce, International Trade Administration, 2016 NAICS Total All 
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, and the Ports of Seattle and Tacoma 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 total economic impact of the maritime sector in 2015 includes $12.5 billion in labor income and $37.8 million in business revenue across Washington. 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). Sea-Tac offers 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.

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 exports 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.

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.

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. Rural Washingtonians rely on the freight system to ship Washington-made products to local customers in the state, to U.S. markets in California and on the East Coast, and worldwide.

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11 Port of Seattle, Air Cargo at Sea-Tac: [https://www.portseattle.org/Cargo/AirCargo/Pages/default.aspx](https://www.portseattle.org/Cargo/AirCargo/Pages/default.aspx)
12 [https://www.portseattle.org/About/Publications/Documents/pos_eco%20impact_seatac.pdf](https://www.portseattle.org/About/Publications/Documents/pos_eco%20impact_seatac.pdf)
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. Agriculture and food processing activities have large economic impacts within Washington. These activities supported 220,600 jobs and $36 billion in business revenue in 2013. 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. The aerospace industry is a major contributor to the state economy and an essential link in the global aerospace supply chain. In 2015, it directly supported 93,800 jobs in Washington, accounting for 19.2 percent of total aerospace employment in the U.S. The industry produced a total economic impact of 252,800 jobs (including direct, indirect, and induced jobs) and $94.7 billion in business revenues to the state. Total exports of aircraft and parts from Washington to foreign countries was valued at $46.5 billion in 2016.

The aerospace industry in Washington is anchored by Boeing, one of the largest aircraft manufacturers in the world. 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 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 multistate 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. 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.

16 Washington State Department of Revenue, Quarterly Business Reviews Calendar 2015: http://dor.wa.gov/Content/AboutUs/StatisticsAndReports/stats_qbr.aspx
18 U.S. Census Bureau, State Trade Data: https://www.census.gov/foreign-trade/statistics/state/data/wa.html
Exhibit 1-1: Aerospace Supply Chain

LEGEND

Aerospace Product and Parts Manufacturing Business Locations
WSDOT Truck Freight Economic Corridors
- T-1 Corridors
- T-2 Corridors
- Alternative Freight Routes
- First/Last Mile Connector Routes to T-1/T-2 Corridors

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 Washington apple orchards. For the 2014-15 crop year, a total of 50 million boxes were exported to international markets, with 16 million boxes exported to Mexico and 7 million boxes exported to Canada by truck. The remaining 27.4 million boxes were trucked to the 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 of the 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. Exhibit 1-2: shows the locations of apple packing facilities on Truck Freight Economic Corridors.

Exhibit 1-2: Apple 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.

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 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
Washington milk 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 1-3 shows the locations of dairy plant facilities on Truck Freight Economic Corridors.

**Exhibit 1-3: Milk Supply Chain**

![Map of Washington State showing milk supply chain](image)

**LEGEND**

- Dairy Processing Plants
- Pasture

**WSDOT Truck Freight Economic Corridors**

- T-1 Corridors
- T-2 Corridors
- Alternative Freight Routes
- First/Last Mile Connector Routes to T-1/T-2 Corridors

**Wheat supply chain**

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

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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 Washington wheat moves by truck and barge, and another five percent moves by rail and barge from field to Portland. From these seaport terminals, grain is loaded onto ocean freighters and exported around the world. Exhibit 1-4 shows the locations of cereal grain production fields on rail and marine Freight Economic Corridors.

Exhibit 1-4: Wheat Supply Chain

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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 Washington potatoes are grown in three distinct growing regions: lower Columbia Basin, upper Columbia Basin, and Skagit Valley.

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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), fresh potatoes (8 percent), dehydrated potato products (12 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). Exhibit 1-5 shows the locations of potato processing/packing facilities on Truck Freight Economic Corridors.

Exhibit 1-5: Potato Supply Chain

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Washington State Potato Commission.
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 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 are typically consolidated in a 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 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 Washington has no local crude oil production, it serves as a major refining center for Pacific Northwest markets with five refineries. Refineries in Washington can refine 633,700 barrels per day. Together they provide 3.4 percent of U.S. refining capacity. 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 exporter of refined petroleum products, as the refineries produce more products than the state consumes. In 2015, 67.4 percent of Washington-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.

The Washington Research Council calculated the total economic impact was 25,012 jobs (2,097 direct jobs, and 22,915 indirect and induced jobs) with a total income contribution of $1.86 billion.

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24 Ibid.
to the state economy in 2015.\textsuperscript{25} 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 growth of production in North Dakota.\textsuperscript{26}

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.\textsuperscript{27}

1.5 Relation to National Multimodal Freight Policy

It is the policy of the United States, as described in 49 U.S.C. §70101,\textsuperscript{28} 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; and
- Rural farm-to-market, natural resource, and manufacturing industries that provide employment in non-urban areas.

\textsuperscript{25} 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.\textsuperscript{26} Ibid.\textsuperscript{27} Ibid.\textsuperscript{28} https://www.gpo.gov/fdsys/pkg/USCODE-2015-title49/pdf/USCODE-2015-title49-subtitleIX-chap701-sec70101.pdf
1.6 Relation to State Transportation System Policy Goals

RCW 47.04.280 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 objectives and strategies described in this freight 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;
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; and
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 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 activities completed, which have been integrated into this plan:

- Railroad condition: In 2015, WSDOT completed a study of short line rail inventory and needs. Needs identified in that study are reported in this plan.30
- 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 2016, 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.
- 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.31

29 http://apps.leg.wa.gov/rcw/default.aspx?cite=47.04.280
30 http://www.wsdot.wa.gov/research/reports/fullreports/8421.pdf
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.\(^3\)

At-grade rail crossing prioritization: A study was completed in 2017, JTC Prioritization of
Prominent Road-Rail Conflicts,\(^3\) 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.\(^3\)

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.\(^3\)

Marine: In early 2017, the Washington Public Ports Association released the draft 2016
Washington State Marine Cargo Forecast, which assesses opportunities for and the
capacity of the marine freight system. The 2017 Washington State Freight System Plan
will be updated once the 2016 Washington State Marine Cargo Forecast is finalized.

While developing the 2017 Washington State Freight System Plan, WSDOT concurrently
prepared to related plans: 2017 Washington State Freight Investment Plan and 2017

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) requires that each state freight plan include a freight investment
plan that:

- 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 $96 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 June 2015,
Second Engrossed Substitute House Bill 1299 Chapter 10 Laws of 2015 Section 307(2)[1]
included language that stated: “Any federal funds gained through efficiencies, adjustments to
the federal funds forecast, additional congressional action not related to a specific project or
purpose, or the federal funds redistribution process must then be applied to highway and bridge
preservation activities.” Furthermore, the 2016 Legislature provided federal appropriation
authority for the 2015-17 biennium that reinforced funding asphalt and concrete preservation
projects, in keeping with the previous year’s requirement to fund highway and bridge

\(^3\) http://www.wsdot.wa.gov/NR/rdonlyres/80660C69-94ED-4613-8F2F-
F44C296CBAF9/0/ListofCertifiedCriticalUrbanandRuralFreightCorridors.pdf
\(^3\) http://leg.wa.gov/JTC/Pages/Road-Rail-Study.aspx
\(^3\) http://www.wsdot.wa.gov/Freight/truckparking.htm
\(^3\) http://www.wsdot.wa.gov/aviation/Planning/wasp.htm
preservation activities. This legislative direction reflects the importance of the NHFP goal to improve the NHFN’s state of good repair. When FHWA provided the FFY 2017 apportionment, WSDOT followed this legislative direction and obligated the funds to complete the construction of three preservation projects. Exhibit 1-7 in Appendix A shows the projects funded by the NHFP from the first three years of available funding.

Following passage of the 2016 Washington State Transportation Budget, the Governor convened an advisory group of legislators, local government entities and various users of the transportation system to review current distributions of federal highway formula funds to the state and local governments under the FAST Act. This FAST Act workgroup recommended that future NHFP funding for 2017-19 biennium be allocated to the state using the project prioritization recommendations made by WAFAC.

Working through MPOs/RTPOs across the state, WSDOT initiated a call for freight projects in 2016, which culminated in a tiered freight project list that WSDOT and the WAFAC submitted to OFM and the Legislature last fall. The Legislature provided WSDOT with additional direction to validate the projects on the list in the 2017-19 Transportation Budget (ESB 5096, Sec. 311(5)).

For FFY 2018, WSDOT has validated roadway and multimodal construction projects between June and August 2017, and allocated FFY 2018 National Highway Freight Program (NHFP) funds to six projects after consultation with the Washington State Freight Advisory Committee (WAFAC).

Validation of projects for FFY 2019-2020 NHFP funding is underway, and will be complete by November 2017. Based on consultation with WAFAC, WSDOT will prioritize projects for funding when complete. A validated, prioritized, fiscally constrained freight project list that meets federal requirements will be included in the final 2017 Washington State Freight Investment Plan. It will include all NHFP-funded projects in Washington, and show how NHFP funds are to be invested and matched. The 2017 plan is required to be approved by the Federal Highway Administration by December 4, 2017.

Marine Ports and Navigation Plan

The goal of the 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 of RCW 47.06.070, and to support the preservation and enhancement of the marine freight system in Washington.

This plan primarily 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.

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36 Marine Ports and Navigation Plan. RCW 47.06.070. [https://app.leg.wa.gov/rcw/default.aspx?cite=47.06.070](https://app.leg.wa.gov/rcw/default.aspx?cite=47.06.070)
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, instead relying 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, 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 primarily use nearby major intermodal facilities in the neighboring states of Idaho and Oregon and the province of British Columbia for their logistics needs. Vancouver 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 may use the Portland International Airport, located 12 miles from downtown Vancouver, or may use the Portland marine port, located eight miles from downtown Vancouver, more often than other intermodal facilities within Washington. Several high volume truck corridors in Idaho, Oregon, and British Columbia perform as primary routes for companies shipping and carrying freight in Washington. For example, trucking companies carrying goods from Vancouver to eastern Washington often use Interstate 84 in Oregon instead of SR 14, the parallel route in Washington. Likewise, the Trans-Canada Highway in British Columbia is the primary east-west truck corridor across 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 WSDOT has not designated a final 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

In 2016, USDOT established the interim National Multimodal Freight Network\(^{37}\) in consultation with 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\(^{38}\) and a table\(^{39}\) 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 and other transportation systems such as the rail, marine, and air systems. There are 88 designated National Highway System (NHS) intermodal connectors in Washington,\(^{40}\) 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).\(^{41}\)

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 east, with urban markets in western Washington, along with global markets via the Ports of Seattle and Tacoma.

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\(^{37}\) https://www.transportation.gov/freight/InterimNMFN


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 (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.

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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.\(^{43}\) WSDOT classifies all highways, county roads, and city streets by reported annual gross truck tonnage, ranging from T1 with the highest tonnage, to T5 with the least tonnage.\(^{43}\) WSDOT prepares a biannual 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.\(^{44}\)

\(^{43}\) RCW 47.05.021  
\(^{44}\) http://www.wsdot.wa.gov/Freight/FGTS/
2.2.3 Truck Freight Economic Corridors

WSDOT, working with FMSIB, the freight industry, MPOs and RTPOs, and many cities, counties, ports, and tribal governments, established the Truck Freight Economic Corridors in 2014. The designations were built upon the FGTS classification by considering resiliency and first/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: T1 and T2 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.

http://www.wsdot.wa.gov/Freight/EconCorridors.htm
2.2.4 National Highway System

The National Highway System\(^{46}\) (NHS) is considered the backbone of the nation's economy, as well as 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 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 that provide first- 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.

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2.2.5 Strategic Highway Network

The Strategic Highway Network\(^47\) (STRAHNET) is a designated national network that is important to national strategic defense and is 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.\(^48\) 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,\(^49\) 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 of 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 and more than 20 short line railroads operate over more than 3,300 miles of track in Washington.

The BNSF Railway Company (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 container yards: Seattle, Spokane, and Tukwila. Rail yards are located in Auburn, Bellingham, Centralia, Everett, Pasco, Seattle, Spokane, Tacoma, Vancouver, Wenatchee, Wishram, and Yakima.

The Union Pacific Railroad (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 Tacoma and Tukwila. The UP has two commercial intermodal container yards: Denver Ave. in Seattle, and TacSim in Tacoma.

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\(^48\) [http://www.globalsecurity.org/military/facility/ppp.htm](http://www.globalsecurity.org/military/facility/ppp.htm)

\(^49\) [https://ops.fhwa.dot.gov/freight/infrastructure/national_network.htm](https://ops.fhwa.dot.gov/freight/infrastructure/national_network.htm)
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, 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- 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 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.

Exhibit 2-3: Rail Freight Economic Corridors

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50 https://www.aslrra.org/
51 http://www.wsdot.wa.gov/Freight/EconCorridors.htm
2.3.2 Strategic Rail Corridor Network

The Department of Defense and the Federal Railroad Administration established the Strategic Rail Corridor Network (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. Many of the heavy and tracked military vehicles 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 system in Washington consists of the Pacific Ocean, the Salish Sea, and the Columbia Snake River System. The marine freight system consists of waterways, ports, and intermodal landside connections that allow the roadway and railway systems to move freight to, from, and on 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 traded globally from ports and terminals. Both ships and barges traverse the Pacific Ocean. There is one deep-draft port capable of handling ocean going vessels, which is in Grays Harbor.

The Salish Sea is composed of three large bodies of water (i.e., 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.

The Columbia Snake River System is composed of the two connected rivers that facilitate commercial navigation. There are 20 ports on the Columbia Snake River System; eight deep-draft ports are capable of handling ocean-going vessels on the Columbia River, and ten shallow-draft ports are served by barge. From Clarkston, Idaho, to the Pacific Ocean, the river system has eight locks along its 360 miles of commercially navigable channels.

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 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.
2.5 Air Cargo System

Air cargo consists of air freight, which includes all non-mail items 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. Freight shipped by air typically needs to arrive at its destination faster than the timeline other modes can provide. Whether 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 is often time sensitive.

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; most of these airports are in the northwestern part of the state, most likely due to the concentration of population in that area. Generally, air cargo activity in Washington is highly concentrated, primarily occurring at Sea-Tac, King County International Airport, and Spokane 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 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.
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, 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. 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.

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; smaller pipelines branch 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.

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

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53 [https://www.utc.wa.gov/regulatedIndustries/transportation/pipeline/Pages/pipelineMaps.aspx](https://www.utc.wa.gov/regulatedIndustries/transportation/pipeline/Pages/pipelineMaps.aspx)
54 [https://www.eia.gov/state/maps.php](https://www.eia.gov/state/maps.php)
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. Jobs are expected to grow 17 percent from 3,503,209 in 2014 to 4,085,682 jobs in 2024. 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) 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. In 2015, nearly 18.0 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 are shipped 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, moving 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 percent.

---

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

### Exhibit 3-1: Weight of Freight by Mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>2015</th>
<th>2035</th>
<th>% Change</th>
<th>% Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Million Tons</td>
<td>Percent of Total</td>
<td>Million Tons</td>
<td>Percent of Total</td>
</tr>
<tr>
<td>Truck</td>
<td>11,396</td>
<td>63%</td>
<td>14,550</td>
<td>64%</td>
</tr>
<tr>
<td>Rail</td>
<td>1,773</td>
<td>10%</td>
<td>2,028</td>
<td>9%</td>
</tr>
<tr>
<td>Water</td>
<td>714</td>
<td>4%</td>
<td>856</td>
<td>4%</td>
</tr>
<tr>
<td>Air</td>
<td>6</td>
<td>&lt;1%</td>
<td>12</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Multiple modes &amp; mail</td>
<td>438</td>
<td>2%</td>
<td>632</td>
<td>3%</td>
</tr>
<tr>
<td>Pipeline</td>
<td>3,358</td>
<td>19%</td>
<td>4,446</td>
<td>19%</td>
</tr>
<tr>
<td>No domestic mode</td>
<td>259</td>
<td>1%</td>
<td>246</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17,944</strong></td>
<td><strong>100%</strong></td>
<td><strong>22,770</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

* Includes crude petroleum imports that arrive by water at a waterside refinery.


### Exhibit 3-2: Value of Freight by Mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>2015</th>
<th>2035</th>
<th>% Change</th>
<th>% Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>13,181</td>
<td>69%</td>
<td>19,657</td>
<td>67%</td>
</tr>
<tr>
<td>Rail</td>
<td>787</td>
<td>4%</td>
<td>1,257</td>
<td>4%</td>
</tr>
<tr>
<td>Water</td>
<td>483</td>
<td>3%</td>
<td>695</td>
<td>2%</td>
</tr>
<tr>
<td>Air</td>
<td>622</td>
<td>3%</td>
<td>1,584</td>
<td>5%</td>
</tr>
<tr>
<td>Multiple modes &amp; mail</td>
<td>2,334</td>
<td>12%</td>
<td>3,890</td>
<td>13%</td>
</tr>
<tr>
<td>Pipeline</td>
<td>1,486</td>
<td>8%</td>
<td>1,863</td>
<td>6%</td>
</tr>
<tr>
<td>No domestic mode</td>
<td>170</td>
<td>1%</td>
<td>162</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19,700</strong></td>
<td><strong>100%</strong></td>
<td><strong>29,108</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

* Includes crude petroleum imports that arrive by water at a waterside refinery.

3.2 State Freight Forecasts

Freight forecasting data for Washington was also obtained from the best available data sources for each mode. For truck, rail, and pipeline modes, data was obtained from FAF4. The Washington Aviation System Plan (WASP) was used, and the Washington State Marine Cargo Forecast (MCF) will be used when it is ready, to provide more granular and comprehensive analysis for Washington, and to consider regional trends and constraints to produce future forecasts. The FAF4 modal forecast is not comparable to the MCF or the WASP due to several major differences:

- Mode classification: FAF4 classifies intermodal shipments, such as truck-rail and truck-water, as a separate category, “Multiple Mode,” and excludes those from specific modal forecasts. The MCF and WASP incorporate multimodal freight shipments in the forecast if the transshipment involves water or air mode.

- Data sources: FAF4 uses 2012 Commodity Flow Survey as the major source, while MCF uses a variety of data sources, including Transearch, and WASP uses data collected from individual airport records.

- Mode of transportation: The forecasts in MCF and WASP include both domestic shipment and international import and export by water/air, while the modal forecast from FAF4 are domestic modes to avoid double counting. 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. Because of this, the FAF4 database export and import shipments by water, which arrive or leave the port of entry by truck or rail, are accounted under truck or rail forecasts.

- Measures: FAF4 uses measures including tonnage (short tons), ton-mile, and value; while MCF and WASP use different volume measures, such as weight in metric tons and Twenty-foot Equivalent Units (TEU) for container traffic.
Exhibit 3-3 shows a comparison of annual growth rate for freight tonnage between the national freight forecast and the Washington freight forecast. 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 state forecast for waterborne freight is not yet available.
Exhibit 3-3: Comparison of Freight Forecasts

<table>
<thead>
<tr>
<th>Mode</th>
<th>National freight forecast - % Annual Growth Rate</th>
<th>State freight forecast – % Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>1.2%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Pipeline</td>
<td>1.4%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Rail</td>
<td>0.7%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Water*</td>
<td>0.9%</td>
<td>TBD</td>
</tr>
<tr>
<td>Air</td>
<td>4.0%</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

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 waterborne traffic growth rate will come from the draft 2016 Washington State Marine Cargo Forecast once it is finalized in August 2017. The state freight forecast for air cargo comes from the Washington Aviation System Plan 2017 Update. Forecasts from 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 FAF 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

<table>
<thead>
<tr>
<th>2015</th>
<th>2035</th>
<th>% Change</th>
<th>% Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonnage (million tons)</td>
<td>281.2</td>
<td>379.4</td>
<td>35%</td>
</tr>
<tr>
<td>Ton-Miles (billion ton-miles)</td>
<td>72.1</td>
<td>102.7</td>
<td>42%</td>
</tr>
</tbody>
</table>

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 the state; and
- **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 in Washington

![Bar chart showing truck freight shipment by direction in Washington for 2015 and 2035.]

Simplified for clarity.

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

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2035</th>
<th>% Change</th>
<th>% Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonnage (million tons)</td>
<td>49.6</td>
<td>59.0</td>
<td>19%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Ton-Miles (billion ton-miles)</td>
<td>56.5</td>
<td>71.0</td>
<td>26%</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

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 in Washington

3.2.3 Marine forecast

Marine forecast information will be added after the draft 2016 Washington State Marine Cargo Forecast is finalized by the Washington Public Ports Association in August 2017.

3.2.4 Air cargo forecast

Air cargo in Washington is projected to grow at an average annual growth rate of 2.5 percent from 2014 to 2034, reaching 845,504 metric tons by 2034. Most of this growth will be driven by air cargo activity at Sea-Tac. 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 3-8 provides a summary of the air cargo forecast for the 20-year planning period.

Exhibit 3-8: Summary of Air Cargo Forecast for Washington (metric tons)

<table>
<thead>
<tr>
<th>Year</th>
<th>Seattle-Tacoma International</th>
<th>King County International</th>
<th>Spokane International</th>
<th>Other Washington Airports</th>
<th>Total Air Cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>327,239</td>
<td>109,653</td>
<td>59,567</td>
<td>22,229</td>
<td>518,688</td>
</tr>
<tr>
<td>2019</td>
<td>370,397</td>
<td>124,063</td>
<td>67,395</td>
<td>23,363</td>
<td>585,218</td>
</tr>
<tr>
<td>2024</td>
<td>419,755</td>
<td>140,365</td>
<td>76,251</td>
<td>24,555</td>
<td>660,926</td>
</tr>
<tr>
<td>2034</td>
<td>541,093</td>
<td>179,680</td>
<td>97,607</td>
<td>27,124</td>
<td>845,504</td>
</tr>
</tbody>
</table>

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


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 shrink to 3.6 percent.

Exhibit 3-9 illustrates the air cargo volume forecast for the largest three air cargo airports in Washington. Spokane International, King Country 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 500,000 metric tons of goods shipped by airplane.

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Exhibit 3-9: Air Cargo Volume Forecast for Major Cargo Airports in Washington


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, it can be expected that international air cargo tonnages will continue to increase at a rapid rate.

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

Pipelines in Washington move refined petroleum products and natural gas. 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 pipeline is anticipated increase from 2.1 billion in 2015 to 2.6 billion in 2035 at an annual growth rate of 1.07 percent. Exhibit 3-10 shows tonnage and ton-miles, a measurement of one ton of freight carried one mile, for pipeline system in Washington.
Exhibit 3-10: Summary of Pipeline Freight Forecast for Washington

<table>
<thead>
<tr>
<th>Mode</th>
<th>2015</th>
<th>2035</th>
<th>% Change</th>
<th>% Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonnage (million tons)</td>
<td>50.3</td>
<td>52.8</td>
<td>5.0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Ton-Miles (billion ton-miles)</td>
<td>2.1</td>
<td>2.6</td>
<td>24%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

Source: FHWA Freight Analysis Framework Version 4

Exhibit 3-11 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.

Source: FHWA Freight Analysis Framework Version 4
4 PERFORMANCE MEASURES

The USDOT is implementing a new set of performance requirements in 2017, based on several rulemakings released in several phases over six years as part of a multimodal program to strengthen the U.S. transportation system. The new transportation rules requires 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 USDOT. 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.

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:
(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: Federal Performance Measures

<table>
<thead>
<tr>
<th>Measure Area</th>
<th>Performance Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Number of fatalities on all public roads</td>
</tr>
<tr>
<td></td>
<td>Number of fatalities per 100 million vehicle miles traveled on all public roads</td>
</tr>
<tr>
<td></td>
<td>Number of serious injuries on all public roads</td>
</tr>
<tr>
<td></td>
<td>Number of serious fatalities per 100 million VMT on all public roads</td>
</tr>
<tr>
<td></td>
<td>Number of non-motorist fatalities and serious injuries on all public roads</td>
</tr>
<tr>
<td>Pavement</td>
<td>Percentage of pavements of the Interstate Highway System in good condition</td>
</tr>
<tr>
<td></td>
<td>Percentage of pavements of the Interstate Highway System in poor condition</td>
</tr>
<tr>
<td></td>
<td>Percentage of pavements of the non- Interstate Highway System NHS in good condition</td>
</tr>
<tr>
<td></td>
<td>Percentage of pavements of the non- Interstate Highway System NHS in poor condition</td>
</tr>
<tr>
<td>Bridge</td>
<td>Percentage of NHS bridges classified as in good condition</td>
</tr>
<tr>
<td></td>
<td>Percentage of NHS bridges classified as in fair condition</td>
</tr>
<tr>
<td></td>
<td>Percentage of NHS bridges classified as in poor condition</td>
</tr>
<tr>
<td>Performance of the National Highway System</td>
<td>Percent of the person-miles traveled on the Interstate Highway System that are reliable</td>
</tr>
<tr>
<td></td>
<td>Percent of person-miles traveled on the non- Interstate Highway System NHS that are reliable</td>
</tr>
<tr>
<td>Freight Movement</td>
<td>Truck Travel Time Reliability Index (TTTR) on the Interstate System</td>
</tr>
<tr>
<td>Congestion mitigation and air quality</td>
<td>Annual Hours of Peak Hour Excessive Delay (PHED) Per Capita</td>
</tr>
<tr>
<td></td>
<td>Percent of Non-Single Occupancy Vehicle (SOV) Travel</td>
</tr>
<tr>
<td></td>
<td>Total Emissions Reduction</td>
</tr>
</tbody>
</table>

63 https://www.wsdot.wa.gov/Accountability/MAP-21.htm
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. 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. Freight is included 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

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

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 Interstate 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 System.

Besides this federal freight performance measure, WSDOT also is considering the following truck performance measures to better monitor and track system performance in the future:

- 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, 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 resulted from changes in congestion and commonly used for evaluating the impact of bottlenecks and quantifying the potential benefits of improving them.

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64 https://www.wsdot.wa.gov/Accountability/GrayNotebook/navigateGNB.htm
The three measures identified above are recommended by the FHWA Freight Performance Measure Approaches Report\textsuperscript{66} 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.

WSDOT currently has access to the 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. FHWA is working on improving the quality of the NPMRDS and making some changes to the data.

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. Railroads in Washington transported 121.8 million tons of freight in 2014, an increase of 13.6 percent from 2013.\textsuperscript{67} 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 4-2.

\begin{itemize}
\item Terminating in state, 48.6% (59.2 million tons)
\item Moving through the state 31.5% (38.4 million tons)
\item Originating in state 15.8% (19.2 million tons)
\item Both originating and terminating in state 4.1% (5.0 million tons)
\end{itemize}

\textsuperscript{66} https://ops.fhwa.dot.gov/publications/fhwahop15033/sec4.htm
\textsuperscript{67} Surface Transportation Board Waybill Data.
Exhibit 4-3 shows the 7-year trend of total freight shipment by rail. The total freight rail tonnage reached its record high in 2014.

Exhibit 4-3: Tonnage of Freight Shipment by Rail (7-years)

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, 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. 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

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foreign, domestic or intrastate depending on both the origin and destination. In 2015, 23.8 percent of waterborne freight was domestic, 67.9 percent was foreign, and the remaining 8.3 percent remained within Washington. Exhibit 4-4 shows the 10-year trend of waterborne freight shipments in Washington. Exhibit 4-5 shows the cargo tonnage for Washington ports in 2015.

**Exhibit 4-4: Annual Marine Freight Tonnage**

**Washington waterborne freight: intrastate, foreign, and domestic**

Tonnage in 1,000s of short tons, 2006-2015


**Exhibit 4-5: Marine Freight Tonnage by Port**

**Cargo Tonnage for Washington Ports in 2015**

Tonnage in 1,000s of short tons

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. BTS 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, 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.

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. The historical trend of air cargo activity in Washington is shown in Exhibit 4-36. 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 Sea-Tac.

Exhibit 4-3: Annual Air Cargo Tonnage by Airport

Source: 2017 Washington Aviation System Plan

In addition to tracking air cargo tonnage, WSDOT also tracks air cargo value in the Gray Notebook. WSDOT will consider additional air cargo performance measures. The 2017 Washington Aviation System Plan\textsuperscript{70} 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.

\textsuperscript{70} http://www.wsdot.wa.gov/aviation/Planning/wasp.htm
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 a domestic economic engine and its importance to the national, regional, and local economy is clear. 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.

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 of 2017,71 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.

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

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 United States Trade Representative's office, 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 upon Washington law. The Committee hears public testimony on the actual and potential impacts of international trade agreements and negotiations on Washington and submits an annual report to the state trade representative’s office.

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.

Promoting international exports

Public and private transportation partners in Washington monitor global supply chain dynamics to assess their impact 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. The Joint Legislative Oversight Committee on Trade Policy Committee of the Washington State Legislature hears public testimony on the impacts of international trade agreements and negotiations on Washington and submits their annual report.

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72 [http://leg.wa.gov/JointCommittees/LOCTP/Pages/default.aspx](http://leg.wa.gov/JointCommittees/LOCTP/Pages/default.aspx)
73 [http://www.exportwashington.com/what-is-export-wa/Pages/default.aspx](http://www.exportwashington.com/what-is-export-wa/Pages/default.aspx)
to the state trade office. The trade office, Export Washington, can continue to use this information to promote trade opportunities beneficial to freight exporters in Washington. WSDOT encourages exporters to testify to the Joint Legislative Oversight Committee on Trade Policy Committee regarding issues related to exporting. WSDOT will work with Export Washington, as needed, to determine the role of the freight transportation system in enhancing export opportunities for businesses in Washington. WSDOT also will work with partners such as the Northwest Seaport Alliance to promote exports from Washington.

### 5.2 Port competition is increasing

A prosperous Washington economy depends heavily on goods imported by container through marine and landside 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.

Canadian ports have redirected U.S. market share to the Ports of Prince Rupert and Metro Vancouver. A recent economic impact analysis\(^{74}\) 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 Canadian Gateway west coast market share; now they are nearly equal.\(^{75}\)

The Harbor Maintenance Tax (HMT) results in an average of $109 per TEU per import container. The Federal Maritime Commission estimated that if the HMT were removed, half of the U.S. cargo that passes through Canadian ports would revert to U.S. ports. Cargo diversion from U.S. ports reduces HMT collections and threatens the stability of the existing trust fund. The Port of Prince Rupert, B.C., developed as part of the Canadian government’s national trade strategy, has been particularly effective in competing with Washington ports. The port has direct on-dock rail access and advertises rail transit times to Chicago nearly a day faster than the transit time from Seattle. Because of the remoteness of the port from major population centers, rail moves 99 percent of cargo processed via Prince Rupert. 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 tax structure. The HMT 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.

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. 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


\(^{75}\) [http://www.fmsib.wa.gov/fac/20140602-FINALComplete%20Folio_for%20printer5-7-14.pdf](http://www.fmsib.wa.gov/fac/20140602-FINALComplete%20Folio_for%20printer5-7-14.pdf)
The Panama Canal expansion completed in 2016 has realized the competitive landscape for U.S. ports. Larger vessels up to 13,000 TEU can now 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 Washington ports face to hold or grow their market share.

The challenge of trucking freight in and out of Puget Sound ports has spurred interest in developing one or more inland sea ports within Washington. An inland sea port 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 sea ports have been developed in the eastern United States. Some examples include Front Royal (Virginia), and Inland Port Greer and Port Dillon (South Carolina).

Improving competitiveness of marine ports

Ships have continued to increase in both size and capacity, particularly for container vessels. In the 1970s, the average size was 1,100 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 Fleet. Today, 10,000 TEU ships are becoming a common sight in Puget Sound. To accommodate these larger ships, ports are looking at all aspects of their infrastructure from cranes, to dredging, to 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.

Technological and operational improvements also help ports remain competitive. Efficiencies also 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. 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.
Northwest Seaport Alliance is exploring the possibility of developing inland sea ports to divert containers originating in eastern Washington from congested highways to existing rail corridors. WSDOT will work with Northwest Seaport Alliance and their potential partners to evaluate the viability of developing inland sea ports 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 commercial, residential, and school land uses near railroads and marine ports in urban areas. The Port of Seattle, Sea-Tac, and King County International Airport/Boeing Field all have limited or no space for expansion 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. This is also the case for land adjacent to much of the trucking, rail, marine, air cargo, and pipeline infrastructure in the state.

Protecting freight-dependent industrial sites

Land that is rail-oriented, waterway-oriented, or in an otherwise ideal location for freight land uses should be preserved for those uses, when appropriate. Cities, counties, ports, and tribal governments are responsible for land use decisions. MPOs and RTPOs coordinate regional planning that may ensure preservation of the most important assets for freight. Cities can preserve land for freight with zoning. One example of this occurred in Clark County, which designated industrial railroad base zones 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.

The Puget Sound Regional Council 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 the 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.

The Governor’s Ports Initiative, passed in 2007, 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,76

76 https://app.leg.wa.gov/rcw/default.aspx?cite=36.70A.085
5.4 Freight industry labor is in short supply

The freight and logistics industry is facing an unprecedented labor shortage, affecting freight supply chains. 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 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. 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, 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. 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.

79 http://www.dol.wa.gov/driverslicense/cdl.html
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. Approximately 40 percent of the Washington State Ferry system’s vessel employees, and around 88 percent of the captains, are eligible for retirement in the next 5 to 10 years. About 70 percent of Ferries’ chief engineers are eligible for retirement within 10 years, as are nearly 90 percent of captains. The average maritime laborer in Washington made almost $67,000 a year in May 2016.

Promoting freight employment and recruitment

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. MARAD provides grant funding for training that foster 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 move toward driverless vehicles, discussed in the Mobility chapter, could increase as the driver shortage worsens and capacity tightens. Due to numerous challenges and concerns, transportation partners will need to monitor this issue for potential collaborative action.

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.

The Joint Transportation Committee of the 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 may not be fully recognized. As a

82 https://qwiexplorer.ces.census.gov/static/explore.html?s=fddfe&v=bar&t=ac0&fc=true&st=WA#x=0&g=0
83 https://www.bls.gov/oes/current/oes_wa.htm#53-0000
85 http://www.southseattle.edu/harbor-island-training-center/
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 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.

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.\(^8^6\) 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 are also some new, heavily used connectors that have not yet been added to the Washington listing. The need to modify the NHS Intermodal Connectors listing will likely 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 accessing the rail facilities. There is a need to consider adding these facilities to the NHS intermodal terminal listing.

**Improving intermodal connections**

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 are recognized regionally. WSDOT regularly updates the Local Planning Resources\(^8^7\) 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

\(^8^6\) [https://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/washington.cfm](https://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/washington.cfm)

\(^8^7\) [https://www.wsdot.wa.gov/planning/community/default.htm](https://www.wsdot.wa.gov/planning/community/default.htm)
these intermodal nodes. WSDOT will continue to update this resource to assist partners in
protecting important freight intermodal connectors.

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

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 Project88 the
Port of Tacoma completed in 2017. The project increased rail capacity and efficiency throughout
the Tideflats area by adding two long tracks to the rail yard, resulting in five tracks for arriving
and departing trains. The Puget Sound Gateway Project is an example of a major investment to
provide additional capacity and reliability for the movement of freight in and out of the waterfront
industrial areas in both Seattle and Tacoma.

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

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. Poor pavement condition also negatively affects truck operations. Pavement deterioration results in increased wear and tear on trucks and more damage to fragile goods, increased truck operating costs, weight restrictions, and poor truck access to damaged routes.

Because of the cost-effective strategies and management of WSDOT’s pavement preservation program, 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. 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.

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.89 There is a higher risk for old bridges on secondary freight routes to become load restricted in the next ten years.

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 been fully funded, and the accelerating decline in county pavement condition has increased the likelihood that existing all-weather roadways on Truck Freight Economic Corridors could be weight restricted for trucks.

**Condition of Pavement on State Highways**

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.

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. 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.

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

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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.

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

Aging concrete roadways are becoming a problem in Washington. Concrete pavement makes
up 50 percent of interstate highway lane miles in Washington, carries 28 percent of statewide
vehicle miles traveled, and is in the highest volume truck corridors. More than half of WSDOT
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 Trucks and Pavement Deterioration

Washington is a major producer of agricultural and timber products typically transported in
heavy truckloads. These heavy loads often contribute to the substantially deteriorated pavement
condition found on roadways that serve these industries. WSDOT analysis of agricultural and
timber supply chains in the state recognizes that deteriorating infrastructure is the most significant freight transportation problem facing these sectors. The agriculture sector in north central Washington and the Columbia Basin – a national center of apple, potato, onion, hay, wine, and lumber production – depends on the I-90 freight corridor to transport products by truck to urban markets in northwest Washington, Puget Sound, and to global markets via the ports of Seattle and Tacoma. The forestry industry relies heavily on local roads to truck timber to highways and onto mills. There is a total of 23 million acres of forestland in Washington, and 44 percent of it is owned by the federal government, 37 percent is privately-owned, 12 percent is state-owned, and 7 percent is owned by tribal governments.90

Approximately 3.2 billion board feet of timber were harvested within the state in 2014, including tribal harvests.91 Logging is concentrated in Grays Harbor, Lewis, Clallam, Snohomish, and Cowlitz counties in western Washington. More than 3 billion board feet of timber harvested from public and private forests in 2014 were processed in wood product mills in Washington. One out of every eight logs came out of Grays Harbor County alone.92 The timber transport relies on truck freight network to move from harvest sites to mills. The timber supply chain is shown in Exhibit 6-2. Supply chains for major agricultural commodities are described and shown in the Introduction. 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 program.

WSDOT’s state-owned bridge inventory consists of 3,294 bridges. 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 are also 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
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 T1 and T2 high volume truck corridors. Some bridges are weight-restricted because they were designed and built at a time when the standard truck weight was lower. Weight restrictions on bridges may increase truck transportation costs, since truck loads above allowable weight are required to use longer detour routes. Exhibit 6-3 illustrates the locations on T1 and T2 truck corridors where bridges have weight restrictions.

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 portion of them are funded for replacement. There is a higher risk for old bridges on secondary freight routes to become load-restricted in next 10 years.

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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 as 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.95

Bridges face several types of major risks that affect service life, including deterioration, scour of foundations, earthquakes, and over-height truck impacts. The damage can result in bridge collapse, bridge closure, or lane restrictions. In May 2013, a portion of the Skagit River bridge on Interstate 5 collapsed after being struck by an oversized load, severing this major freight corridor carrying nearly 8,000 trucks on average each day. The collapse shut down I-5 near Mount Vernon for 26 days, until a temporary bridge span was installed in mid-June. 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 around $8.3 million.96

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 Interstate 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 Interstate 5 in Chehalis was severely damaged by an oversized load; the damaged span was demolished and a temporary bridge 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.97 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 will still be a backlog of pavement preservation needs.

Cities and counties have struggled to fund basic road maintenance over the past decade. Funding for urban corridors with heavy bus and truck traffic is below the estimated need to make the necessary improvements. 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.

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 NHS network, and about 10 percent of those NHS local bridges were in poor conditions in 2016.

**Addressing pavement and bridge preservation needs on major truck routes**

High volume roadway corridors and areas that support the agriculture, timber, mining, and energy sectors experience heavy truck traffic. As a result, these roadways may experience substantial pavement and bridge deterioration. WSDOT is responsible for highway infrastructure condition, while local governments are responsible for local infrastructure condition. In the 2017-2019 biennium, WSDOT specifically will address preservation of structurally deficient bridges or bridges that are at risk of becoming structurally deficient.

WSDOT and local governments continue to address pavement and bridge preservation needs by investing in pavement and bridge needs on Truck Freight Economic Corridors, which are the most important freight routes. The number of trucks that use a highway each year is a factor that WSDOT uses in its process to prioritize paving projects. Funding for these projects comes from multiple sources.

WSDOT and partners can assess opportunities to develop a statewide core all-weather county road 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 and UP, the two Class I railroads in the state. Each firm 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*[^98] 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) railroad.

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

WSDOT completed a short line rail study\(^9\) 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. Class I railroads 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.

Much of the existing short-line rail system in Washington currently can only 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 must meet new Federal Railroad Administration compliance guidelines that require reporting on the load rating, safe operating weight, and condition of all rail bridges by September 2017. When the railroads complete 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.\(^1\) Because this system of three branches is owned by the Washington state, and managed by WSDOT, system conditions are available. The plan identified and


\(1\) https://www.wsdot.wa.gov/NR/rdonlyres/936F27B0-8F84-49C4-AF4E-33E7216E1A23/105893/2015PCCStrategicPlan1.pdf
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. Lastly, the plan highlighted the need to identify and replace defective rail through integrity testing.

Addressing rail infrastructure needs

Collaboration among transportation partners is necessary to preserve rail service in Washington. RCW 47.76.240101 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, economic development potential, environmental protection, and safety, should be assisted through the joint efforts of the state, local jurisdictions, and the private sector.

Railroads continue to invest in infrastructure to maintain and improve condition, as needed. 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. Railroad owners are responsible for rail infrastructure improvements in the state, including private companies, ports, and WSDOT.

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. In addition, 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

101 http://app.leg.wa.gov/rcw/default.aspx?cite=47.76&full=true
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 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-feet 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 landside infrastructure in need of preservation. This includes roadways, highways, and rail infrastructure that directly serves 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 are responsible for maintaining 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. Channel maintenance and navigation aides 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.

WSDOT will consider compiling infrastructure inventories, to be a champion for infrastructure needs of public ports in Washington.
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 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\(^{102}\), primary airports have shown improved condition in pavement since 2005, while non-primary airports show a significant decrease in condition. The Washington Aviation System Plan\(^{103}\) 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

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 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.

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;
3. 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\textsuperscript{[104]} 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 is also 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

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.\footnote{Ibid.} 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.

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 crashes in Seattle involved trucks and pedestrians or bicyclists\footnote{http://www.seattle.gov/transportation/docs/fmp/FMP_Report_2016E.pdf}. 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.

\begin{figure}
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\includegraphics[width=\textwidth]{Exhibit_7-1_Temporary}
\caption{Exhibit 7-1: Truck-Related Fatalities and Serious Injuries}
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\footnote{FARS ARF data as of April 2017 (Washington Traffic Safety Commission).}
\footnote{Source: WSDOT Crash Data Mart as of April 8, 2017 (WSDOT TDGMO Crash Data and Reporting
Branch).

Reducing truck-related fatalities and serious injuries

The Target Zero plan\footnote{http://www.targetzero.com/PDF2/targetzero.pdf} 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 Division to encourage company policies which, when backed with speed monitors or speed regulators, can reduce speeding in commercial vehicles.

WSDOT will address freight safety with innovative technologies and operational improvements. Transportation systems management and operations (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.

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 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.

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. With the increased focus on crash-causing violations, in 2014 Washington enforcement officers inspected 89,204 heavy 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.

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 of collisions, thereby reducing the potential for fatal and serious injury collisions. In addition, WSDOT and other partners promote industry safety initiatives by performing safety consultations with carrier safety management, as well as providing 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. The Utah DOT has initiated Truck Smart, an initiative that aims for drivers to incorporate safe behaviors and increase safety on the highway system.

To support efforts to reduce truck-related fatalities and serious injuries, WSDOT will look for opportunities to research the causes of truck-related crashes. 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 forecasted 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 can also 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 U.S. 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 Interstate 5, Interstate 405 and Interstate 90. WSDOT found that parking issues are the most 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

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 intends to conduct additional research on truck parking availability systems, and 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.

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 the WSDOT app to enhance information for the freight industry.

WSDOT published a set of truck parking maps in 2017, with the purpose of identifying locations of safe places for truck drivers to take rest breaks. These maps (Exhibit 7-2), 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.

While improving access to information will optimize the use of existing truck parking areas, it doesn’t completely 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 to recommend future projects. In addition, safety rest areas currently have an eight-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 eight-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.

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110 [http://www.wsdot.wa.gov/freight/](http://www.wsdot.wa.gov/freight/)
111 [http://www.wsdot.wa.gov/Freight/truckparking.htm](http://www.wsdot.wa.gov/Freight/truckparking.htm)
Improving truck parking opportunities at weigh stations is another possibility. The Washington State Patrol 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 ten-hour rest break. WSP generally allows this practice due to the lack of truck parking supply, so long as the weigh station is closed. WSDOT will work with WSP to explore opportunities to provide parking at weigh stations when enforcement activities are not occurring. In addition, new weigh stations can be designed to include truck parking; sites should be strategically located in the state to create the most benefit. One such site under consideration is near North Bend, 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 Washington State Joint Transportation Committee (JTC) published the Efficiency and Effectiveness of Weigh Station Management in Washington State report, which suggested creating an interagency working group to better address weigh station management. This interagency working group could address truck parking at weigh stations.

As WSDOT continues to develop highway projects on major truck routes, additional land can be purchased and set aside for truck parking. WSDOT’s Gateway project on state routes 167 and 509, and other major projects that serve major freight activities (e.g., ports), are ideal opportunities, due to their proximity to major truck routes and to the Seattle and Tacoma ports. 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. WSDOT will analyze opportunities to provide truck parking on WSDOT real estate, at mountain pass chain-up areas, and at park and ride lots.

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. WSDOT will update the Target Zero plan to include truck parking as a strategy.

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 FRA’s Office of Safety Analysis\(^{112}\). The total number of freight rail accidents declined significantly between 2010 and 2012 but have been increasing every year since 2012. One possible factor in the rise of incidents in Washington is attributed to increased train traffic, but train volume statistics for Washington are not available to confirm this.

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</tr>
</thead>
<tbody>
<tr>
<td><strong>Freight Train Accidents</strong></td>
<td>49</td>
<td>39</td>
<td>30</td>
<td>34</td>
<td>38</td>
<td>28</td>
<td>40</td>
</tr>
<tr>
<td><strong>Collisions</strong></td>
<td>1</td>
<td>8</td>
<td>6</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>Derailments</strong></td>
<td>39</td>
<td>27</td>
<td>20</td>
<td>19</td>
<td>22</td>
<td>15</td>
<td>26</td>
</tr>
<tr>
<td><strong>Other types, e.g., obstructions</strong></td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>12</td>
<td>9</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

Emerging technologies will continue to improve the safety of shipping freight on railroads. Positive train control (PTC) is required on Class I railroad main lines that handle poisonous-inhalation-hazardous materials, and any railroad main lines 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 because of a misaligned track switch.

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.

Improving rail safety

Emerging technologies will continue to improve the safety of shipping freight on railroads in Washington. The Class I freight railroads (i.e., BNSF, Union Pacific) along with Amtrak and Sound Transit, are continuing work to implement Positive Train Control systems within the state by December 31, 2018. The systems are 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 because of a misaligned track switch. WSDOT will work with partners to implement Positive Train Control technology in the Amtrak Cascades fleet.

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. With the growth in road and rail traffic, conflicts at these crossings have a potential to grow. In 2015, the Legislature directed the 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. The study 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 Washington Utilities and Transportation Commission 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, there were 102 collisions at crossings, resulting in 23 injuries and 10 fatalities. Trespass fatalities are slowly decreasing over time. The current five-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.

113 Second Engrossed Substitute House Bill 1299 (2015), Section 204(3)
114 https://www.utc.wa.gov/publicSafety/railSafety/Pages/WARailCrashStats.aspx
### Exhibit 7-4: Rail Crossing/Trespass Incidents in Washington, 2010 to 2016

<table>
<thead>
<tr>
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<tr>
<td>Crossing Collisions</td>
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<td>29</td>
<td>33</td>
<td>20</td>
<td>36</td>
<td>37</td>
<td>40</td>
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<tr>
<td><em>Injuries</em></td>
<td>10</td>
<td>4</td>
<td>18</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td><em>Fatalities</em></td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>7</td>
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<tr>
<td>Trespass Fatalities</td>
<td>15</td>
<td>22</td>
<td>10</td>
<td>17</td>
<td>9</td>
<td>23</td>
<td>7</td>
</tr>
</tbody>
</table>

### Enhancing rail crossing safety

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 those groups continue to invest in rail improvements to enhance safety.

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.

The train involvement data in Target Zero is limited to fatal and serious crash events involving trains that also involved a motor vehicle and occurred at crossings accessible to the public. The UTC monitors all fatalities and injuries involving trains, including those occurring at private crossings, such as crossings at residential driveways or service roads, or on industrial properties. The UTC’s Rail Safety 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. In 2017, the Legislature directed UTC and FMSIB to address at-grade rail crossing locations, based on results of the study and tool. In addition, FMSIB is to update the database to continue to identify prominent road-rail conflicts.

WSDOT also is involved in vehicle-train safety. 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 is a partner in Washington Operation Lifesaver, 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

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116 https://www.wsdot.wa.gov/Rail/TrainSafety.htm#Lifesaver
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 will also 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.

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. JBLM is 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, a major exercise for U.S. and allied units to train together and improve joint capabilities. The exercise tests 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 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. 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 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

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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 to be scanned through non-intrusive inspection and radiation detection equipment in a foreign port prior to being loaded on 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 rehandled 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 ensures that highway operations are available to meet military needs in the event of a national security emergency, while similar functions are performed by city and local transportation agencies. 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 is also 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.

Ports also have a role in supporting overseas military logistics. In 2004, the military began using the Port of Olympia for shipments out of Fort Lewis. 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.

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. WSDOT will continue participating as an active partner with IMTC, including improving the U.S. Customs and Border Protection’s (CBP) Customs-Trade Partnership Against Terrorism program. Ports continue to play an important role in security with TWIC programs that limit access to ports. Ports also implement safe and efficient cargo screening processes. The Northwest

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Seaport Alliance has made addressing this issue a priority for their 2017 legislative agenda.
Transportation partners should strive to achieve an appropriate balance between safety and security at ports and promote efficient supply chains.
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.

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 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 economy121 found that if congestion increases by 20 percent, more than $3.6 billion in regional economic output and

more than 21,700 jobs could be lost 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)\textsuperscript{122} 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 creates a bottleneck on the railroad, but also causes
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.

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. Several types
of congestion are described in this section.

8.1 Traffic congestion and bottlenecks create delay

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 develop strategies to achieve performance
expectations and sustain what works well.

To identify the performance gap in mobility, WSDOT developed a mobility screening process\textsuperscript{123}
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

\begin{itemize}
  \item \textsuperscript{122} https://www.leidos.com/products/security/vacis-ip6500-fullscan
  \item \textsuperscript{123} Washington Department of Transportation. 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
\end{itemize}
strategies to address root causes of congestion. The congestion screening process includes the following steps:

**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, urban freeway with an operating speed below 40 mph is classified as congested, while the congestion threshold for 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, 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 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. Truck bottlenecks can be categorized in various ways. To be consistent with the FHWA Freight Bottleneck Study, 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 are increased 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.

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.
Truck bottlenecks can be categorized in various ways. To be consistent with the FHWA Freight Bottleneck Study, 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 are increased 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.

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

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### Exhibit 8-2: Highway Bottlenecks by Type

<table>
<thead>
<tr>
<th><strong>Congestion-Based Delay Bottlenecks</strong></th>
<th><strong>Volume-Related Bottlenecks</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometric-Related Bottlenecks</td>
<td>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.</td>
</tr>
<tr>
<td>Volume-Related Bottlenecks</td>
<td>Caused by too much traffic volume even if there are no geometric restrictions. Examples include commuter peak period traffic, seasonal vacation traffic, and special event traffic.</td>
</tr>
<tr>
<td>Disruption-Related Bottlenecks</td>
<td>Caused by a temporary loss of capacity due to disruption. These are also commonly referred to as &quot;non-recurring&quot; bottlenecks, caused by incidents, severe weather, work zones etc.</td>
</tr>
<tr>
<td>Processing-Related Bottlenecks</td>
<td>Caused by legal or safety/security reasons. Examples include international border crossings, vehicle weigh and inspection stations, terminal gates, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Non-Congestion-Based Delay Bottlenecks</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrictions Requiring Rerouting</td>
<td>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.</td>
</tr>
<tr>
<td>Restrictions Requiring Changes in Timing of Trip</td>
<td>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.</td>
</tr>
<tr>
<td>Restrictions Requiring Other Logistics Changes</td>
<td>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.</td>
</tr>
</tbody>
</table>

There are other studies conducted by research institutes to identify truck bottleneck locations utilizing different dataset 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 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. 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 each direction). Using this definition, they identified eighteen freight bottlenecks on roadways in Seattle.

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125 [https://ops.fhwa.dot.gov/freight/freight_analysis/perform_meas/](https://ops.fhwa.dot.gov/freight/freight_analysis/perform_meas/)
126 [http://atri-online.org/2017/01/17/2017-top-100-truck-bottleneck-list/](http://atri-online.org/2017/01/17/2017-top-100-truck-bottleneck-list/)
Truck traffic is increasing, and can cause congestion and delays that affect others. Transportation partners that own infrastructure in the state 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 during climbing a steep grade, or during acceleration from a complete stop. As a result, trucks can cause congestion or worsen it. 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.

**Addressing traffic congestion and truck bottlenecks**

WSDOT is using the 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. 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 that will help reduce the severity of congestion at truck bottlenecks. Transportation systems management and operations (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.

To improve the movement of freight in congested corridors, WSDOT is implementing several major capital projects. The Puget Sound Gateway Project is an example of a project that will aid

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127 [http://www.wsdot.wa.gov/planning/corridor-sketch-initiative](http://www.wsdot.wa.gov/planning/corridor-sketch-initiative)
128 [http://fratis.trac.washington.edu/TSMO/](http://fratis.trac.washington.edu/TSMO/)
the movement of trucks between the port terminals in Seattle and Tacoma and the extensive
warehouse and manufacturing area located along SR 167. 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 regularly updates an inventory of restrictions on roadways and bridges.\(^{129}\) Restrictions
on high-volume truck corridors that require oversize/overweight trucks to take a long detour
route cause higher operational costs to trucks. WSDOT prioritizes bridges for rehabilitation or
replacement based on structural condition, truck volumes, and load restrictions. Higher priority
is given to structurally deficient bridges located on high volume truck corridors, and weight
restriction is considered as a secondary criterion in the prioritization process. WSDOT has also
developed a bridge vertical clearance trip planner application, which helps the public to identify
bridges with restricted vertical clearances up to 16 feet on the state highway system.\(^{130}\)

WSDOT also plans to assess 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
recommendations for harmonizing state regulations with adjacent states regarding truck
combination vehicles.

A lack of freight travel information has negative effects on the efficient movement of freight
transportation, planning of freight daily work activities, the environment of nearby communities,
energy consumption and safety of the traveling public. The Northwest Seaport Alliance 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 idling at
the ports. 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 FRATIS funding for this project and is committed to partnership
with the ports to ensure this system is beneficial to the freight industry.

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.

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

\(^{129}\) Washington Department of Transportation. Restrictions for Oversize/Overweight Motor

\(^{130}\) https://www.wsdot.wa.gov/Bridge/Structures/BVCTP.htm
by utilizing 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. WSDOT will continue to provide information to truck drivers using these technologies. 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, 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 address congestion or delay caused by truck freight, WSDOT will use the results of the Corridor Sketch Initiative to identify contributing factors. WSDOT will continue to monitor and manage congestion using Traffic Management Centers\(^{131}\) and Incident Response Program.\(^{132}\) 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 maintenance of mountain passes to reduce mobility issues. 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.

8.2 Growth in rail volume may strain capacity and access

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. While BNSF’s three existing east-west corridors have seen diminished volumes over the past few years, ensuring the availability of adequate east-west capacity 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.\(^{133}\) Freight rail tonnage is expected to double by 2035; if rail engines and cars are not available, this will cause capacity issues. These projections suggest that railroads will need to implement capacity improvements on nearly all R1 Rail Freight Economic Corridors to ensure the system continues to function efficiently.

\(^{131}\) \hspace{1cm} \url{http://www.wsdot.wa.gov/Operations/Traffic/tmc.htm}
\(^{132}\) \hspace{1cm} \url{https://www.wsdot.wa.gov/Operations/IncidentResponse/}
\(^{133}\) \hspace{1cm} \url{http://www.wsdot.wa.gov/NR/rdonlyres/F67D73E5-2F2D-40F2-9795-736131D98106/0/StateRailPlanFinal201403.pdf}
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 train volume grows. 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 BC 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., temporary slow orders) and freight train interference (i.e., delays from freight trains). Amtrak Cascades service includes four daily round trips between Seattle and Portland, and two daily round trips between Seattle and Vancouver BC. 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 caused by freight train interference are not included in Exhibit 8-3.

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 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 caused by freight train interference are not included in Exhibit 8-3.
Exhibit 8-3: Passenger Rail Service Delay

Delay minutes caused by freight train interference in 2016 by sub-segments

- Blaine - Bellingham
- Bellingham - Mount Vernon
- Mount Vernon - Stanwood
- Stanwood - Everett
- Everett - Edmonds
- Edmonds - Seattle
- Seattle - Tukwila
- Tukwila - Tacoma
- Tacoma - Olympia
- Olympia - Centralia
- Centralia - Kelso
- Kelso - Vancouver, WA
- Vancouver, WA - Portland

At-grade crossings cause unpredictable congestion and delays for both motorists and freight carriers. In 2017, the Joint Transportation Committee 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

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

Public and private stakeholders can build upon the road-rail conflicts prioritization work done by the Joint Transportation Committee as they work towards developing solutions that address crossings with the greatest needs. The Legislature has directed FMSIB to manage and update the database of road-rail conflicts in the 2017-2019 biennium.

WSDOT will update the State Rail Plan to meet federal and state requirements. WSDOT plans to update the current 2013 Washington State Rail Plan 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 at major ports

The marine system generally does not experience congestion, other than at ports, terminals, and through lock structures. At these locations, some areas experience capacity limitations, due to a lack of available anchorages, docks, piers, and other loading or storage capacity. Delay data at ports and terminals is not centrally located.

Currently evolving alliances in the West Coast shipping lines are causing delays at ports. The Northwest Seaport Alliance (NWSA) harbors of Seattle and Tacoma are experiencing extra work as they reposition containers from facilities where the former alliance vessels had called while at the same time taking on containers from the new alliance rotations. 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.

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

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134 https://www.wsdot.wa.gov/Rail/highspeedrail.htm
135 https://www.fra.dot.gov/Page/P0511
136 http://app.leg.wa.gov/RCW/default.aspx?cite=47.06.080
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 FRATIS funding for this
project and is committed to partnering with the ports to ensure this system is beneficial to the
freight industry.

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 NWSA received the largest
container ship in its history, the Ben Franklin, with a capacity of 18,000 TEU. This single ship
can move nearly one percent of the NWSA’s 2015 international container volume. Instead of a
dozen vessels per month, ports expect a few very large 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 at less frequent arrivals. This may also 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 USACE monitors and
reports delay using its Lock Performance Monitoring System.139 Lock queue data is available by
waterway and lock structure, showing the number of vessels, number of barges, and delay
minutes.

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 law140 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.141 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, WA and Portland, OR, which serves bi-
state traffic and freight movement, and 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
and taking a while 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

139 http://corpslocks.usace.army.mil/lpwb/f?p=121:3:0:
141 Washington Department of Transportation. Moveable Bridges on State Routes.
http://www.wsdot.wa.gov/bridge/reporting/moveablebridges.htm
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, yet have now become a non-vessel operating common carrier for international freight to and from China. In their first month, they shipped 150 containers.142 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 FRIB/FRAP programs, and with the NHFP.

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. 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 will continue to work with transportation partners on moveable bridge restrictions.

8.4 Air cargo volume is experiencing significant growth

Air cargo activity in Washington is highly concentrated, primarily occurring at 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 Northwest. King County International Airport and Spokane International Airport handle the remaining majority of air cargo activity in the state, with small amounts of service provided at various smaller airports. Capacity and congestion information here is from the Washington Aviation System Plan. In general, Sea-Tac is the only airport in Washington dealing with air cargo capacity and congestion issues, challenged by aggressive expansion of air passenger and maintenance, repair, and overhaul activities. Other airports are not experiencing constraints on air cargo activity.

Sea-Tac air cargo facilities are comprised of 12 total on-airport cargo warehouses interspersed throughout a ramp area on the north end of the airport that primarily serve as “pass-through” facilities. There are 17 cargo freighter hardstands for widebody aircraft. There is also a 58,000-square-foot lower-deck cargo (belly cargo) facility on the southeast side of the airport. A capital improvement project is underway to expand the cargo aircraft parking areas to accommodate the increasing frequency and use of the Group VI Boeing 747-8 nose load freighters. Sea-Tac also handles a large volume of cargo carried on international passenger flights, which have increased in recent years. Air cargo capacity and congestion issues are increasing at Sea-Tac, due to the limited amount of land available for development and the significant growth in both passengers and cargo over the past five years.

The Sustainable Airport Master Plan (SAMP), currently under development by the Port of Seattle, includes several alternatives that would result in a decrease in air cargo parking positions. Compounding the seriousness of the existing resource constraints for air cargo is the

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142 https://www.flexport.com/blog/amazon-ocean-freight-forwarder/
The actual 2016 cargo volumes have already exceeded the SAMP forecast. Therefore, the ability of Sea-Tac to accommodate future air cargo demand is in doubt. The master plan lists air cargo as fourth on a list of development priorities, below the airport passenger terminal, the airport airfield, and landside business and roadway development.

According to projections in the Washington Aviation System Plan, King County International Airport will experience moderate growth in air cargo demand and have adequate resources to accommodate the increase in air cargo volume. 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 BFI by about 20 flights per week. Results of the Draft 2016 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 there exists sufficient land and runway capacity available to accommodate future air cargo demand at the airport.

Spokane International Airport will experience moderate growth in air cargo demand and have adequate resources to accommodate increasing air cargo volumes, according to the Washington Aviation System Plan. A 26,400-square-foot joint-use building at the airport 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, and Skagit all have relatively small cargo operations, and on-site capacity does not seem to be an issue. FedEx and UPS 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 widebody 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 accommodating air cargo activities. Should Sea-Tac be unable to keep up with demand, it is not clear that 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 or reduces its capacity.
for air cargo in favor of increasing passenger capacity. The viability of other Washington airports to meet the growing demand for air cargo in the state needs to be better understood.

According to the Aviation Plan, the ability of Sea-Tac to accommodate and expand air cargo activity, particularly international freighter service, may be in jeopardy due to an underestimation of demand and the aggressive expansion of air passenger and maintenance, repair, and overhaul activities. The analysis found no evidence of constraints to air cargo activity at other Washington system airports. Although Spokane International Airport and Boeing Field/King County International Airport are projected to experience moderate growth in air cargo demand and have adequate resources to accommodate future air cargo growth, Snohomish County, Pasco, Yakima, Bellingham, Wenatchee, Moses Lake, Port Angeles, and Skagit all have relatively small cargo operations, and on-site capacity does not seem to be an issue.  

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 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 the 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 aviation plan, approximately 88 percent of airports have adequate access roads and 74 percent have adequate airport signage. Of the major airports, all have adequate access roads.

**Evaluating air cargo capacity statewide**

Air cargo in Washington is projected to grow at an average annual growth rate of 2.5 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 as well as maintenance, repair, and overhaul activities. Air cargo service providers make business decisions to overcome capacity limitations as they arise. Shippers may truck their air cargo to airports outside of Washington, such as Portland, OR, Vancouver, BC, and even Los Angeles, CA. Some international air cargo already is moving through these out-of-state airports due to advantageous pricing. The Legislature has directed the Joint Transportation Committee to study air cargo movement at airports in the state. This study will define air cargo congestion metrics; identify market forces determining demand for

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cargo service; and make recommendations regarding how to efficiently meet the demand for air
cargo in Washington.

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
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 truck 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\textsuperscript{144} totaled $105.7 billion, an increase of 4.1 percent from the fourth quarter of
2016. This trend is shifting freight distribution towards more point-to-point shipments from
warehouses to homes, and 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 technology 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

\textsuperscript{144} \url{https://www2.census.gov/retail/releases/historical/ecomm/17q1.pdf}
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 deliveries weigh five pounds or less and could technically be carried by a drone. While there have been successful small-scale tests of drone delivery technology, 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, with 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 being 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. 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.

USDOT’s Volpe National Transportation Systems Center is studying the feasibility of the commercial use of Hyperloop technology. 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, as 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. There are numerous issues and unknowns about this technology that need further research.

Monitoring emerging technologies

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145 https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=Press Releases&id=1487687844847-162
146 http://nebula.wsimg.com/28ad8975cef999798fa4b20e7238f67?AccessKeyId=02FB2B5A65F7EC056121&disposition=0&alloworigin=1
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, OR.\textsuperscript{148} WSDOT and other infrastructure owners can address this trend with capital, operational, and technological solutions.

In June 2017, Governor Inslee’s Executive Order\textsuperscript{149} on autonomous vehicles helps to 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. The order develops a pilot program to conduct safe testing and operation of autonomous vehicles.

Due to the rapid development of unmanned aircraft systems, WSDOT 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 UW’s Urban Freight Lab, to monitor emerging technologies.

\textsuperscript{148} http://www.oregonlive.com/commuting/index.ssf/2016/12/ups_debuts_delivery_by_electri.html
\textsuperscript{149} 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;
3. 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, 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; and
- 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 qualitative risk assessment to identify which state owned roads, bridges and other facilities

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150 http://www.ecy.wa.gov/climatechange/2012ccrs/infrastucture.htm
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 WSDOT-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. Washington State Ferries were found to be resilient, while some ferry terminals may need to accommodate rising sea levels or storm surge.

Assessing vulnerability of climate impacts

The multimodal freight transportation system is vulnerable to climate impacts, including flooding, wildfires, and extreme heat. WSDOT will use results of the 2011 Climate Impacts Vulnerability Assessment\(^{152}\) to inform corridor studies and plans. WSDOT staff also will evaluate potential risks during the design phase of projects and identify ways to address those risks.

Other owners of infrastructure can monitor their assets, as needed. For example, Seattle’s 2016 Climate Action Plan\(^{153}\) identifies actions to evaluate impacts to the movement of goods, including development of a Freight Master Plan. The plan encourages support of alternative freight modes, such as bicycle delivery, that help reduce emissions. The plan also identifies the need for system resiliency to allow for disaster relief and response to extreme events.

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 traffic. In Washington, legacy diesel engines emitted 6,474 tons of PM\(_{2.5}\) in 2011. A variety of sources contribute to the total amount of PM\(_{2.5}\) from diesels. The key sources include: on-road vehicles, marine vessels, construction equipment, agricultural equipment, and locomotives. These sources are in both urban and rural areas. 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 are also substantial contributors of total diesel PM\(_{2.5}\), contributing nine percent and six percent

\(^{152}\) https://www.wsdot.wa.gov/SustainableTransportation/adapting.htm
respectively. The relative amount that different sources contribute to diesel PM$_{2.5}$ emissions varies across the state. For example, 42 percent of the total statewide diesel PM$_{2.5}$ emissions occur in the central Puget Sound region counties of Snohomish, King, Pierce, and Kitsap counties, which contain the majority of the state’s population. 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.

Reducing diesel emissions

The U.S. Environmental Protection Agency’s (EPA) 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 has been awarded DERA funds recently$^{154}$, including $213,467 in 2015 and $327,908 in 2016. Since 2011, six tribal governments in Washington have used DERA funding$^{155}$. 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.

The Washington State Department of Ecology (Ecology) has identified diesel exhaust as the air pollutant most harmful to public health in Washington. To address this issue, Ecology developed a Diesel Particulate Emission Reduction Strategy to guide its work on reducing diesel exhaust. In addition, Ecology administers the Clean Diesel Grant Program in Washington that provides about $2.5 million annually to fund projects that reduce emissions from heavy-duty diesel vehicles and equipment.$^{156}$

The Northwest Seaport Alliance Clean Air Strategy is a partnership to reduce diesel emissions and spills, and to minimize the impact of Seattle and Tacoma port operations on local communities. The NVSA is one of seven port authorities in the U.S. recognized in 2017 for its efforts to reduce seaport-related emissions through the Northwest Ports Clean Air Strategy. The Puget Sound Clean Air Agency has an ongoing Diesel Solution Program to reduce diesel emissions in the Puget Sound region. 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 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 must apply to receive $112.7 million and develop a plan on how to use the settlement funds to reduce diesel pollution. Ecology provides information about this opportunity, including eligible uses, and administers the Volkswagen settlement funds in Washington.$^{157}$

$^{154}$ https://www.epa.gov/cleandiesel/clean-diesel-state-allocations#alloc2
$^{155}$ https://www.epa.gov/cleandiesel/tribal-awarded-grants
$^{156}$ http://www.ecy.wa.gov/programs/air/cars/diesel_exhaust_information.htm
$^{157}$ http://www.ecy.wa.gov/programs/air/cars/vw_fedsettfunds.htm
The Washington State Legislature authorized business and occupation tax and public utility tax credits for businesses and utilities that buy or convert certain alternatively-fueled commercial vehicles in the 2015 Connecting Washington transportation funding package. Increasing the number of alternatively fueled vehicles will help reduce diesel emissions.

Government regulations can accelerate innovative technologies. EPA and the U.S. Department of Transportation’s National Highway Traffic Safety Administration (NHTSA) 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. EPA and NHTSA expect the final standards will lower CO2 emissions by approximately 1.1 billion metric tons. WSDOT will continue to partner with the EPA’s West Coast Collaborative to identify opportunities for reduced emissions in freight transportation.

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. 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 so that it is 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.

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 Department of Ecology’s Spills Program to undertake multiple policy initiatives to help

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160 https://www.wsdot.wa.gov/Environment/EJ/
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 safe operations of oil trains 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**

Controversies over pipeline expansions, combined with rapid increases in petroleum production
has led to the movement of petroleum products by rail in recent years. Department of Ecology is
implementing the policy initiatives in the Oil Transportation Safety Act (ESHB 1449). This
includes monitoring and reporting the volume of crude oil transported in Washington.
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 have 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.¹⁶²

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 also 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 report163 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 highways164 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 provide or restore essential services within three to seven days and be fully operational within.

163 https://mil.wa.gov/other-links/seismic-safety-committee-ssc
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\textsuperscript{165} routes map shows the
corridors needed to provide these essential services with primary routes being I-5, I-405, and I-90 mainline. 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\textsuperscript{166} 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 work to make the state-supported Amtrak Cascades passenger rail service more
resilient to landslides has also made the freight rail system more resilient. This 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.
WSDOT plans to take a similar approach at other landslide prone locations affecting Amtrak
Cascades service as funding allows.

Additionally, WSDOT will continue to coordinate with WMD on the coordination of WSDOT’s
Commercial Vehicle Emergency Detour Pass with WMD’s Business Re-Entry Pass\textsuperscript{167} system
which provides statewide consistency in the credentials necessary for business representatives
to re-enter an impacted area in the event of an emergency.

\textsuperscript{165} https://www.wsdot.wa.gov/NR/rdonlyres/6DC18600-429D-480A-A914-
8D2DF7B06E2B/0/BridgeSeismicRetrofitLifelineRoutes.pdf

\textsuperscript{166} https://www.fema.gov/cascadia-rising-2016

\textsuperscript{167} https://mil.wa.gov/form/business-re-entry-pass
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 that 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\textsuperscript{168}. Under this law, Washington retailers 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. 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. Conflicts also can arise when jurisdictions develop bicycle and pedestrian facilities in industrial areas.

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

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.

\textsuperscript{168} http://app.leg.wa.gov/rcw/default.aspx?cite=82.32.730
Addressing regulatory challenges

The sales and use tax streamlining law passed in 2008 significantly decreased tax revenues collected by cities containing warehouse districts. Cities that contain the largest warehouse districts in the state have experienced a decline in sales tax revenues. Local governments can meet this challenge by closing the gap between funds needed and available to maintain heavily used truck routes.

Local governments regulate land uses through the development of comprehensive and transportation plans. 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. WSDOT will continue to encourage inclusion of freight elements in local planning by regularly updating the Local Planning Guide, a document that details transportation-related requirements, recommendations, and resources for local planning. WSDOT will also continually update the Community Planning Portal, which provides access to state transportation data to help local and regional planners, decision-makers, and citizens better understand the state transportation system.

The U.S. Army Corps of Engineers, Bureau of Reclamation and Bonneville Power Administration began preparation of an environmental impact statement (EIS) on the Columbia-Snake River System operations and configurations. Changes to the operation of the system that affect navigation also would affect the movement of freight. Transportation partners have provided comments on the scope of the study, including the Port of Lewiston. WSDOT will monitor the EIS process and participate, as needed, to support commercial navigation needs and use of the Columbia-Snake River System.

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.

Federal law prohibits states from increasing the size and weight of combination vehicles on the Interstate Highway System beyond that allowed in 1991. Changes to additional length would require the appropriate number of axles to minimize roadway damage. WSDOT will monitor this issue to determine possible opportunities to harmonize size and weight regulations with bordering states. This action addresses 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.

http://www.wsdot.wa.gov/sites/default/files/2014/06/20/Final2016ExternalWSDOTLocalPlanningResources08816.pdf
http://www.wsdot.wa.gov/planning/community/CommunityPlanningPortal.htm
http://portoflewiston.com/slide-river-dams/
Current maintenance, preservation, and operations funding will not take care of the estimated 10-year $3.1 billion unmet need to keep the highway system in good condition. Risks to the freight system include:

- Declining roadway conditions. In 15 years, pavement could deteriorate to less than 60 percent of total pavements in good/fair condition;
- Preservation will have to be limited to the highest-priority needs on the most heavily-traveled corridors;
- Maintenance service levels will be reduced, meaning critical roadway maintenance may have to be deferred to future allowing smaller problems to become more extensive and more expensive; and
- Truck-travel reliability and safety may deteriorate due to road closures from flooding and slides and reduced incident response coverage.

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 the state’s aging freight transportation infrastructure. The federal short line tax credit, which provides significant relief for short line railroad companies, has not been reauthorized. Effective capital spending and planning requires a multi-year horizon to be effective and efficient.

**Identifying sustainable freight funding**

Numerous programs fund freight projects. Appendix D describes many of the programs that fund projects that 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. In addition, WSDOT will explore opportunities for public/private partnerships.

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 that 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

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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
could levy the appropriate tax rates at fueling stations. WSDOT will consider researching this option further.

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 NCFRP, Report 15, Dedicated Revenue Mechanisms for Freight Transportation Investment: 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 could also 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 through existing systems with relatively small increases in labor and electronic processing capabilities. WSDOT will consider researching this option further.

The Environmental Protection Agency (EPA) allocates Diesel Emission Reduction Act (DERA) grant program funds 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 thousand in Clean Diesel funds. The Washington State Department of Ecology (Ecology) manages the state Clean Diesel Grant program. The Volkswagen partial settlement provided additional DERA funding for states choosing to implement the DERA Option.

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.173

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 can often be a challenge as a result. To do better planning and align resources to where they can provide the most benefit, improved freight data is required. In addition, datasets from traditional sources, such as the Freight Analysis Framework, do not give

173 http://www.wsdot.wa.gov/Projects/PracticalDesign/
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 NHS. 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 TDM 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.

**Improving data, transportation models, and performance measures**

WSDOT will continue working with USDOT as a partner to improve 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 also is working on better Washington truck counts and working with partners in the state to make sure data collected is usable for their needs.

WSDOT is evaluating 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 reliability; identify infrastructure and economic constraints that would result in practical solutions; and prioritize investment needs within the freight system.

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.

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 and transportation partners will 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 is also working together with MPOs to jointly
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 key considerations. WSDOT will work with partners to set performance
targets and to track and report these 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 received 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 that crosses across the public
and private sectors, across jurisdictions, and across modes.

Enhancing communication and coordination

WSDOT will continue to look for ways to improve communication related to freight issues with
internal and external partners, and with the public. This includes working with multi-state
councils such as the Great Northern Corridor Coalition, the AASHTO Freight Working Group,
the Coalition for America’s Gateways and Trade Corridors, North/West Passage, and the
Western States Freight Coalition.

WSDOT will continue to manage and improve the Freight Alerts174 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
delay 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 prevent backups to a minimum during this event.

WSDOT will continue to test and enhance the Commercial Vehicle Emergency Detour Pass175 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

174 http://www.wsdot.wa.gov/freight/
175 http://www.wsdot.wa.gov/CommercialVehicle/detourpass.htm
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 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.

WSDOT will continue working with FMSIB, cities, counties, 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 Coordinating committee. WSDOT will coordinate with adjacent states on freight issues and participate in national conversations regarding freight to develop and implement multimodal solutions.

Washington will 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 and the Ports of Moses Lake, Walla Walla and Whitman County are developing a strategic plan for the Washington State Grain Train program\(^\text{176}\) in 2017. The program was started in 1994 to provide cost-effective grain hopper cars, and now moves thousands of tons of grain to deepwater ports along the Columbia River and Salish Sea for transport to ships bound for Pacific Rim markets. The study is being conducted to ensure that the grain train program meets current stakeholder needs.

WSDOT will update the Design Manual\(^\text{177}\) 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 has been 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, and Chapter 1330: Traffic Control Signals.

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. For example:

<table>
<thead>
<tr>
<th>Snoqualmie Pass - Vicinity</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESTRICTION – No loads over 12’ wide eastbound from 8:00 pm to 9:00 am each night, from Tuesday night through Friday morning.</td>
</tr>
</tbody>
</table>

\(^\text{176}\) [https://www.wsdot.wa.gov/Freight/Rail/GrainTrain.htm](https://www.wsdot.wa.gov/Freight/Rail/GrainTrain.htm)

\(^\text{177}\) [http://www.wsdot.wa.gov/Publications/Manuals/M22-01.htm](http://www.wsdot.wa.gov/Publications/Manuals/M22-01.htm)
After drivers receive permits for oversize loads prior to a lane narrowing, 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 oversize load permits get timely notifications of lane restrictions, WSDOT can help drivers safely complete their trips with minimal delays.

In 2016, WSDOT conducted a best practices study of construction impacts to transit and freight\textsuperscript{178}. The report identifies opportunities for improvement largely related to engagement and collaboration, and 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.

\textsuperscript{178} \url{http://www.wsdot.wa.gov/publications/fulltext/LegReports/15-17/HighwayConstructionAndTrafficReport.pdf}
11 NEXT STEPS

This draft plan was developed with input from the freight industry and industry associations, regional and local governments, and federal and state partners. Outreach efforts are detailed in Appendix E. This draft plan will be available for review from August 15 to September 14, 2017. Please send comments, using the comment form located at the WSDOT Freight website located here: http://www.wsdot.wa.gov/Freight/.

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:

(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

11.1 Areas of Focus

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

<table>
<thead>
<tr>
<th>Transportation System Policy Goals</th>
<th>Areas of Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Vitality</td>
<td>Promoting international exports</td>
</tr>
<tr>
<td></td>
<td>Improving competitiveness of marine ports</td>
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<tr>
<td></td>
<td>Promoting freight employment and recruitment</td>
</tr>
<tr>
<td></td>
<td>Protecting freight-dependent industrial sites</td>
</tr>
<tr>
<td></td>
<td>Improving intermodal connections</td>
</tr>
<tr>
<td>Preservation</td>
<td>Addressing pavement and bridge preservation needs on major truck routes</td>
</tr>
<tr>
<td></td>
<td>Addressing rail infrastructure needs</td>
</tr>
<tr>
<td></td>
<td>Addressing port and terminal infrastructure and navigation aides</td>
</tr>
</tbody>
</table>
### Transportation System Policy Goals

<table>
<thead>
<tr>
<th>Areas of Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addressing air cargo pavement conditions</td>
</tr>
<tr>
<td>Safety</td>
</tr>
<tr>
<td>Reducing truck-related fatalities and serious injuries</td>
</tr>
<tr>
<td>Assessing opportunities to improve truck parking</td>
</tr>
<tr>
<td>Improving rail safety</td>
</tr>
<tr>
<td>Enhancing rail crossing safety</td>
</tr>
<tr>
<td>Enhancing freight security and defense capabilities</td>
</tr>
<tr>
<td>Mobility</td>
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<tr>
<td>Addressing traffic congestion and truck bottlenecks</td>
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<tr>
<td>Improving rail system capacity</td>
</tr>
<tr>
<td>Improving marine system congestion</td>
</tr>
<tr>
<td>Evaluating air cargo capacity statewide</td>
</tr>
<tr>
<td>Addressing changing supply chain dynamics</td>
</tr>
<tr>
<td>Monitoring emerging technologies</td>
</tr>
<tr>
<td>Environment</td>
</tr>
<tr>
<td>Assessing vulnerability of climate impacts</td>
</tr>
<tr>
<td>Reducing diesel emissions</td>
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<tr>
<td>Monitoring the safety and security of fuel supply chains</td>
</tr>
<tr>
<td>Stewardship</td>
</tr>
<tr>
<td>Improving freight system resiliency</td>
</tr>
<tr>
<td>Addressing regulatory challenges</td>
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<tr>
<td>Identifying sustainable freight funding</td>
</tr>
<tr>
<td>Improving data, transportation models, and performance measures</td>
</tr>
<tr>
<td>Enhancing communication and coordination</td>
</tr>
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### 11.2 Projects

The National Highway Freight Program (NHFP) provides Washington an estimated $96 million from federal fiscal years 2016 to 2020. Exhibit 17 in Appendix A shows the projects funded by the NHFP from the first three years of available funding. Validation of projects for FFY 2019-2020 NHFP funding is underway, and will be complete by November 2017. Based on consultation with WAFAC, WSDOT will prioritize projects for funding when complete. A validated, prioritized, fiscally constrained freight project list that meets federal requirements will be included in the final 2017 Washington State Freight Investment Plan. It will include all NHFP-funded projects in Washington, and show how NHFP funds are to be invested and matched. The 2017 plan is required to be approved by the Federal Highway Administration by December 4, 2017.
11.3 Plan Update Schedule

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.